Technical Report

Simple Configuration Guide for NetApp Storage

Jason Blosil and Rishikesh Boddu, NetApp
April 2011 | TR-3913

EXECUTIVE SUMMARY

This guide is an overview of NetApp® storage solutions and the value they offer businesses of all sizes. It includes simple instructions on how to set up and configure a basic NetApp storage system. It also discusses advanced NetApp features that can deliver exceptional storage efficiency and functionality for backup, restoration, and disaster recovery.

TABLE OF CONTENTS

1 BUSINESS OVERVIEW

As the value and amount of electronic data increases, deploying the right storage strategy becomes even more critical. A centralized storage strategy offers the best solution to store, protect, and retain your valuable data. Today's solutions address technology trends around managed scalability, server virtualization, and networking with advanced features and simplified management for organizations with limited IT staff.

The growth of data is not unique to larger enterprises. Businesses of all sizes face the challenges of acquiring, storing, and retaining large amounts of data. In response to these challenges, solutions that were once considered overly complicated and expensive for smaller businesses have been made simpler to procure, deploy, and manage. Advanced functionality once reserved for costly solutions is now common in lower-priced solutions, making it easier for midsize organizations to address data growth and retention.

NetApp leads the industry in storage efficiency and innovation. With features such as thin provisioning, deduplication, high-performing and space-efficient Snapshot® copies, and advanced disaster recovery capabilities, NetApp offers solutions to help you achieve your business goals. With a shared vision of a virtual dynamic data center and a partnership that extends back to 2003, NetApp is developing technologies that deliver the value and performance needed to meet your IT requirements. We partner with industry leaders to provide reference architectures and proven configurations to enable organizations of all sizes to meet the IT and business needs of today and tomorrow.

NetApp storage solutions are built on a single platform that scales from small deployments of a few terabytes to large deployments beyond a petabyte, all with a common set of features and management tools. Each NetApp fabric-attached storage (FAS) system is capable of running multiple block- and file-based protocols at the same time, including Network File System (NFS), Common Internet File Service (CIFS), Fibre Channel (FC), and Internet Small Computer System Interface (iSCSI). NetApp unified storage simplifies data management with the ability to scale your storage environment as your business grows, without the need for staff retraining or forklift equipment upgrades. NetApp V-Series storage systems can extend the life of your existing FC storage investments by extending many of the same advanced features as the FAS storage systems to managing legacy installed-base storage systems from third-party manufacturers.

1.1 STORAGE NETWORKING

A network infrastructure that uses Fibre Channel or Ethernet should have no single point of failure. A highly available solution includes:

- Two or more Fibre Channel or Ethernet network switches
- Two or more host bus adapters (HBAs) or network interface cards (NICs) per server
- Two or more target Fibre Channel ports or Ethernet NICs per storage controller
- In addition, when using Fibre Channel, two fabrics are required to have a truly redundant architecture

NetApp unified storage solutions enable powerful thin provisioning, simplified data management, and scalable and consistent I/O performance for all protocols across network-attached storage (NAS, NFS, CIFS) and storage area networks (SANs, Fibre Channel, Fibre Channel over Ethernet [FCoE], and iSCSI) in a single pool of storage. These solutions:

- Support SAN (Fibre Channel, FCoE, and iSCSI) or NAS
- Scale nondisruptively from a few terabytes to over 2 petabytes
- Are easily installed, configured, managed, and maintained
- Dynamically expand and contract storage volumes as needed
- Offer features that provide:

- Rapid backup and recovery with zero-penalty Snapshot copies
- Simple, cost-effective replication for disaster recovery
- Instant space-efficient data clones for provisioning and testing
- Data deduplication to reduce capacity requirements

NetApp storage solutions offer these powerful data management and data protection capabilities that enable you to lower costs while meeting capacity, utilization, and performance requirements.

2 DEPLOYING A NETAPP STORAGE SOLUTION

NetApp System Manager is a feature-rich yet easy-to-use storage management tool for basic configuration and management of NetApp storage systems. System Manager is ideal for initial setup and configuration of one system at a time. As your environment grows, NetApp offers a suite of storage management tools.

This guide uses System Manager to demonstrate how to easily configure a NetApp storage system. Version 1.1 is supported on all NetApp FAS2000, FAS3000, FAS3100, FAS3200, FAS6000, and FAS6200 systems and on the corresponding V-Series systems. NetApp System Manager is supported on the following host systems:

- Windows® XP 32-bit, SP2 and later (also supported in a VMware® 32-bit guest OS)
- Windows Vista® Enterprise 32-bit and 64-bit
- Windows Server 2003 SP1
- Windows Server 2008 Enterprise 64-bit

2.1 SYSTEM SETUP AND MANAGEMENT

INITIAL SYSTEM SETUP

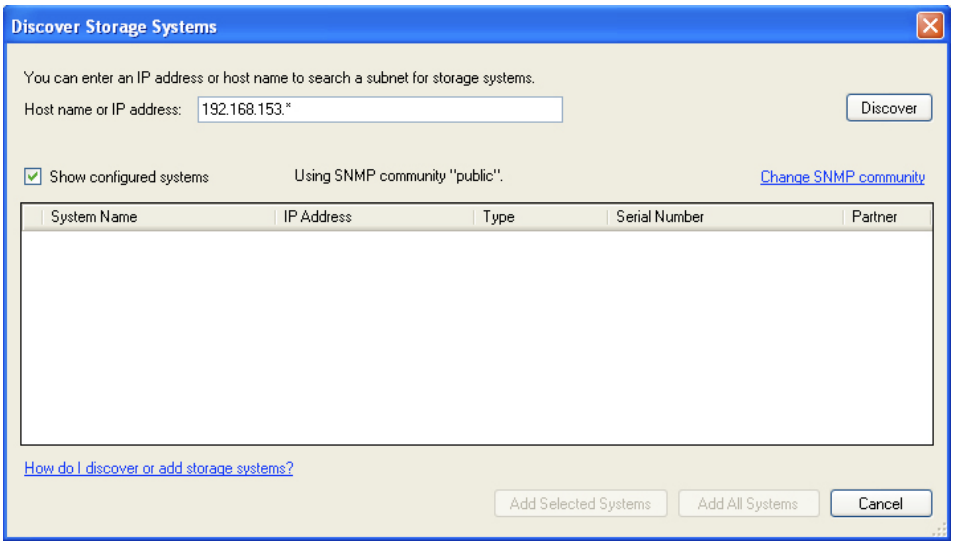
The setup includes the basic configuration such as of the host name, IP address, subnet, credentials, management interface, and system default IP gateway. It also sets up the time and date and CIFS in workgroup mode.

Connect the management interface of the storage system or array on a network with Dynamic Host Configuration Protocol (DHCP) enabled and working.

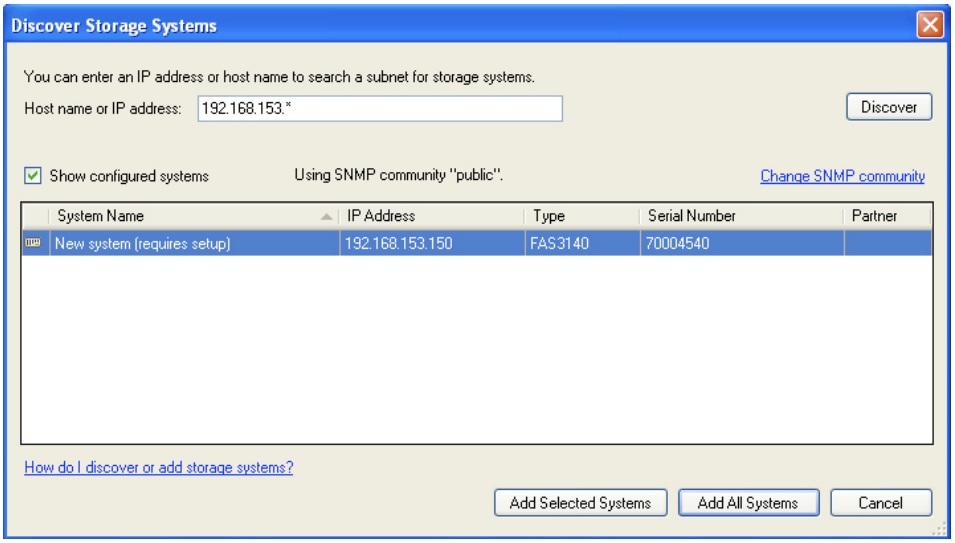
Note: If a source of DHCP services is not available to provide initial configuration, the console port on the NetApp system provides an alternate command-line approach to set the IP address of the management port.

1. Install NetApp System Manager from the software CD and launch System Manager.
2. When you launch System Manager for the first time, you are prompted to either add individual systems or to discover all systems on a network, so you can select the controllers you want to manage. To search for your controller, enter an IP address in the subnet that contains your controller in the **Host Name** or **IP Address** field and click **Discover**.

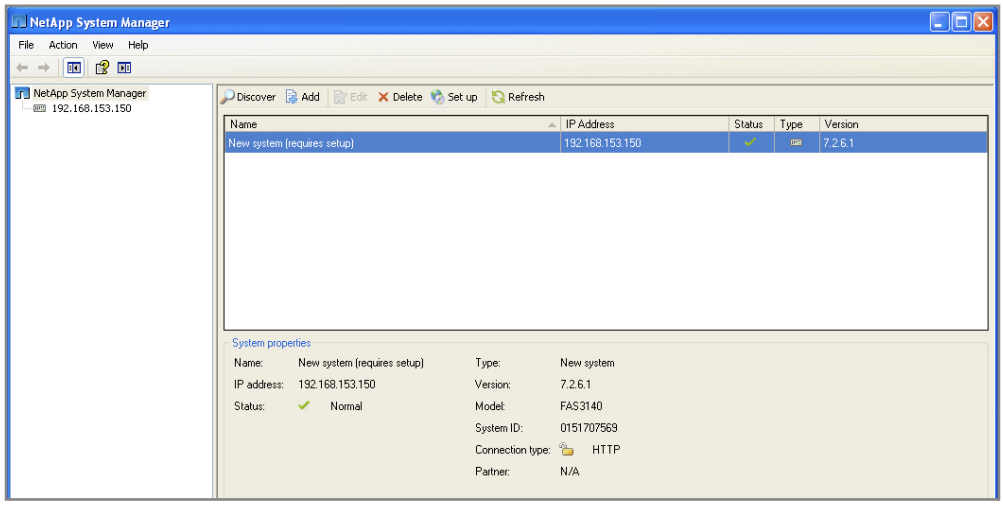
   System Manager uses DHCP and Simple Network Management Protocol (SNMP) to discover storage controllers. New controllers are represented as **New system (requires setup)**.



3. Select the new system and click **Add Selected Systems**.

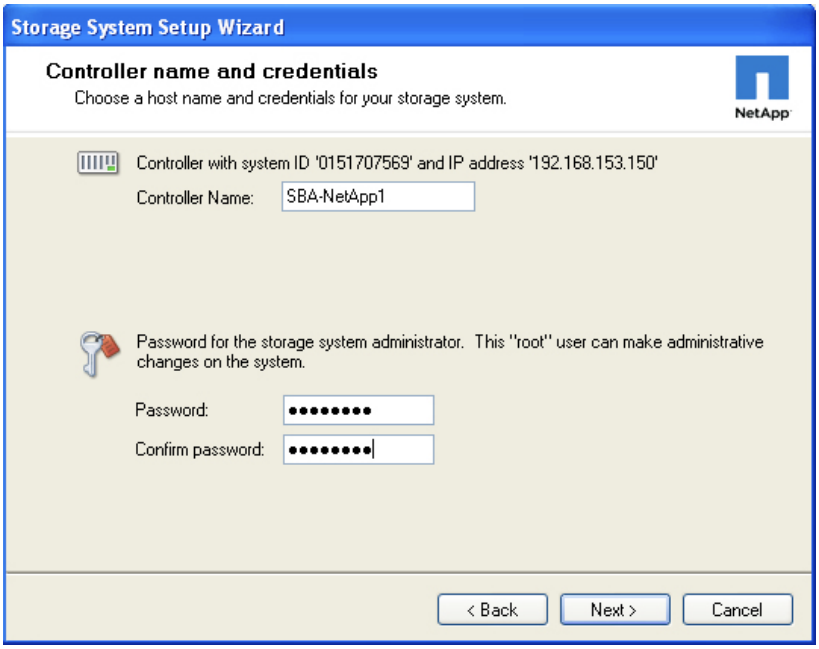


In the window that opens, the left pane shows the new controller with the IP address acquired by the controller from DHCP.

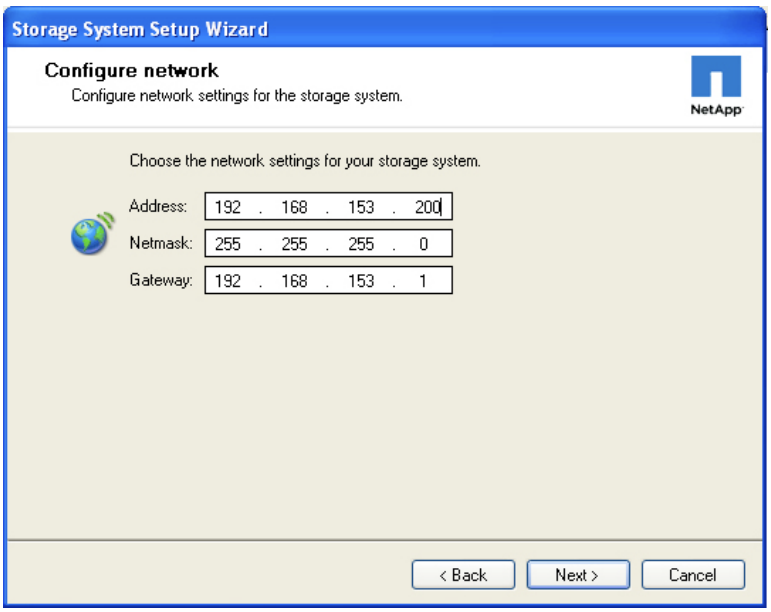


4. Select the new controller IP address. A message displays in the right pane: “This new storage system requires setup.” To set up the new storage system, click the **Set Up Storage System** link, which launches the Storage System Setup Wizard.

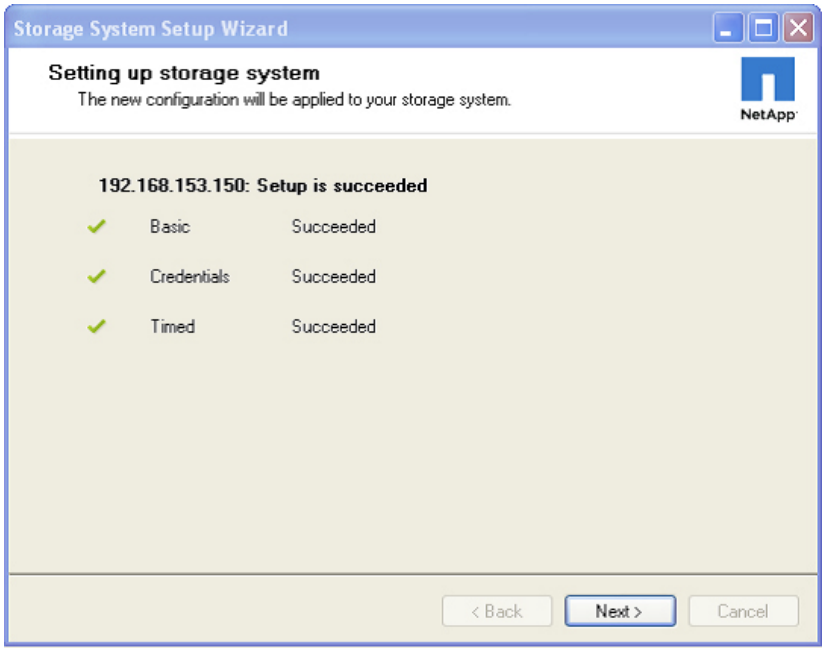
   The wizard prompts you for the controller name and credentials.



5. System Manager displays the IP address that the controller acquired from DHCP. This is the final step to configure your storage on the network. Change this IP address to a static IP address assigned to you by the network administrator.



6. Click **Next** to display a summary of the configuration. Click **Next** to complete the configuration.

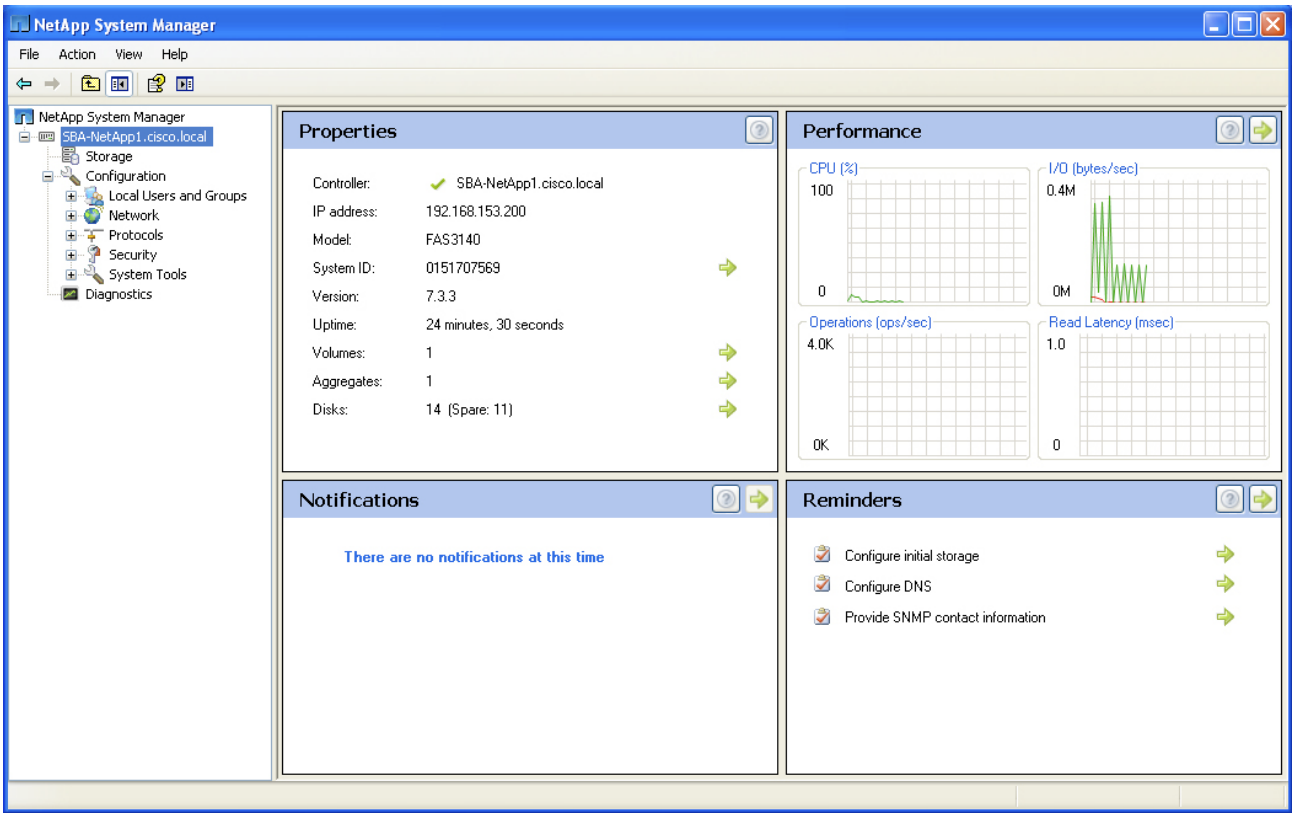


Note: System Manager provides the ability to set up basic SSL to establish a secure link between the host and controller for management. These settings can be configured by clicking the **Storage > Security** tab in the left pane.

NETAPP SYSTEM MANAGER

1. To view system details, click the controller name in the left pane. The dashboard view that opens displays system properties including name, IP address, model, system ID, Data ONTAP® version, system uptime, and number of volumes, aggregates, and disks.
2. To manage these items, click the green arrows to their right.

   System Manager also provides basic performance graphs for CPU utilization, total I/O, combined operations of all protocols, and latency for all protocols.



3. System Manager also offers Notifications and Reminders roll-ups. The Notifications area shows the current event list by scanning through the syslog. The Reminders area shows reminders or a to-do list. To go directly to the source of the reminder, click the green arrow next to it.

Your NetApp storage system is configured and ready to use. You can now perform storage management (manage disks, aggregates, volumes, qtrees, Logical Unit Numbers [LUNs]), protocol management (CIFS, NFS, iSCSI, FCP, FCoE), and system configuration (network, licenses, SNMP, users, groups).

2.2 STORAGE PROVISIONING

Storage provisioning on NetApp storage is easy, involving only a few steps to provision a LUN or file share. Aggregates form the foundation storage layer from which flexible volumes and then LUNs are stored. The layers of storage virtualization offer a number of advantages to manage and optimize the storage, protection, and retention of your data. The process for configuring an iSCSI LUN includes the following steps:

1. Create an aggregate.
2. Configure flexible volumes.
3. Enable an additional Ethernet interface.
4. Enable Ethernet storage as a VIF (optional).

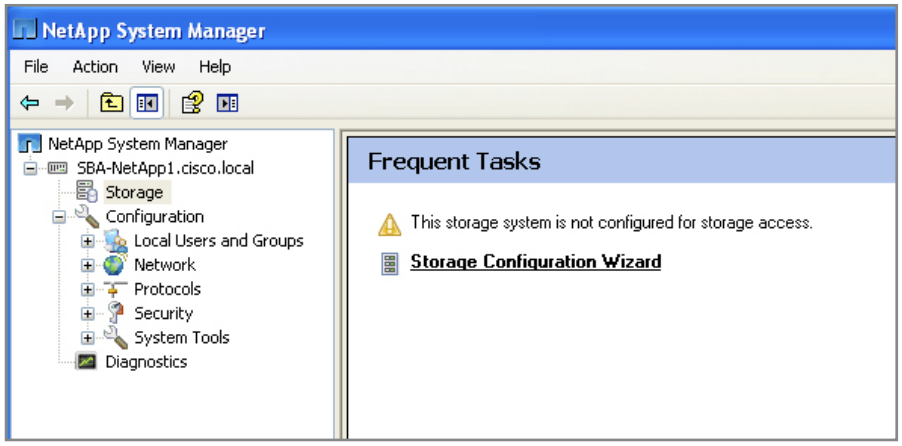
5. Add an iSCSI initiator group.

CREATE AN AGGREGATE

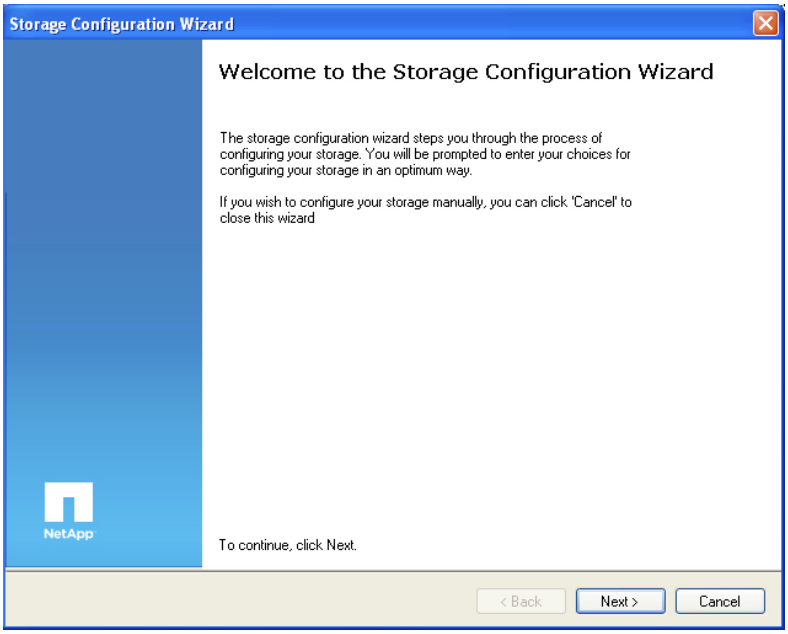
An aggregate is NetApp's virtualization layer, which abstracts physical disks on a storage device from logical datasets that are referred to as flexible volumes. Aggregates are the means by which the total IOPS (input/output operations per second) available from all of the individual physical disks are pooled as a resource. Aggregates are well suited to meet users' differing security, backup, performance, and data-sharing needs, as well as the most unpredictable and mixed workloads.

NetApp recommends that, whenever possible, a separate small aggregate with RAID-DP® be used to host the root volume. This stores the files required to run and provide GUI management tools for the NetApp storage system. The remaining storage should be placed into a small number of large aggregates. This provides optimal performance because of the ability of a large number of physical spindles to service I/O requests. On smaller arrays, it might not be practical to have more than a single aggregate, due to the restricted number of disk drives on the system. In these cases, it is acceptable to have only a single aggregate.

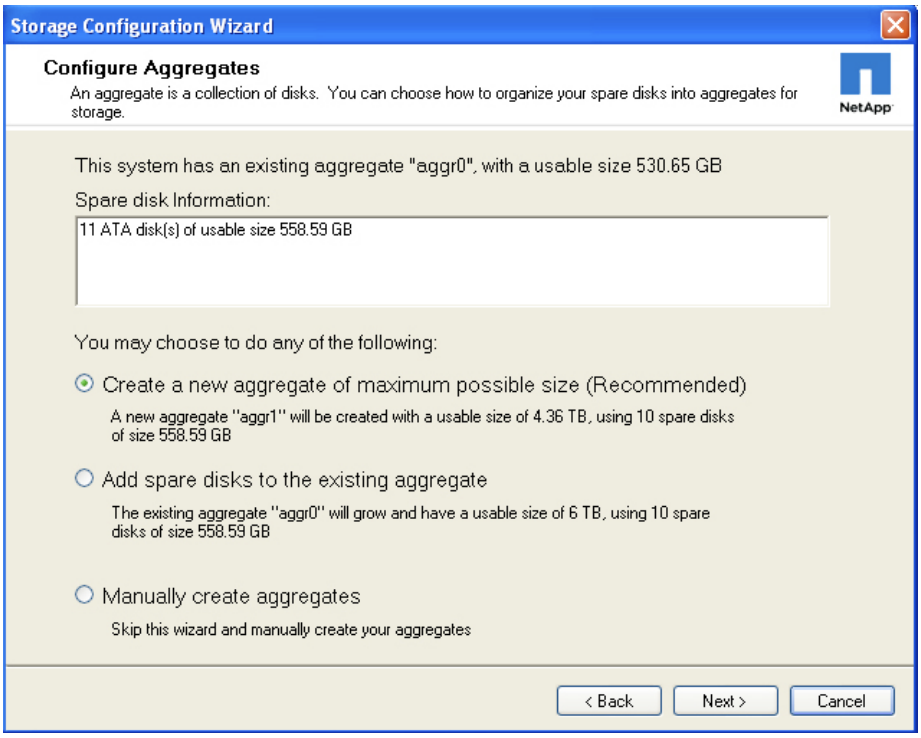
1. From the left pane, select **Storage**. Click the **Storage Configuration Wizard** link in the right pane to launch.



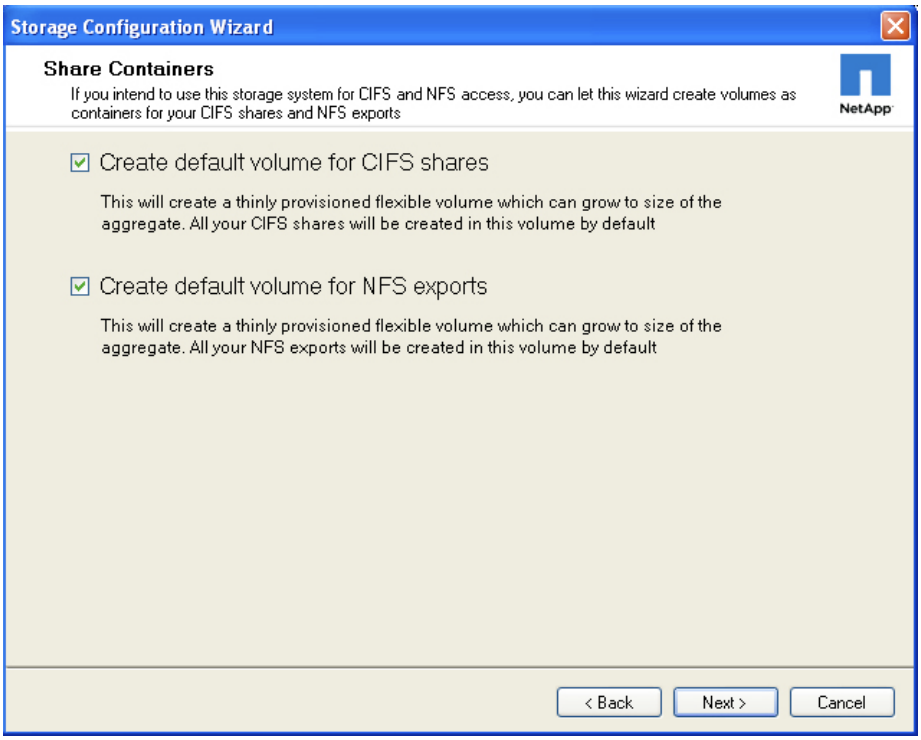
2. Click **Next** to proceed with initial storage configuration.



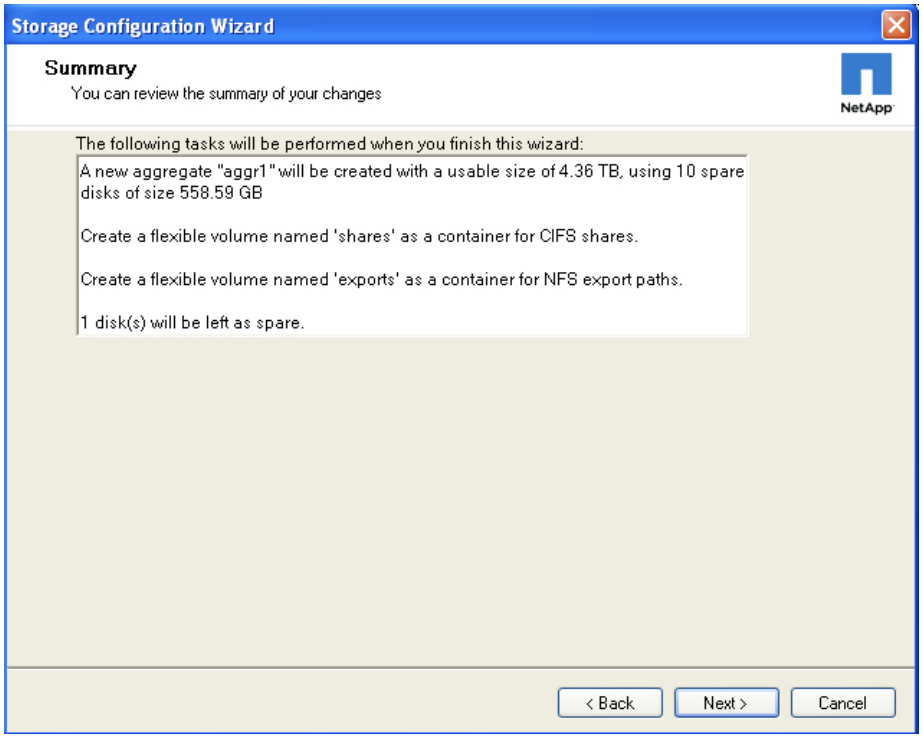
3. Choose the appropriate radio button for your desired configuration of aggregates. For this example, we chose the recommended item: **Create a new aggregate of maximum possible size**.



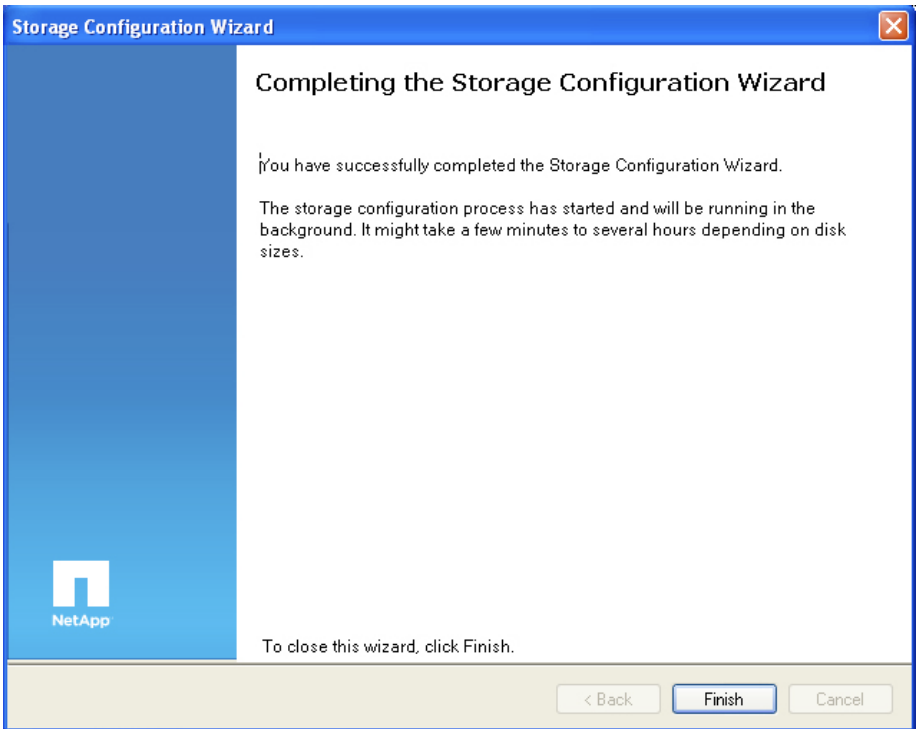
4. Select the appropriate checkboxes to create default CIFS shares and NFS exports if required in your configuration. Selecting these boxes also enables thinly provisioned volumes. Choose the desired options and click **Next** to continue.



5. Verify the summary of settings being performed by the Storage Configuration Wizard displayed in the window. Click **Next** to create the aggregate.



6. The creation of an aggregate takes place in the background, allowing you to store data immediately. Click **Finish** to close the wizard.

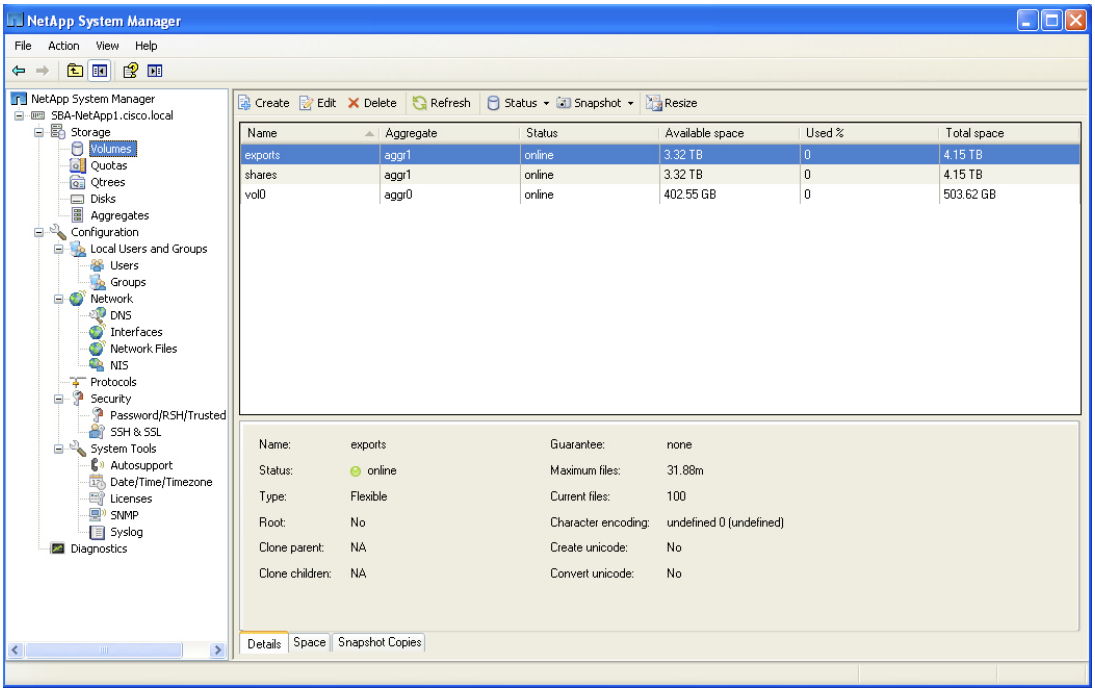


Note: For details on manually configuring an aggregate, see “Configure an Aggregate” in section 3.6.1 of the “Data ONTAP Storage Management Guide,” available on the NetApp Support (formerly NOW™) site.

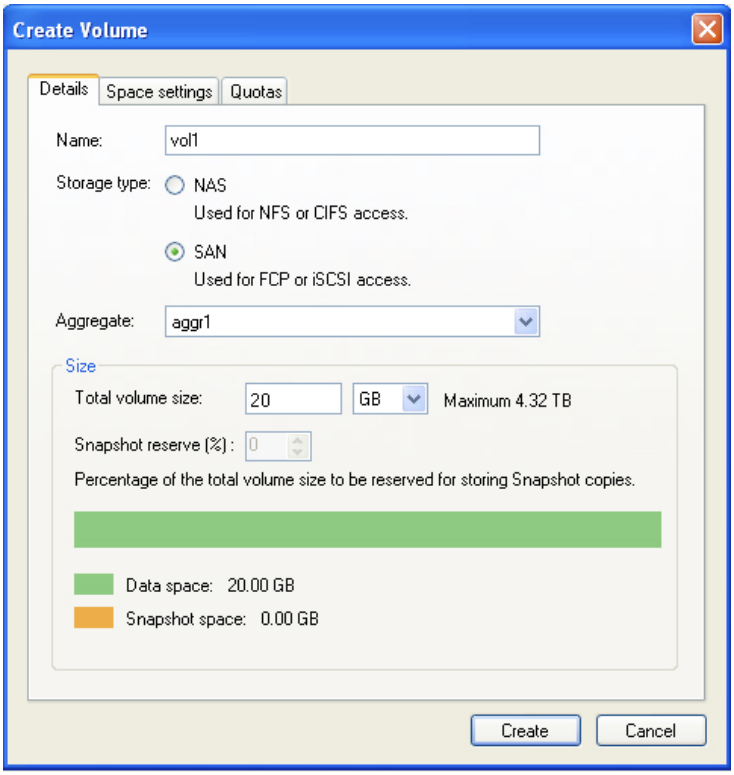
CONFIGURE FLEXIBLE VOLUMES

FlexVol® volumes (flexible volumes) are thin storage containers that can contain LUNs and/or file shares that are accessed by servers over Fibre Channel (FC), Fibre Channel over Ethernet (FCoE), iSCSI, NFS, or CIFS. A FlexVol volume is a virtual volume that you can manage and move independently from physical storage. It can be created and resized, larger or smaller, as your application needs change.

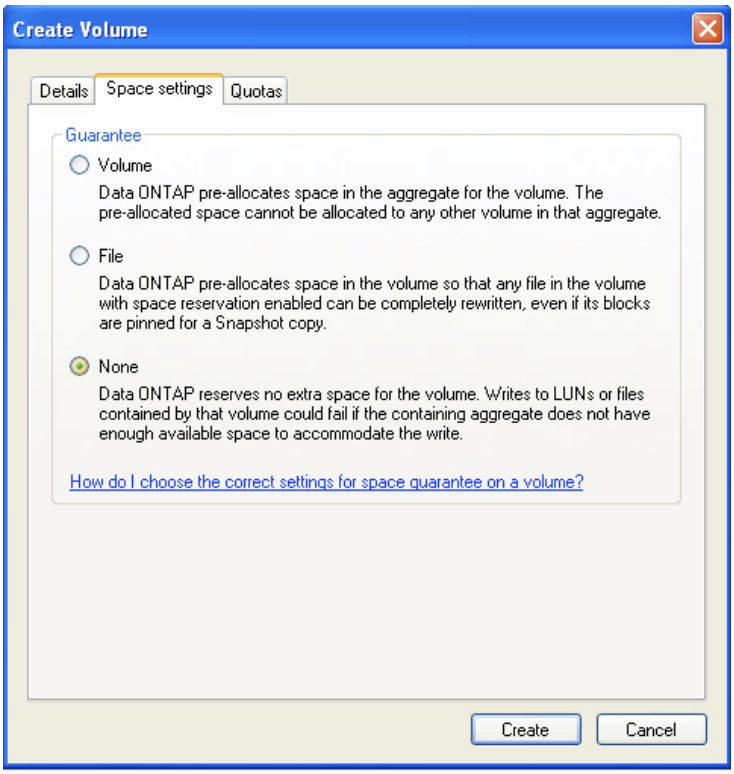
1. Click **Storage > Volumes** and click **Create** to create a volume.



2. To create a volume, define the following properties:
   - **Volume name**: NetApp suggests using a combination of the host name, physical disk, and replication policy. Example: HostB_Disk1_4hmirror.
   - **Storage type**: NAS (file properties) or SAN (block properties).
   - **Aggregate**: Specify an aggregate where the volume resides for the LUN.
   - **Volume size**: For SAN volumes, this would be the LUN capacity.
   - **Snapshot reserve**: The amount of the LUN to be reserved for Snapshot data. This dedicates space in the LUN for Snapshot data. The default setting is 20%, which means that 20% of the LUN is not available for other data storage. You can choose a higher value or as little as 0%, depending on your requirements. NetApp recommends configuring all SAN volumes with 0% and disabling the default Snapshot schedule. You may choose to reserve space for NAS volumes.



3. The **Space Settings** tab is used to reserve space on disk for the volume. You can reserve space for the whole volume or for a file with reservation properties. Additionally, you can select **None** to create a thinly provisioned volume that consumes space on disk only as data is written.



Note: For a description of thin provisioning see “Thin Provisioning” in the “Advanced Features” section in this document.

4. Click **Create** to create the volume.

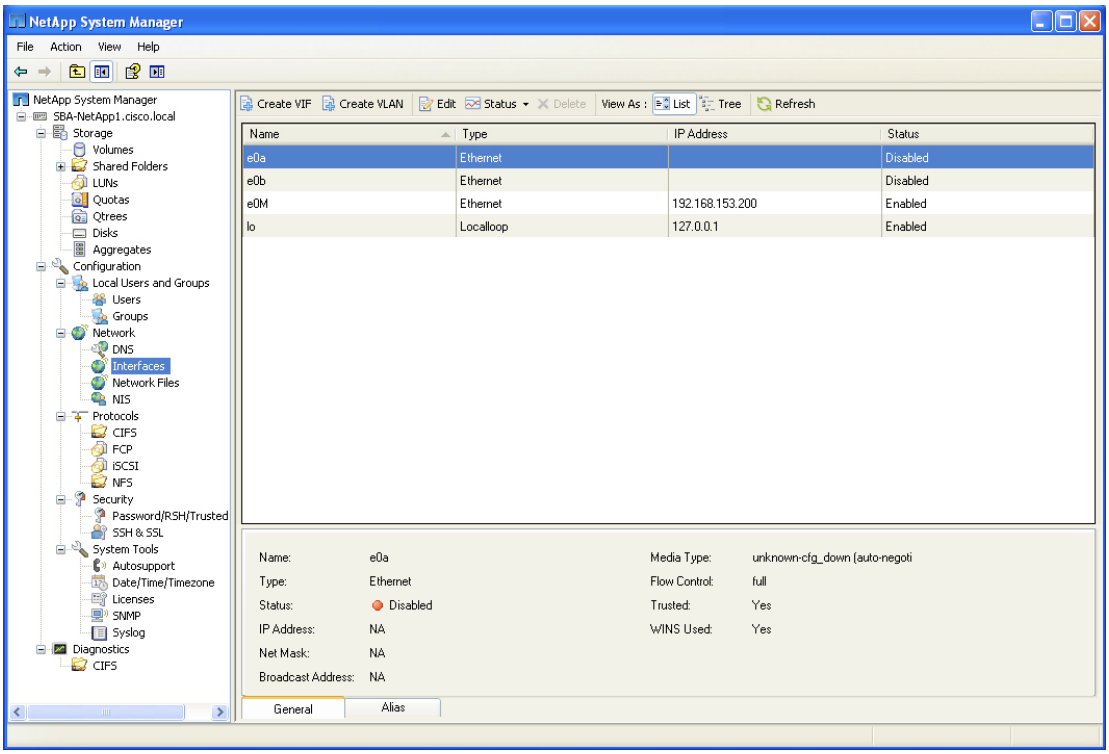
Note: Because out-of-space errors aren't expected in a CIFS environment, do not set the space guarantee to **None** for volumes accessed by CIFS.

Space guarantees are honored only for online volumes. If you take a volume offline, any committed but unused space for that volume becomes available for other volumes in that aggregate.

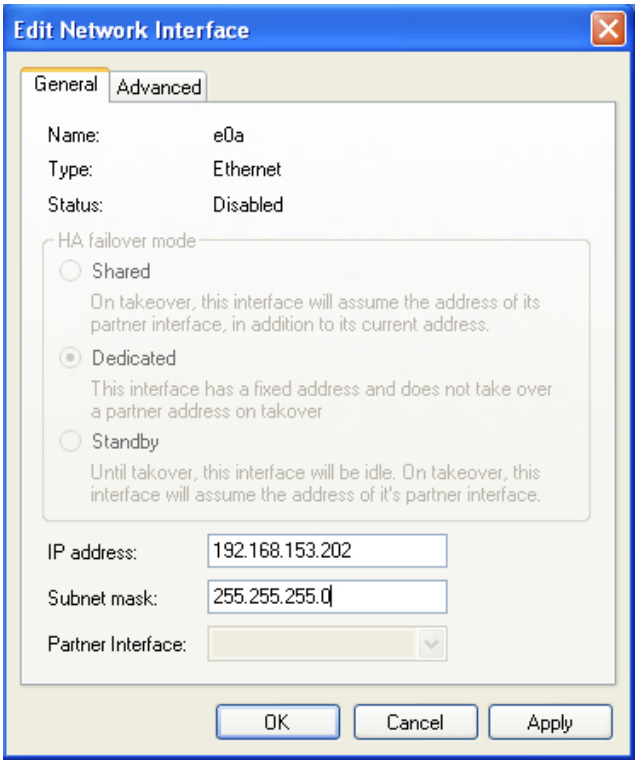
ENABLE AN ADDITIONAL ETHERNET INTERFACE

On a system that will support Ethernet-based access to storage, it is desirable to dedicate the e0M for system management traffic and to use one or more separate physical Ethernet interfaces for iSCSI initiators or NAS clients to access storage.

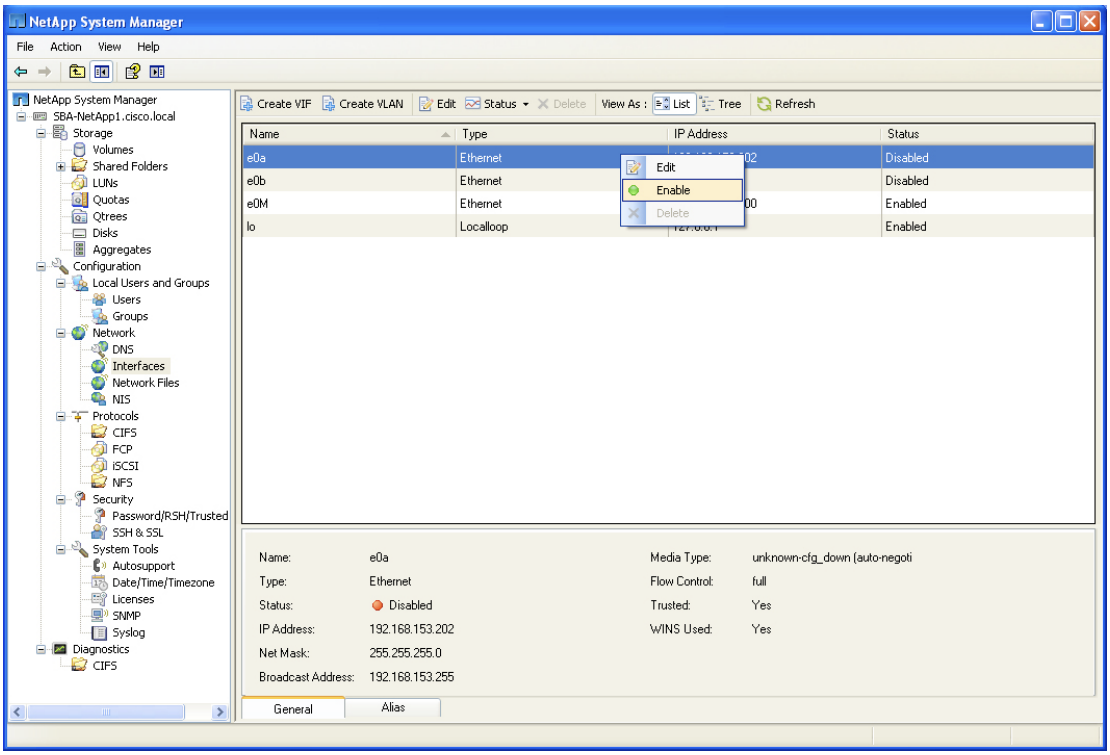
1. Click **Configuration > Network > Interfaces** from the left pane, and highlight an available Ethernet interface in the right pane.
2. Click **Edit** to edit the interface settings.



3. In the **Edit Network Interface** window, click the **General** tab and configure the IP address and subnet mask information. Click **OK**.



4. Once the interface has an IP address, right-click the configured interface and click **Enable** from the pop-up menu.

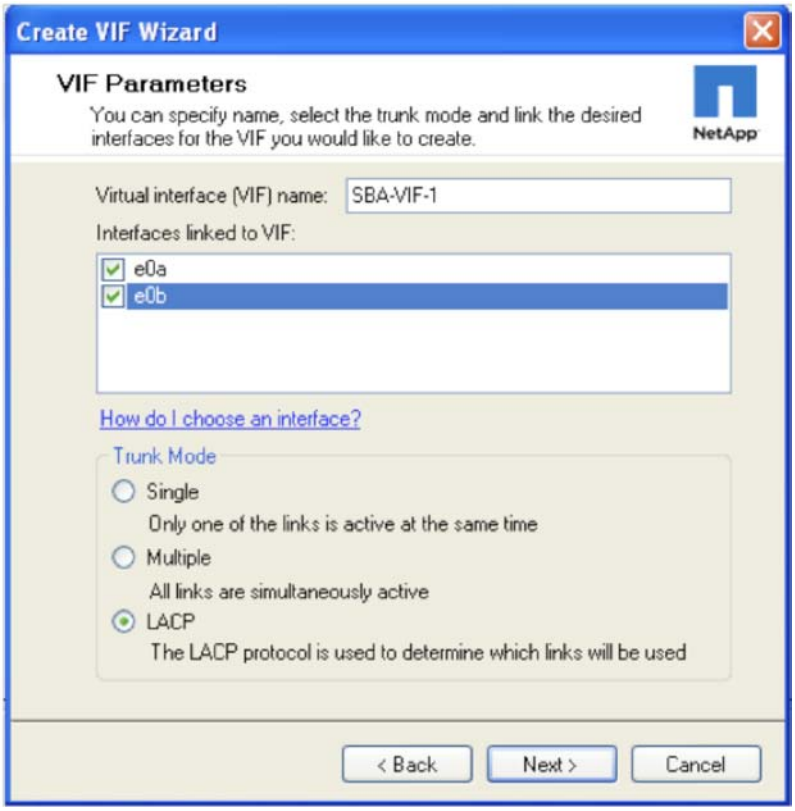


The address configured on the new interface should be used as the target IP address for iSCSI initiators. This configuration allows management traffic to be isolated on a separate interface from production storage traffic and to provide separate management access if the Ethernet storage interface ever needs to be reset or changed.

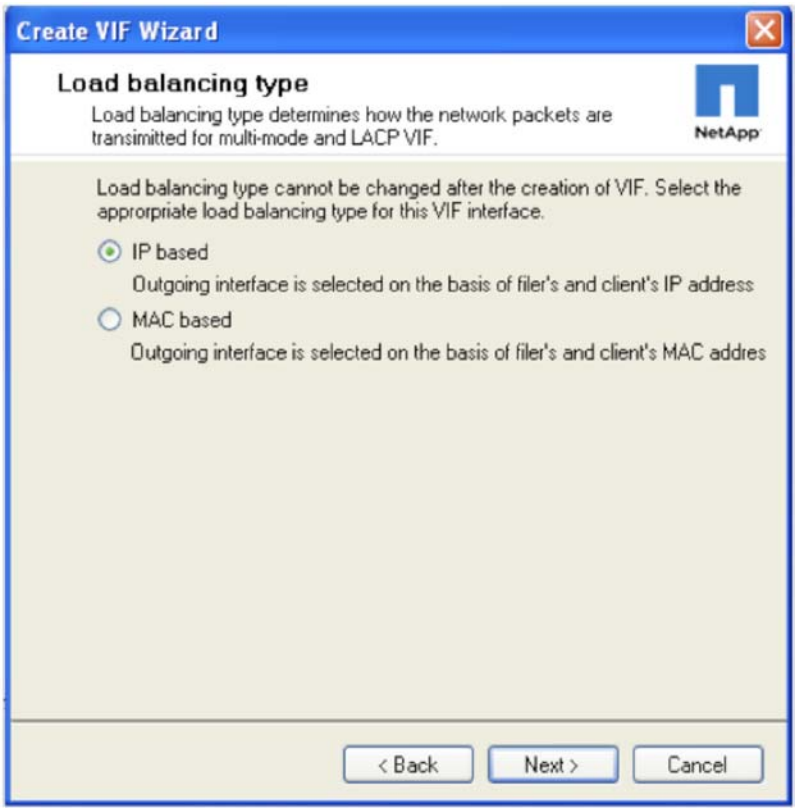
ENABLE ETHERNET STORAGE AS A VIF

NetApp storage systems connect to the Ethernet network using a virtual interface, or VIF. With a VIF configuration the dual interfaces provide system resiliency and, when configured as a port-channel using Link Aggregation Control Protocol (LACP), both links can actively carry storage traffic.

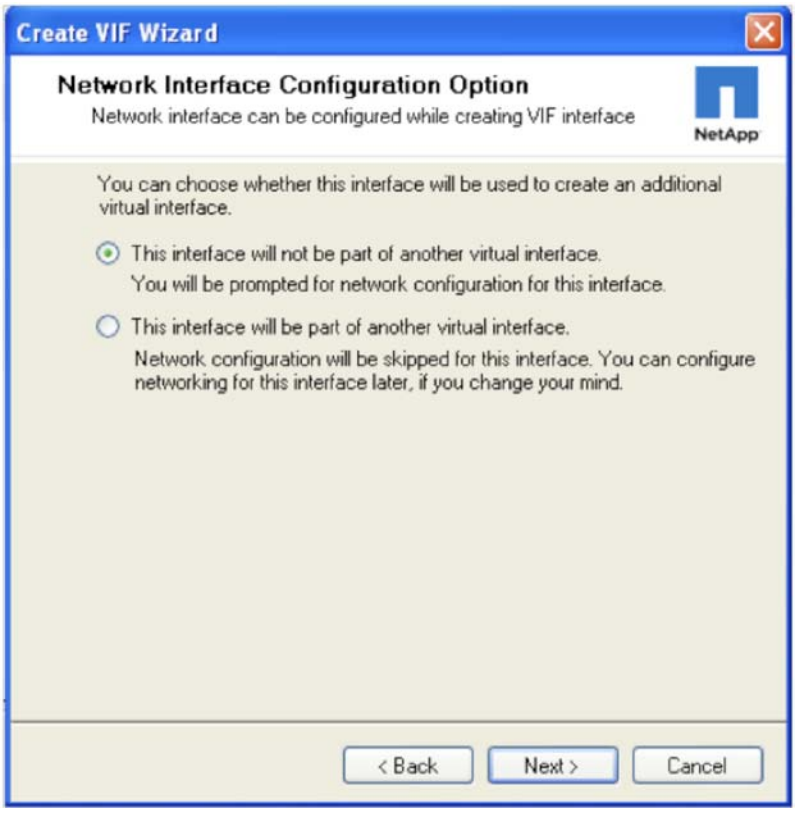
1. To enable the Ethernet storage interface as a VIF, from the **Network Interfaces** screen choose **Create VIF**.
2. Choose the two interfaces that will be part of the VIF, and select **LACP** as the trunk mode to connect to an Ethernet switch fabric configured for an LACP port-channel connection. Click **Next**.



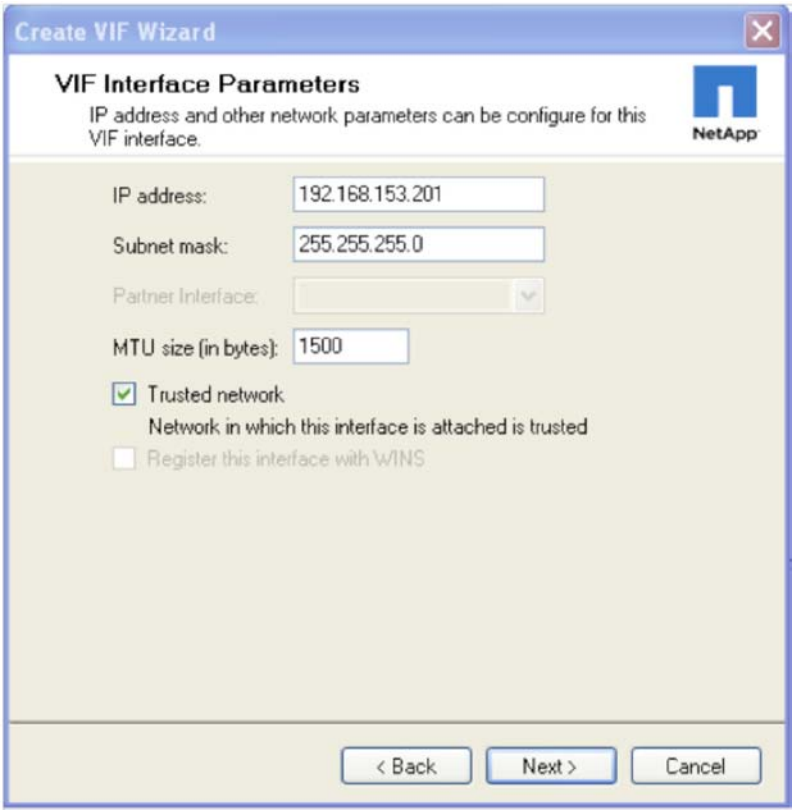
3. Select the load balancing type and click **Next**. IP-based balancing is the default and the recommended type.



4. In the Network Interface Configuration Option screen, select the **This interface will not be part of another virtual interface** button. Click **Next**.



5. Assign an IP address to the VIF. If you are converting a single interface configuration to a VIF, any existing IP address will automatically be removed from the physical interfaces as they are placed into the VIF. So the same interface address previously used on a single interface may be reapplied to the VIF.



6. Leave the other choices on the screen at the default value and click **Next** to continue and create the VIF.
7. Once the VIF is created, you can opt to monitor the port status in the Network Interfaces screen. When LACP negotiation is completed with the Ethernet switching fabric, the port status will be shown as "Enabled."

   Note: You may require configuration of the management and Ethernet storage interfaces on different subnets. In that case it is necessary to send traffic to different default gateways through separate specific interfaces.

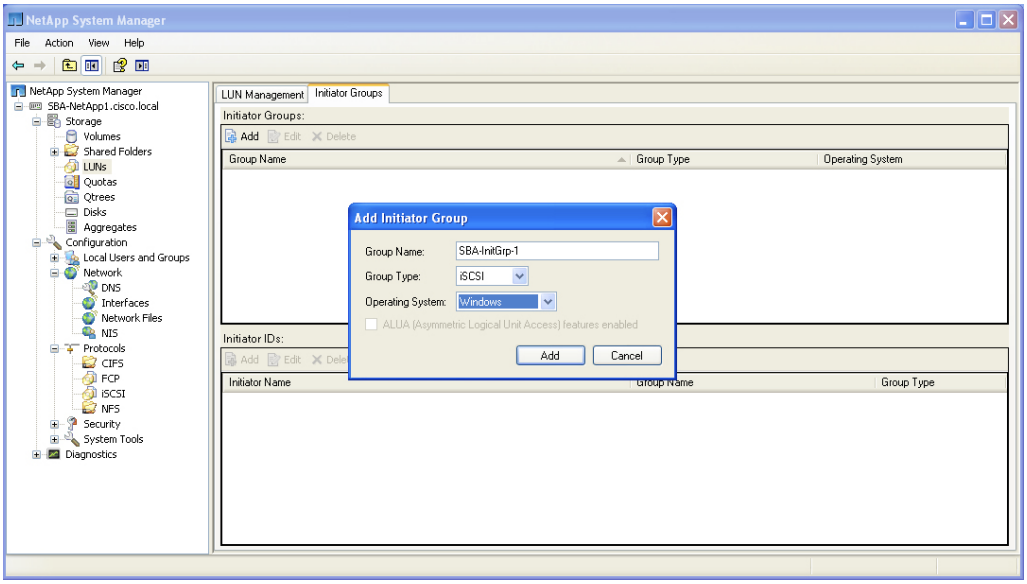
For more information on this type of configuration, consult the NetApp online knowledge base (see https://now.netapp.com/Knowledgebase/solutionarea.asp?id=kb27012). The NetApp knowledge base requires a login, which is available free of charge.

ADD AN ISCSI INITIATOR GROUP

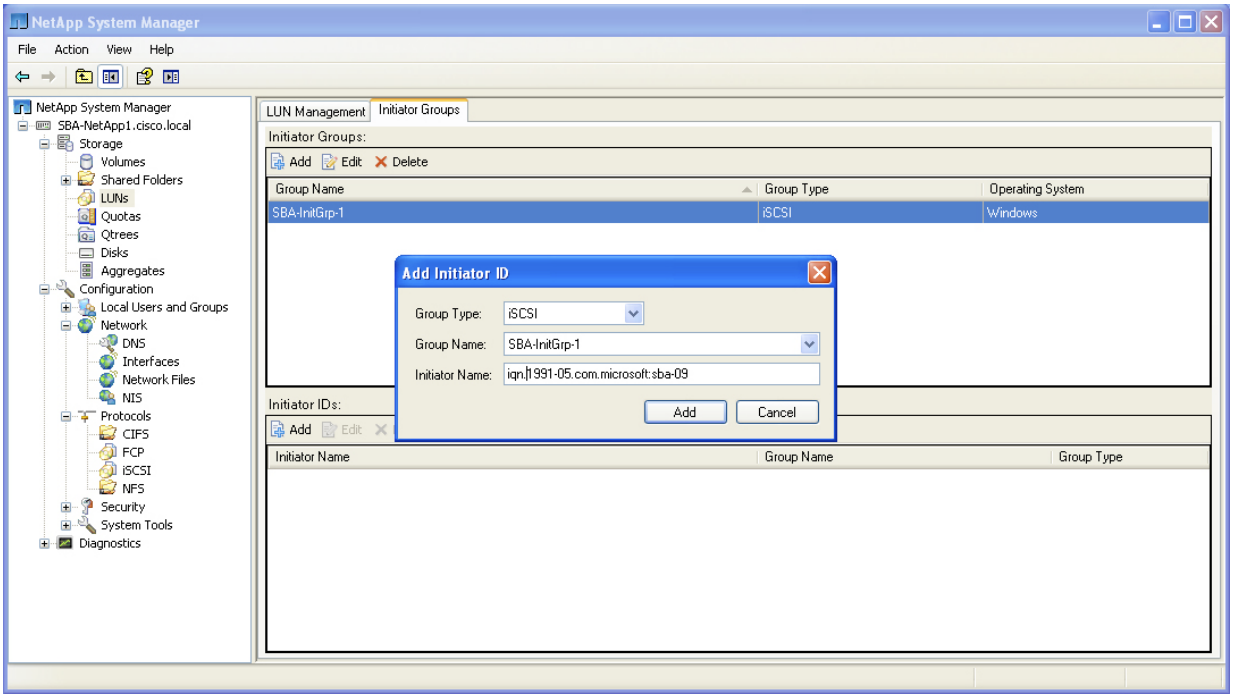
An iSCSI initiator group may be associated to a LUN for iSCSI access, and holds one or more initiator IDs. Initiator IDs are text identifiers configured on the host systems that need to access storage. Initiator groups are also commonly referred to as igroups, access control lists, or LUN masking lists. When creating a LUN for iSCSI access, it is helpful if the appropriate iSCSI initiator group already exists so that it can be associated to the LUN directly within the LUN Creation Wizard.

1. Click **Storage > LUNs** in the left pane of System Manager, and click the **Initiator Groups** tab.
2. Click **Add** and enter a name for the initiator group.
3. Select **iSCSI** as the group type, and select the appropriate operating system for the host that will be accessing this group.

4. Click the **Add** button in the Add Initiator Group window to create the group.

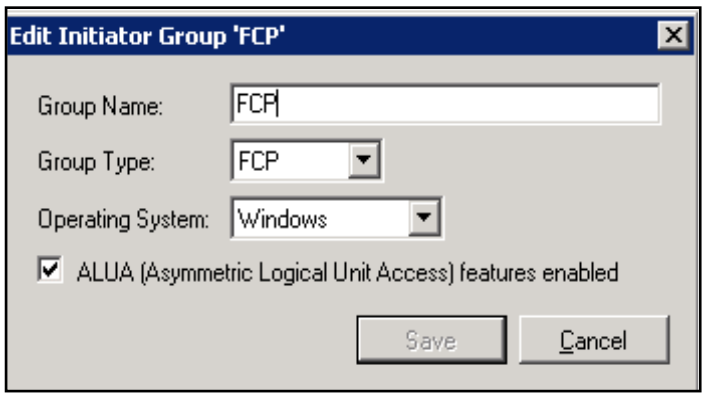


5. To create an initiator group for a Fibre Channel host, use the Group Type drop-down menu to change the type to **FCP**.
6. Once the group has been created, highlight the group name in the upper half of the right pane, and click **Add** to add an initiator ID to the group. The initiator name must match the name identified in the iSCSI configuration of the host machine that will access storage.



7. Click **Add** in the Add Initiator ID window to complete the addition of the new ID. With the initiator group and ID created, you are now ready to proceed with adding a LUN to the system to be accessed via iSCSI.

Note: To add an initiator ID for a Fibre Channel host, choose **FCP** from the Group Type drop-down menu and enter the appropriate Host WWN in the Initiator Name field. When selecting FCP, a checkbox to enable ALUA appears. NetApp recommends enabling ALUA. ALUA offers enhanced path access for high-availability configurations.



2.3 ADDING A LUN

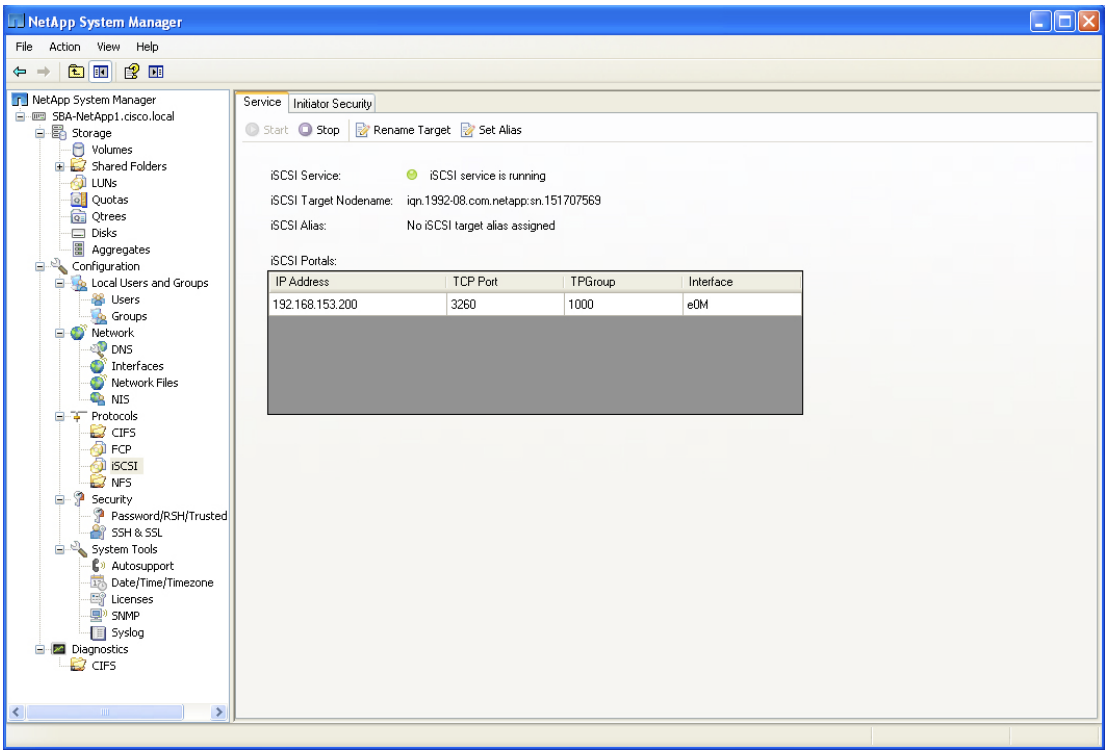
LUNs are logical units of storage provisioned from a NetApp storage system directly to servers. Hosts can access the LUNs as physical disks using the FC, FCoE, or iSCSI protocol. The process for creating a LUN on a NetApp FAS storage system is the same regardless of protocol and includes two general steps:

1. Create a LUN for iSCSI or Fibre Channel.
2. Create a LUN mapped to an iSCSI initiator.

CREATE A LUN FOR ISCSI, FIBRE CHANNEL, OR FCOE

The following example shows how to configure an iSCSI LUN.

1. Before configuring the LUN, start the iSCSI service on the storage system. Click **Configuration > Protocols > iSCSI** and then click **Start**.



2. You can create four different types of storage objects on the same storage system. Click the storage icon to list the four available options:
   – Create volume

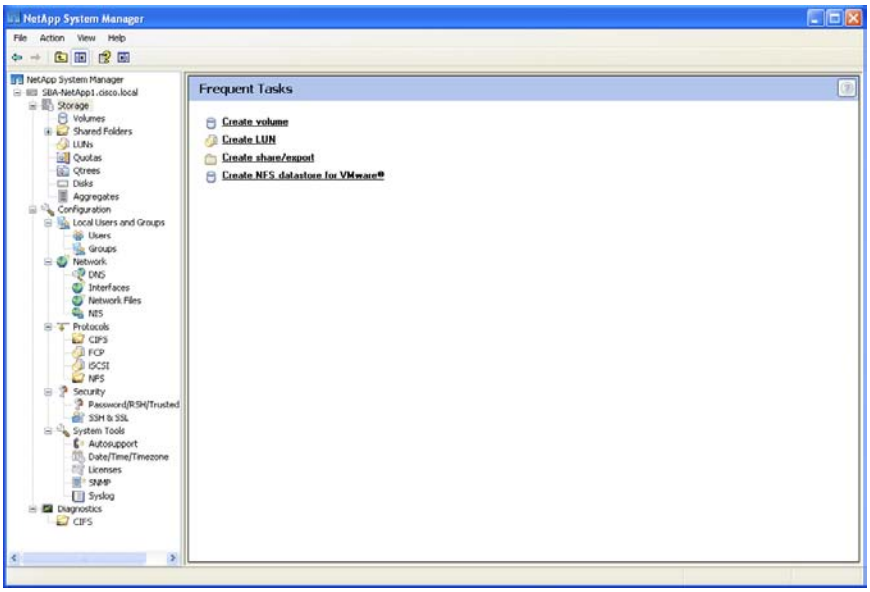
- Create LUN
- Create share/export
- Create NFS datastore for VMware

LUNs and file shares/exports are objects within a volume. Creating a LUN automatically creates a default volume as part of the process. If you want to configure a volume with properties other than the defaults, you can do so separately. Also, you can create an NFS data object optimized for VMware applications.

CREATE A LUN MAPPED TO AN ISCSI INITIATOR

The process of configuring an FC LUN or file share/export is essentially the same. The protocol used for access to the LUN is determined by the type of initiator group created earlier.

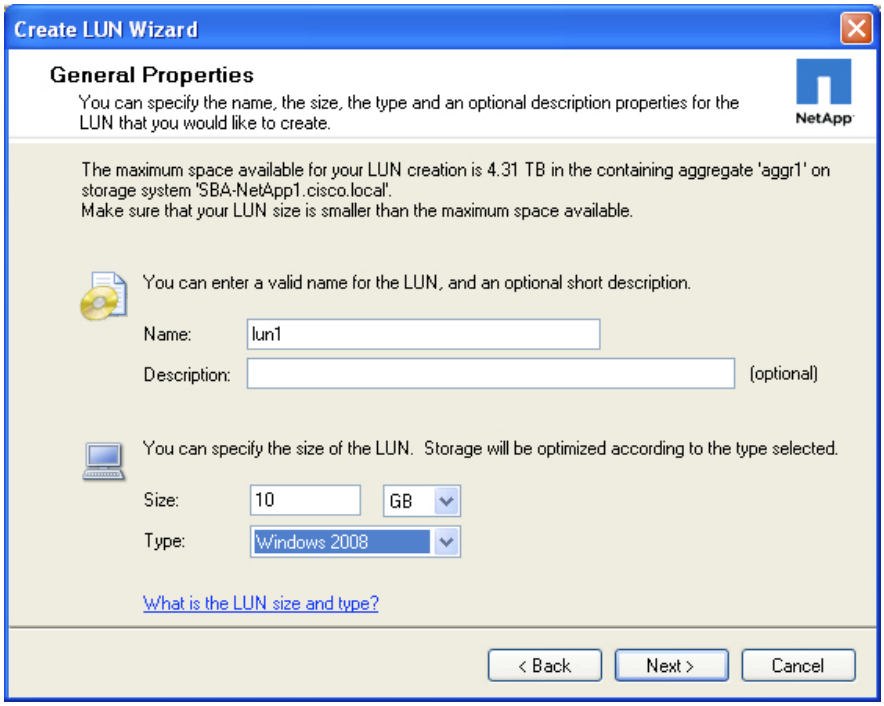
1. With Storage selected in the left pane, click **Create LUN** to launch the Create LUN Wizard.



2. Click **Next** to begin creating a LUN.

3. Define the following properties for your LUN:

- LUN name
  - Description (optional)
  - LUN size
  - Operating system type



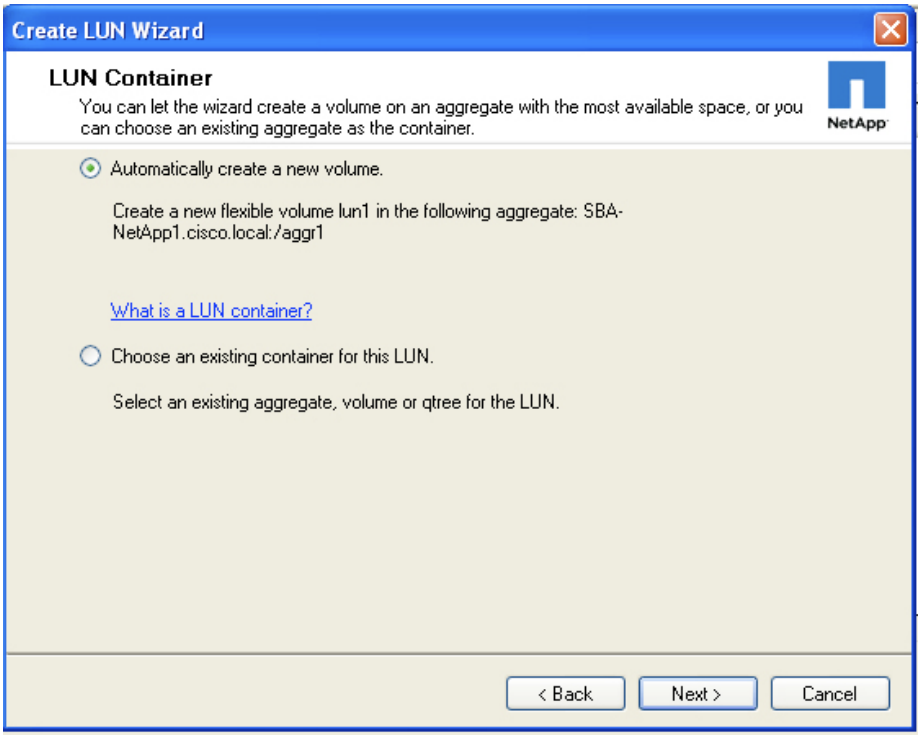
Each operating system (OS) maps data to LUNs slightly differently. The OS type parameter determines the on-disk layout of the LUN. It is important to specify the correct OS type to make sure that the LUN is properly aligned with the file system on it. This is because optimal performance with the storage system requires that I/O be aligned to a 4,096-byte boundary. Unaligned I/O:

- Can cause an increase in per-operation latency
- Requires the storage system to read from or write to more blocks than necessary to perform logical I/O

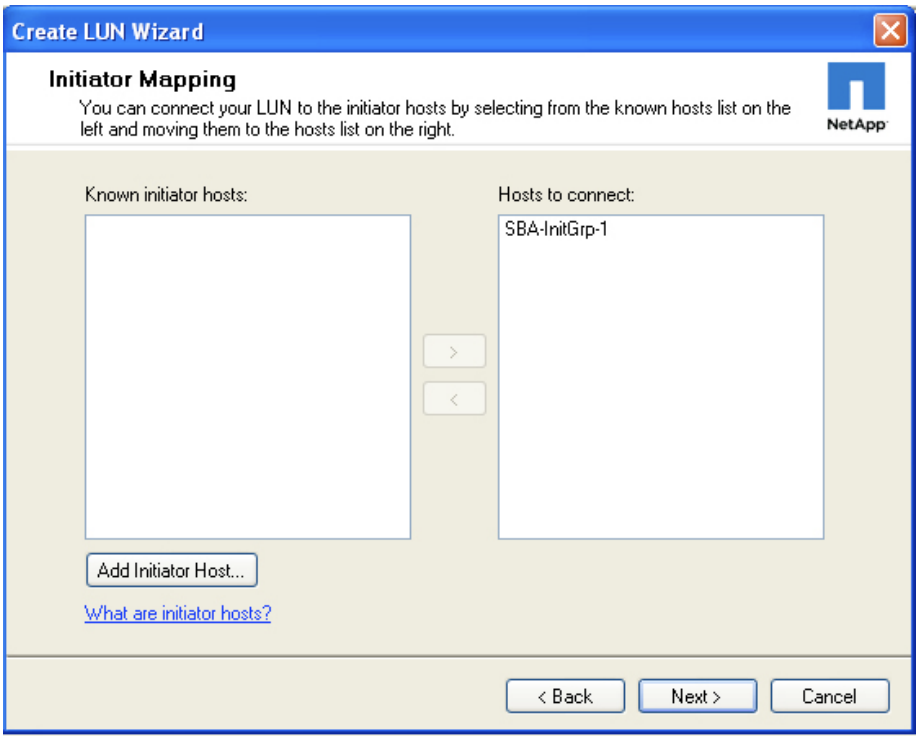
This issue is not unique to NetApp storage. Any storage vendor or host platform can exhibit this problem. Once the LUN is created, you cannot modify the LUN host operating system type.

Note: If you select the incorrect OS type and then create the LUN, the LUN at the storage array will be misaligned. To properly align the LUN, you must create a new LUN, then select the correct OS type.

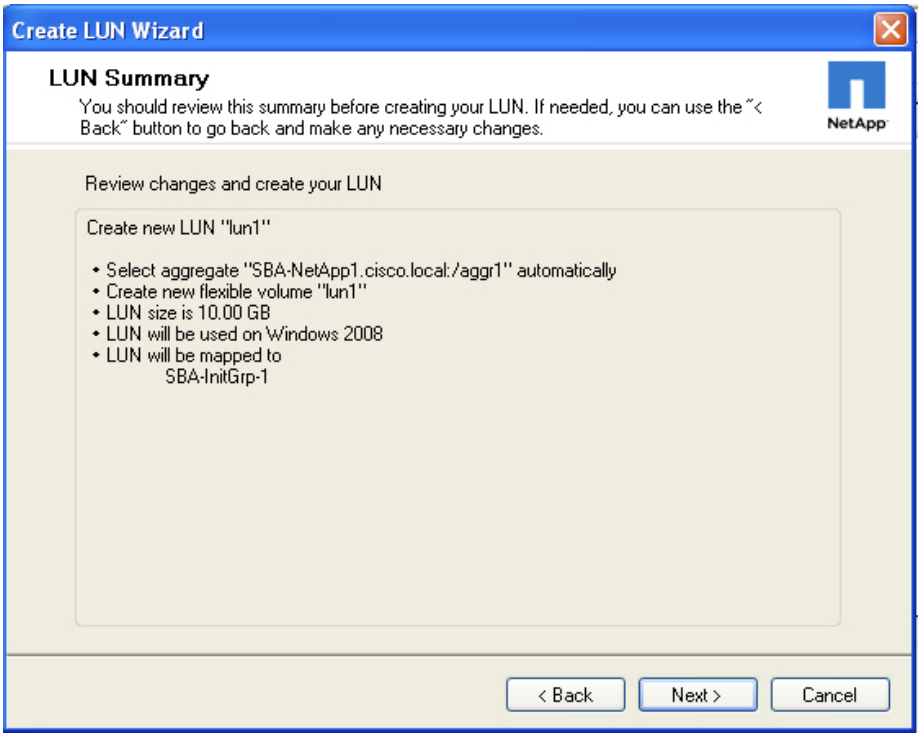
4. Specify whether you want to automatically create a new volume or select an existing volume. If you created a separate volume before creating a LUN, the option exists to choose an existing volume.



5. Use the Initiator Mapping window to map the LUN to the initiator group (host) that was previously created. Select the group name in the left side of the window and click the right arrow to move the selected name to the Hosts to connect list. Click **Next**.



6. Verify the changes that will be applied to the system listed in the **LUN Summary** window. Click **Next** in the LUN Summary window to complete creation of the LUN.



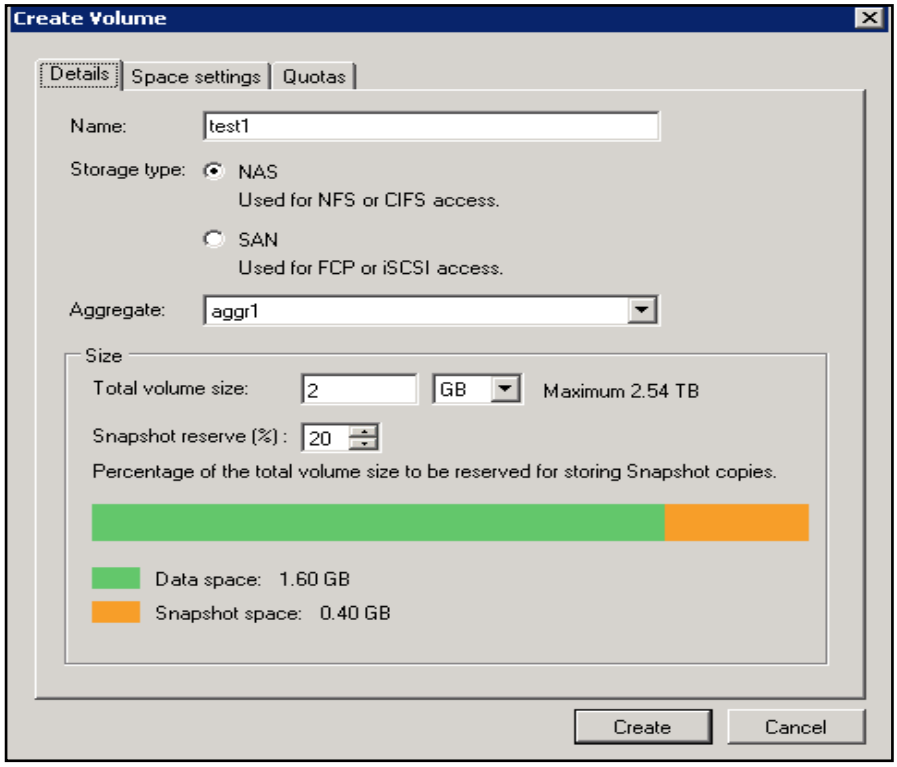
Once the LUN has been created, it will be accessible to the iSCSI host that was identified in the initiator mapping.

2.4 CONFIGURING A NAS VOLUME

As stated in section 2.2.2 Configure Flexible Volumes, you can configure either NAS or SAN volumes based on your requirement.

The following steps are used to create a NAS volume and configure the volume to be accessed via CIFS or NFS.

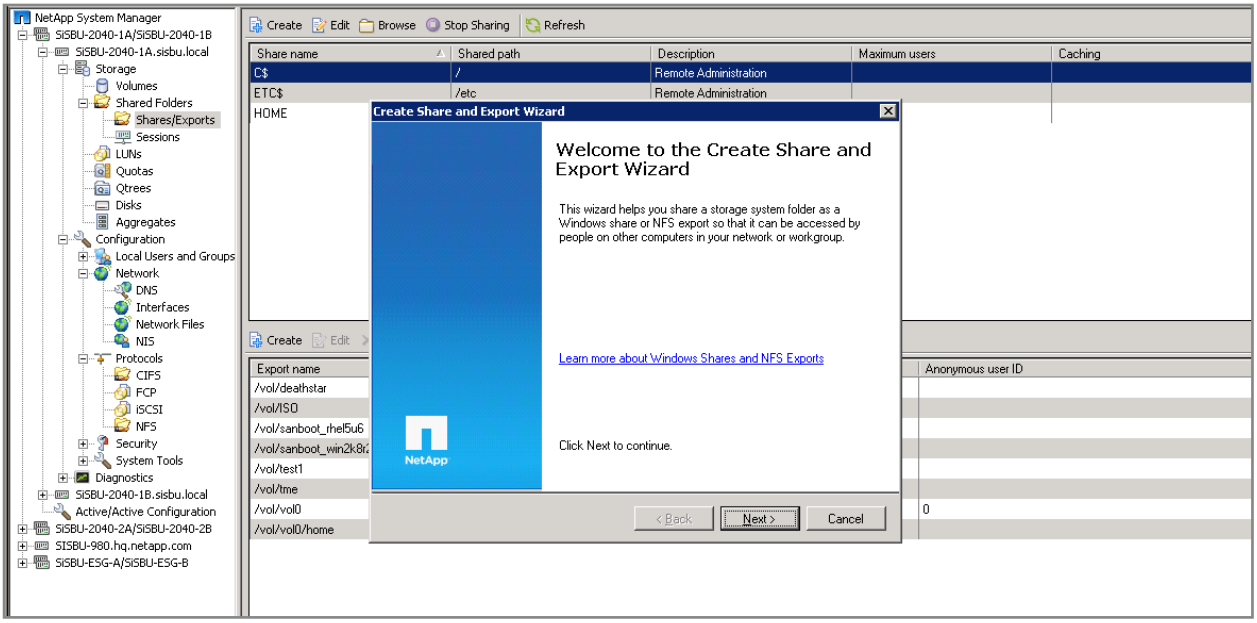
1. In the storage panel under the volume section, click **Create Volume** and select the storage type as **NAS**. This will create a volume that can be accessed by either of the file-level protocols, that is, CIFS or NFS.



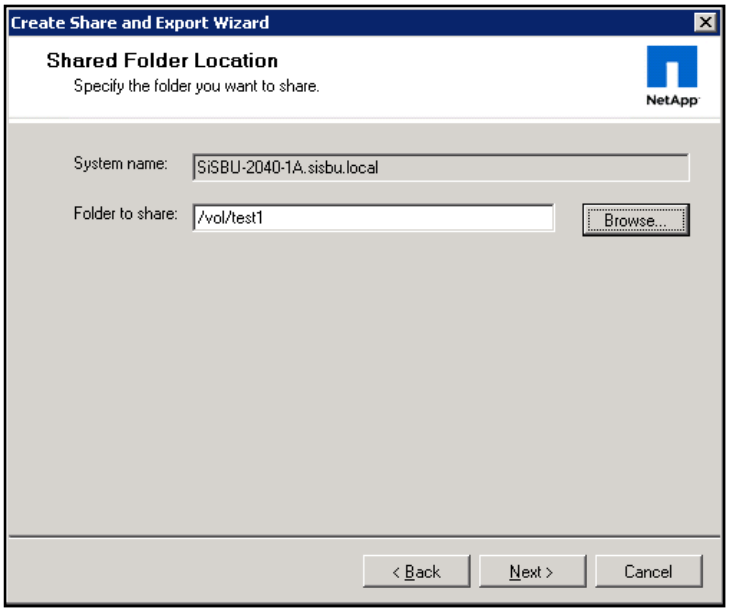
2. Configure the volume for CIFS or NFS access.

CONFIGURING A CIFS VOLUME

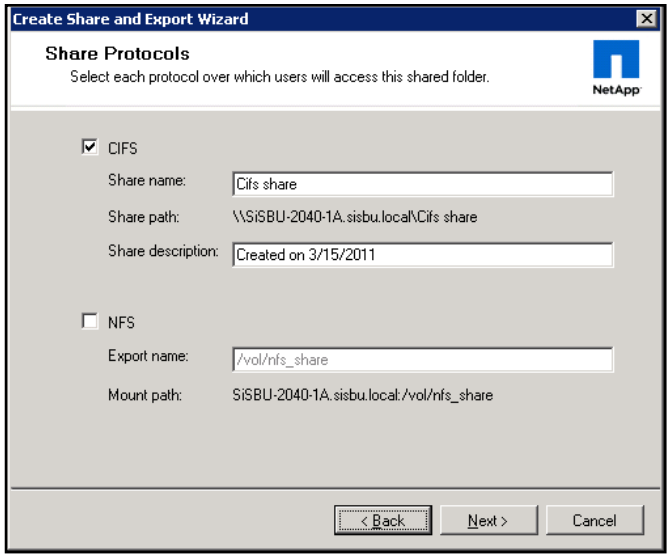
1. Within the storage panel under share folders, click **Shares** > **Exports**. Click **Create** to open the CIFS wizard.



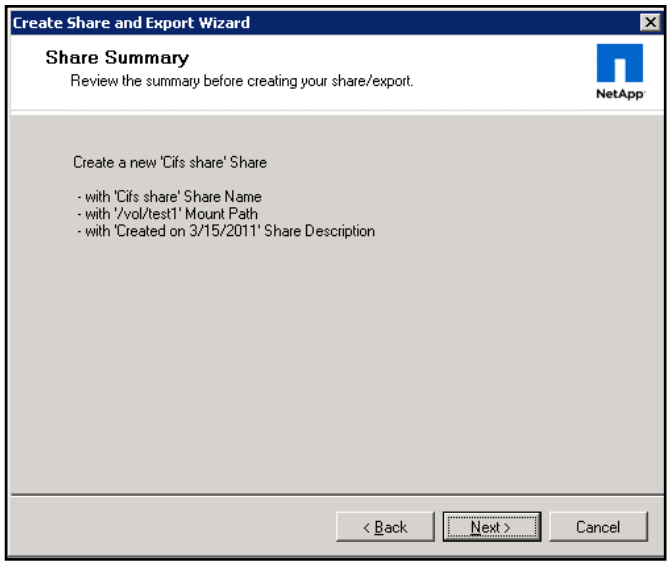
2. Browse and select the appropriate volume to be shared.



3. Select the **CIFS** checkbox and enter the share name that will be used to access the volume.



4. Commit the settings and apply them to the volume. Once completed, you can start accessing your storage.

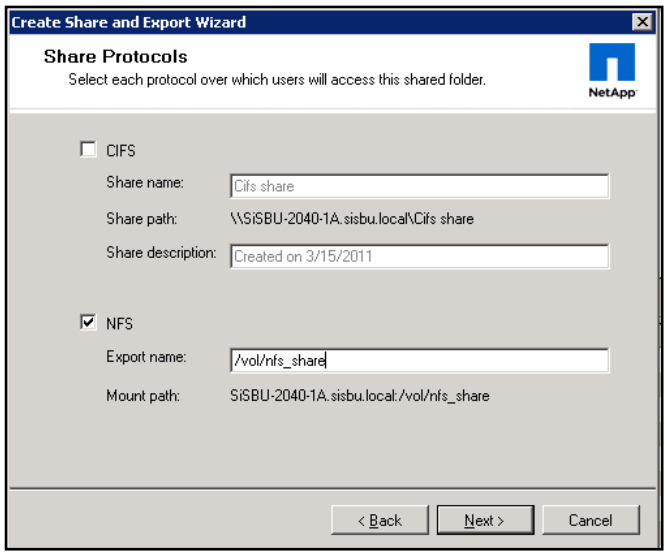


CONFIGURING AN NFS VOLUME

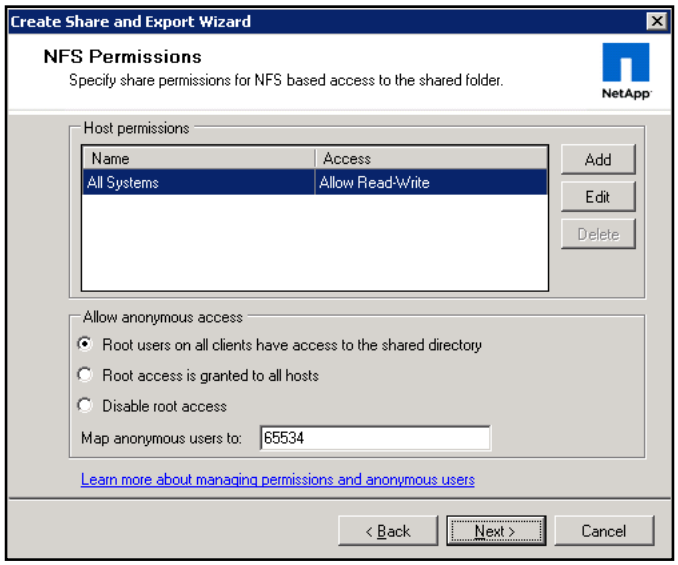
Configuring an NFS volume follows essentially the same process as that for CIFS volumes.

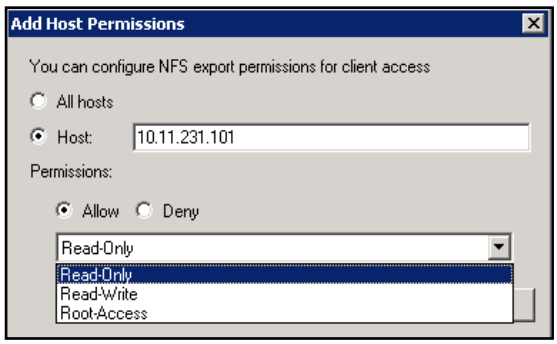
Note: By default, newly created volumes are exported via NFS automatically. This process only needs to be followed if the export was removed previously.

5. Repeat steps 1 and 2 in the section Configure Flexible VolumesSelect the **NFS** checkbox and enter the export name that will be used from the host end to mount the volume.

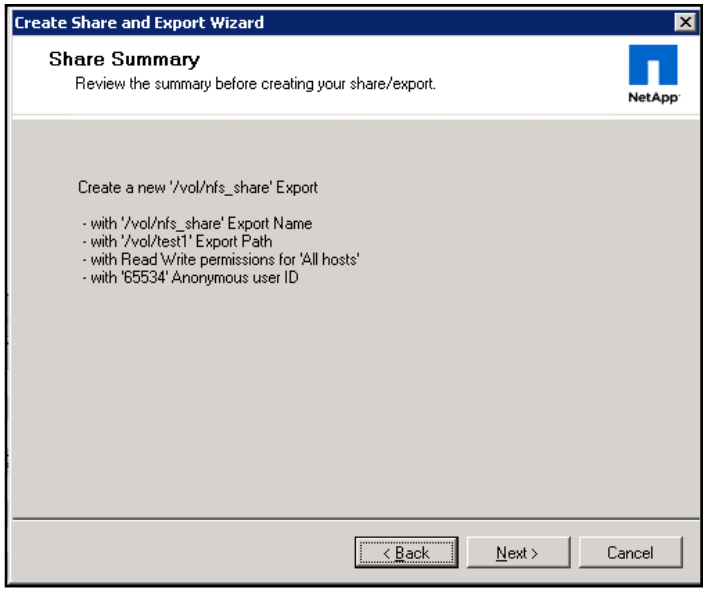


6. Edit the NFS permissions. By default all hosts can mount the volume. You may also specify a host to access the storage volume.





7. Commit the settings and apply them to the volume. Once completed, you can start accessing your storage.



3 INCREASING EFFICIENCY AND FLEXIBILITY WITH ADVANCED FEATURES

Once your storage is configured you are able to apply a number of advanced features that increase the value of your NetApp storage. A brief overview of these features follows.

3.1 SPACE EFFICIENCY

THIN PROVISIONING

Traditional storage provisioning and preallocation of storage on disk is a method that storage administrators understand well. It is a common practice for server administrators to overprovision storage to avoid running out of storage and the associated application downtime when expanding the provisioned storage.

Although no system can be run at 100% storage utilization, there are storage virtualization methods that allow administrators to address and oversubscribe storage in the same manner as with server resources (such as CPU, memory, networking, and so on). This form of storage virtualization is referred to as thin provisioning.

Traditional provisioning preallocates storage; thin provisioning provides storage on demand. The value of thin-provisioned storage is that storage is treated as a shared resource pool and is consumed only as

each individual application requires it. This sharing increases the total utilization rate of storage by eliminating the unused but provisioned areas of storage that are associated with traditional storage. The drawback to thin provisioning and oversubscribing storage is that (without the addition of physical storage) if every application requires its maximum possible storage at the same time, there will not be enough storage to satisfy the requests.

NetApp FlexVol uses thin provisioning to allow LUNs that are presented as physical disks to be provisioned to their total capacity, yet consume only as much physical storage as is required to store data. LUNs connected as pass-through disks can also be thin provisioned. Thin provisioning applies equally to file shares.

NETAPP DEDUPLICATION

With NetApp deduplication, server deployments can eliminate the duplicate data in their environment, enabling greater storage utilization. Deduplication can be seamlessly introduced into the server environment without having to make any changes to server administration, practices, or tasks. Deduplication runs on the NetApp storage system at scheduled intervals and does not consume any CPU cycles on the server.

Deduplication can be extremely helpful for virtual server scenarios such as fixed-size virtual hard drives, frequent creation and deletion of virtual disk files on the SAN LUNs, and data in the child VM.

Deduplication is enabled on the NetApp volume, and the amount of data deduplication realized is based on the commonality of the data stored in a deduplication-enabled volume.

NETAPP SNAPSHOT

A NetApp Snapshot copy is a locally retained, frozen, space-efficient read-only view of a volume or an aggregate. Its improved stability, scalability, recoverability, and performance make it more efficient than other storage snapshot technologies.

Snapshot copies facilitate frequent low-impact, user-recoverable online backups of files, directory hierarchies, LUNs, and application data. They offer a secure and simple method of restoring data so that users can directly access the Snapshot copies and recover from accidental file deletion, data corruption, or modification. The SnapManager® suite of products, which are available for various enterprise applications, uses the features of Snapshot copies and delivers an enterprise-class data protection solution.

NETAPP FLEXCLONE

NetApp FlexClone® technology creates true cloned volumes—instantly replicated datasets, files, LUNs, and volumes that use no additional storage space at the time of creation. A FlexClone volume is a writable point-in-time copy generated from the Snapshot copy of a FlexVol volume. It has all the features of a FlexVol volume, including growing, shrinking, and being the base for a Snapshot copy or even another FlexClone volume.

FlexClone volumes deployed in a virtualized environment offer significant savings in dollars, space, and energy. Additionally, the performance of a FlexClone volume or file is identical to the performance of any other FlexVol volume or individual file.

3.2 BACKUP, DISASTER RECOVERY, AND HIGH AVAILABILITY

Backup and recovery are the most critical components of a data protection plan. If data is changed unexpectedly, a system is compromised, or a site is lost, a backup is crucial to protect and recover business information.

NetApp backup and recovery solutions equip users to increase the reliability of data protection while minimizing management overhead and cost. These solutions fit into any strategy, enabling users to meet their service-level requirements.

BACKUP AND RECOVERY CONCEPTS

Data protection plans for a virtualized environment become more critical as consolidation brings all crucial data into one place, so any failure results in a massive impact on the business applications.

Backup tasks running in the server virtualized infrastructure are often resource (CPU, memory, disk I/O, and network) intensive and can result in bottlenecks that adversely affect the performance of the other business-critical applications that share the environment. Backup schedules must be closely coordinated with the applications that run on the available resources.

DISASTER RECOVERY

Business operations depend heavily on information systems and the related IT infrastructure. A minor application outage can cause a significant impact, and the effect of data loss is even more critical. Various metrics are commonly used in designing a business continuity plan. Two of the most frequently used metrics are recovery point objective (RPO) and recovery time objective (RTO). RPO, measured in minutes and hours, describes how far the recovered data is out of sync with the production data at the time of disaster. RTO, measured in minutes, describes how fast the operations can be restored.

Several approaches have been developed to increase data availability and business continuity in case disaster occurs at the hardware or software level or if site failures occur. Backup methods primarily provide a way to recover from data loss from an archived medium—a high-level data protection method.

Redundant hardware setups can provide second-level protection to mitigate damage caused by hardware failures. Data mirroring is another mechanism to increase data availability and minimize downtime.

NetApp offers the SnapMirror® solution, which empowers IT infrastructures with a fast, flexible data replication mechanism over Ethernet and Fibre Channel networks. It is a key component to consider when designing and deploying enterprise data protection plans. SnapMirror is an efficient data replication solution that takes advantage of underlying NetApp technologies such as Snapshot, FlexClone, deduplication, and so on. Disaster recovery is its primary objective, and SnapMirror can also assist in other critical application areas such as DR testing, application testing, load sharing, remote tape archiving, and remote data access.

BUSINESS CONTINUANCE CONCEPTS

Disaster can occur in any IT infrastructure, and a data protection plan is even more critical for environments that are consolidated by using server virtualization. This is true because consolidation adds complexity by sharing reduced physical hardware resources for the applications and the business-critical data that are running.

The infrastructure must be designed with special attention to the following challenges, which can crop up in a virtualized environment.

- Less time (or even no time) is available to schedule downtime windows to perform cold backup on virtual machines.
- Performing hot backup of virtual machines can result in inconsistent backup copies, which are of no use during recovery.
- Infrastructure contains various OS instances, making it difficult to identify a consistent state for backup.

- Replicating data over a Local-Area Network (LAN) or a Wide-Area Network (WAN) can consume twice as much of the available resources.
- Planning for identical resources at the disaster recovery site results in increased total cost of ownership and unused infrastructure.

3.3 NETAPP ADVANCED SOLUTIONS

NetApp offers solutions that complement server virtualization solutions and help to mitigate these challenges. Solutions such as NetApp Snapshot, FlexClone, deduplication, and so on enable an architect to design a complete data protection solution and to efficiently use available resources.

NETAPP SNAPMIRROR

NetApp SnapMirror software is a simple, flexible, cost-effective disaster recovery and data distribution solution that is deployed for more of the enterprise application infrastructure. Data is replicated across a LAN or WAN, offering high availability and faster disaster recovery for business-critical applications. Continuous data mirroring and mirror updates across multiple NetApp storage systems facilitate use of the mirrored data for multiple purposes. Businesses in different geographical locations can take advantage of SnapMirror and make local copies of mirrored data available to all locations, enhancing efficiency and productivity.

NETAPP SNAPVAULT

NetApp SnapVault® leverages disk-based backup and block-level incrementals for reliable, low-overhead backup and recovery of NetApp storage suitable for any environment.

With SnapVault, data protection occurs at the block level, copying only those data blocks that changed since the last backup, not entire files. This enables backups to run more frequently and to use less capacity, because no redundant data is moved or stored.

For distributed organizations, this not only makes disk-based backup cost effective, but it offers the option of backing up directly from remote facilities to a core data center, centralizing management and minimizing investment needs at the edge.

3.4 MONITORING AND MANAGEMENT

Storage monitoring and management are critical to the success of the server environment. NetApp OnCommand™ management software offers several tools to help optimize utilization, meet SLAs, minimize risk, and boost performance. A sample of these tools, in addition to System Manager, described in this installation guide, is briefly described below.

NETAPP SNAPMANAGER

NetApp SnapManager management tools integrate with the leading business applications to automate and simplify the complex, manual, and time-consuming processes associated with the backup, restoration, recovery, and cloning of the leading business applications, including Oracle®, Microsoft® Exchange, SQL Server®, SharePoint®, SAP®, and server virtualization.

Leverage the NetApp technology stack to create near-instant and space-efficient Snapshot copies and clones of your applications. Integrate with native application technologies and achieve complete automation of data management.

Use policies to simplify, standardize, and automate data protection. Increase backup frequency—without affecting performance—for better data protection. Recover and restore a failed database to full production in minutes, regardless of size.

Create complete data clones in seconds on primary storage or directly to your development and test environment. Use clones to engage in parallel QA, development, testing, and other processes, and deploy applications faster than ever before.

NETAPP OPERATIONS MANAGER

NetApp Operations Manager monitors, manages, and generates reports on all of the NetApp storage systems in an organization. When you use NetApp thin provisioning, NetApp recommends deploying Operations Manager and setting up e-mail and pager notifications to the appropriate administrators. With thin-provisioned storage, it is very important to monitor the free space available in the aggregates. Proper notification of the available free space means that additional storage can be made available before the aggregate becomes completely full.

NETAPP PROTECTION MANAGER

Protection Manager's policy-based management, global monitoring, and reporting allow you to automate your data protection operations.

Managing data protection can be complicated and time consuming. Most tools fail to give you a comprehensive and easy-to-understand view of your data protection environment. What's more, they make it difficult to efficiently provision and use storage resources.

Protection Manager can simplify common data protection tasks and automate management across Snapshot, SnapMirror, SnapManager, SnapVault, and Open Systems SnapVault operations. It automates storage provisioning and provides global policy-based management, monitoring, and alerting.

Protection Manager makes it easy to define, apply, and update data protection policies across the enterprise. It minimizes effort, cuts administrative overhead, and helps to meet best practices and service-level agreements globally.

A simple dashboard shows comprehensive data protection information, including unprotected data, alerts, and utilization, at a glance.

Protection Manager automation combines with thin provisioning, deduplication, NetApp Snapshot, and block incremental technology to shrink the storage footprint and increase management efficiency.

NETAPP PROVISIONING MANAGER

NetApp Provisioning Manager can speed the creation of new NetApp storage resources and help improve capacity management of existing storage resources. Storage administrators can use Provisioning Manager's policy-based automation to create repeatable, automated provisioning processes to improve the availability of data and enable provisioned storage to comply with policies. These processes are faster than manually provisioning storage, are easier to maintain than scripts, and help to minimize the risk of data loss due to misconfigured storage.

NetApp Provisioning Manager applies user-defined policies to consistently select the appropriate resources for each provisioning activity. This frees administrators from the headache of searching for available space to provision and allows more time for strategic issues. A centralized management console allows administrators to monitor the status of their provisioned storage resources.

NetApp Provisioning Manager can help improve your business agility and capacity utilization, shrink provisioning time, and improve administrator productivity. By leveraging Provisioning Manager's thin-provisioning and deduplication capabilities, you can get a high level of storage efficiency from your NetApp storage investment. This allows you to store more data more efficiently, and helps improve your business agility.

4 CONCLUSION

The requirements of midsized organizations increasingly reflect those of larger enterprises, although generally on a smaller scale. However, with limited IT skill sets, midsized organizations must rely on partners and vendors who can deliver effective solutions in a simplified manner.

NetApp storage solutions offer the performance and functionality needed to unlock the value of your business regardless of size. The NetApp family of storage solutions offers class-leading storage efficiency and performance that scale with your organization. Whether you deploy a NetApp FAS system or choose to extend the life of your existing FC storage with a NetApp V-Series system, NetApp storage solutions offer a common storage platform that is designed to maximize the efficiency of your data storage. Capable of data-in-place upgrades to more powerful FAS or V-Series systems, running the same Data ONTAP operating system, and using the same management tools and feature sets, NetApp systems grow with your organization and are ideal for midsized organizations as well as large enterprises.

.

www.netapp.com