Symantec NetBackup™ Appliance Capacity Planning and Performance Tuning Guide

Release 2.6.0.x

NetBackup 52xx

Symantec™

Symantec NetBackup™ Appliance Capacity Planning and Performance Tuning Guide

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North America and Latin America	supportsolutions@symantec.com

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Chapter 1

About this Guide

This chapter includes the following topics:

- About this guide
- About the intended audience
- About the NetBackup Appliance documentation

About this guide

The Capacity Planning and Performance Tuning guide covers the v2.6.0.1 release for NetBackup 5220 and 5230 Appliances.

Symantec NetBackup Appliance is a high-performance data protection application that caters to, large sized enterprises as well as mid sized organizations. It can be scaled to manage large-scale data centers with multiple clients or smaller data centers at remote offices or branch offices. This manual is for administrators who want to analyze, evaluate, and tune the performance of their NetBackup Appliances. Table 1-1 provides a detailed description of all the sections included in this guide:

Table 1-1 Parts and sections in this guide

Capacity planning	Best practices	Performance tuning
These sections help you to analyze your backup requirements, identify your pain points, and plan on putting together a backup solution that is perfect for your environment	These sections provide a reference for implementing the planned backup solution that you have identified in the Capacity Planning chapter. It lists the ideal settings and scenarios to configure the backup solution.	This section helps to monitor and improve your backup solution to obtain the optimum performance.

Note: The *Capacity Planning and Performance Tuning guide* is an improvement-in-progress guide, that means it will be updated improved each time we learn of new tools, and processes for capacity planning or performance improvements. You can refer to the DOC2792 for the most updated versions of the NetBackup Appliance documentation.

About the intended audience

This guide is intended for the end users that include consultants, partners, system administrators, and IT technicians who are tasked to analyze the backup requirements of their organization to identify a complete backup solution. This guide can also enable the end users to monitor their appliances and inform them about the affect each type of process has on the backup activity.

About the NetBackup Appliance documentation

Included with your NetBackup appliance are the following documents to ensure you can successfully install, configure, and use your appliance. You can find these documents on the Symantec Support web site at the following URL:

http://www.symantec.com/docs/DOC2792

Table 1-2 NetBackup Appliance documentation

Guide	Description
Symantec NetBackup™ Appliance Hardware Installation and Initial Configuration Guide	This guide provides the following information: ■ An introduction to the physical layout of the appliance hardware. ■ Install preparation steps, such as unpacking procedures, environmental conditions, and safety precautions. ■ Hardware configuration steps This section guides you through the required steps to install your appliance in a rack and connect your appliance cables. ■ Software configuration steps This section guides you through the configuration process from the NetBackup Appliance Web Console or from the NetBackup Appliance Shell Menu.

Table 1-2 NetBackup Appliance documentation *(continued)*

Guide	Description
Symantec NetBackup™ Appliance Administrator's Guide	The *Symantec NetBackup™ Appliance Administrator's Guide* is provided as part of the NetBackup appliance software package. This guide may contain updates that have occurred since the initial release of the document. For the latest administration information always refer to this version of the guide. The *Symantec NetBackup™ Appliance Administrator's Guide* contains the following types of information: ■ Deployment information ■ Administering your appliance ■ Monitoring information
Symantec NetBackup™ Appliance Command Reference Guide	The *Symantec NetBackup™ Appliance Command Reference Guide* provides a complete list of the commands that are available for you to use through the NetBackup Appliance Shell Menu. This document is provided as a part of the product software that is installed on the appliance, and in electronic form on the Symantec Support Web site: http://www.symantec.com/docs/DOC2792
Symantec NetBackup Appliance Release Notes	This document contains information about NetBackup appliance, version 2.6.0.3. It contains brief descriptions of new features within the release, operational notes that apply to the release update, and any known issues. This document is available on the Symantec Support Web site at the following location. http://www.symantec.com/docs/DOC2792
Symantec NetBackup Appliance Troubleshooting Guide	This document contains the latest troubleshooting information for the NetBackup appliances. It is available on the Symantec Support Web site at the following location. http://www.symantec.com/docs/DOC2792
Symantec NetBackup Appliance Capacity Planning and Performance Tuning Guide	This document contains information on how to optimize your backup environment and your NetBackup appliance. It helps you to analyze your backup requirements and design a system that best fits your needs.

Table 1-2 NetBackup Appliance documentation *(continued)*

Guide	Description
Symantec NetBackup Appliance Security Guide	This document describes the security features in NetBackup Appliance and how to use those features to ensure that your appliance environment is secure.
Symantec NetBackup Appliance Third-party Legal Notices	The *Symantec NetBackup Appliance Third-party Legal Notices* document lists the third-party software that is included in this product, and it contains attributions for the third-party software. This document is available from the following website: http://www.symantec.com/about/profile/policies/eulas/

For additional information about the appliance hardware, refer to the following documents:

- *Symantec NetBackup 5220 Appliance and Symantec Storage Shelf Safety and Maintenance Guide*
- *Symantec NetBackup 5220 Appliance and Symantec Storage Shelf Product Description*
- *Symantec NetBackup 5230 Appliance and Symantec Storage Shelf Safety and Maintenance Guide*
- *Symantec NetBackup 5230 Appliance and Symantec Storage Shelf Product Description*

Section 1

Capacity planning

- Chapter 2. Analyzing your backup requirements
- Chapter 3. Designing your backup system
- Chapter 4. Capacity Planning checklist

Chapter 2

Analyzing your backup requirements

This chapter includes the following topics:

- Analyzing your backup requirements

Analyzing your backup requirements

Many factors can influence your backup strategy. Analyzing these factors can help you to make better backup decisions based on your site's priorities. This section helps you to analyze the backup requirements of your organization by answering the following core questions:

- What do you want to backup?

  Note: You can use the provided templates in the Record your backup requirements section to gather backup requirements for your organization.

- How much data do you want to back up?
- When should the backup take place?
- What is the retention period?

What do you want to backup?

The first step in analyzing your backup requirements is to identify the systems that you need to backup. The term **Systems** includes any component that contains vital data which needs to be backed up. There are several parameters and considerations

that you will have to take into account for each type of system. Table 2-1 lists some of these systems and the considerations made to back them up:

Table 2-1 Systems to be backed up

System	Considerations to be made
Computer systems	Identify and record the following information, for each computer system: ■ Host name ■ Operating system and its version ■ Location ■ Network technology ■ Whether the computer system is directly or remotely connected to the network ■ Number of resources to be backed up ■ Number of disk drives or tapes, connected to each system ■ Model type of each connected drive or library connected ■ Applications installed on the computer system that are to be backed up **Note:** You can use the templates provided in the Template to record computer system information to gather backup requirements for your organization.

Table 2-1 Systems to be backed up *(continued)*

System	Considerations to be made
Databases and Application servers	Identify and record the following information, for each database or application server: ■ Host name ■ Location ■ Operating system and its version ■ Server type and application release numbers ■ Network technology - 10 GB Ethernet, 1 GB Ethernet, or SAN Clients ■ Database types, database engines, and their version numbers ■ Method used to backup these databases ■ Whether the databases or application server can be backed up while they are online or offline To backup an online database, you need a NetBackup database agent specific to the database engine. Recording this information can help you to identify the various database agents you may require based on your backup requirements. For the compatibility list of all NetBackup database agents, refer to TECH126904. ■ Whether you want to backup the entire database or the raw partitions. If you decide to take databases backups using raw partitions by Snapshot Client backup, this may result in a backup size equal to the total size of your raw partition. Identifying this information can help you decide how you would like to backup your databases **Note:** You can use the templates provided in the Template to record database information to gather backup requirements for your organization.
Virtualized datacenters	Identify the following information, about the virtualized infrastructure: ■ Hosts within these virtualized datacenters ■ Operating systems and their versions ■ Type of data stored ■ Type of Hypervisor used ■ Network technology used - 10 GB Ethernet, 1 GB Ethernet, or VADP over SAN ■ Type of backup performed on these virtualized datacenters- incremental, full

See “Analyzing your backup requirements” on page 16.

See “How much data do you want to back up?” on page 19.

See “When should the backup take place?” on page 20.

See “What is the retention period?” on page 22.

How much data do you want to back up?

When calculating the total amount of data to be backed up consider the current requirements and the expected growth in the data in the near future. Table 2-2 lists the considerations to be made for calculating the amount of data to be backed up.

Table 2-2 Calculating the amount of data to be backed up

Checks to calculate the amount of data to be backed up	Additional comments
Have you computed the total disk space on each individual system?	■ Calculate the total disk space for each individual system, along with the space used for databases. ■ Identify the total number of files to be backed up on each system. ■ Calculate the amount of disk space used by a computer system on their disk drives, shared drives, and so on. ■ You can use the calculated total size to analyze the potential growth of your system to ensure that your current backup solution accommodates the growth in backup requirements ■ Perform thorough analysis of the data being protected for at-least 30 days to get an understanding of data types, growth trends and change rates using the NetBackup Deployment Utility.
Have you identified and added all the data types included in the backup?	Ensure that you have identified and listed all the data types to be included in the backup. For example, does the data contain text, graphics, databases, and so on. Each data type contributes to a specific amount of data in your total backup requirement. Some of the advantage of identifying the data types to be backed up are listed below: ■ Based on this classification you can identify the amount of data collected under each type, this calculated amount can help you compute the expected growth in data in the near future. ■ The other advantage of identifying data types can help you decide upon the relevance and priority of backing up a particular data type.
How compressible is the data?	Identify how much amount of data from your total capacity is compressible or not. Based on this information you can ascertain the amount of space to be allocated to backup data that is compressible and to data that is incompressible.
Will the data be encrypted?	Identify if you want to encrypt the data during backup. Based on the level of security applicable to the data being backed up this decision can be taken. **Note:** You will also need to consider the additional time encrypted backups may take. Based on which your backup schedules will get affected.

Table 2-2 Calculating the amount of data to be backed up *(continued)*

Checks to calculate the amount of data to be backed up	Additional comments
Have you added the space on mirrored disks only once?	Ensure that you consider the amount of data stored on these repositories only once, if you use storage replication or disk mirroring techniques.
Have you added the size of your database backups to your final calculations?	Ensure that you add the amount of data stored on all the database management systems maintained in your organization.
What are your data protection requirements?	Understand the data protection requirement for the data to be backed up, like the SLA, disaster recovery, and Backup retention and so on.
Have you added the requirements of the test-backup environment?	Create an independent test-backup environment to ensure that your production environment will work with the changed backup solutions. The test-backup environment helps to keep in study the effects of a new backup solution and of the changes made to the hardware and the software infrastructure over a period of time
Have you added any resulting growth factor to your total backup solution?	Identify the annual data growth factor to calculate capacity increase over years.
Have you computed the amount of data you will need to backup in the next six months to a few years from now?	Ensure that you have computed the growth in amount of data in the next six months to a few years. Based on the expected growth you can identify the strategy to expand your existing storage configurations, as required.

See "When should the backup take place?" on page 20.

See "Analyzing your backup requirements" on page 16.

See "When should the backup take place?" on page 20.

See "What is the retention period?" on page 22.

When should the backup take place?

To correctly size and configure your backup solution, you must decide on the type and frequency of your backups. When considering a backup schedule you need to consider the following checks:

Table 2-3 Schedule a backup

Checks to be performed	Additional comments
Will you perform daily-incremental backups?	The size calculation and deduplication ratio for taking full backups differ from the size calculation and deduplication ratio required for an incremental backup.

Table 2-3 Schedule a backup *(continued)*

Checks to be performed	Additional comments
When will you perform a full backup? ■ Weekly ■ Bi-weekly ■ Monthly	When you determine this information helps in calculating the storage capacity requirements for over longer period of time. The size calculation and deduplication ratio for taking full backups differ from the size calculation and deduplication ratio required for an incremental backup.
How many jobs will be run per day?	Considering that it takes 2 seconds / 3 seconds per job, it means that approximately ~15000 jobs per backup window (1000 per hour) are run. If the job count exceeds the 2-second or 3-second rule, you may need to consider increasing the backup window or setup a new domain. Also, the number of jobs is limited by the total number of streams that appliance can take and also on the total throughput of the deduplication storage on the appliance.
What is the window of time that is available to complete each backup?	The length of a window dictates several aspects of your backup strategy. For example, you may want a larger window of time to back up multiple, high-capacity servers.
Would you want to configure a deduplication solution to take backups?	In some scenarios you may want to only use AdvancedDisk for backup. An AdvancedDisk is the normal disk backup, performed without any deduplication. Deciding on whether you want to configure a deduplication solution can help you opt for a mix of MSDP and AdvancedDisk.
Would you want to consider using the advanced NetBackup features such as NetBackup accelerator?	NetBackup Accelerator uses a platform and file system independent track log to intelligently detect changed files and send the changed segments from those files to media server. These changed segments are written to a supported storage pool in the NetBackup Appliance. Although the primary benefit from NetBackup Accelerator is for performing full backups, it also reduces a subset of costs in running incremental backups.
Would you be adopting NDMP to perform backups?	The NDMP (Network Data Management Protocol) is used along with NetBackup Accelerator to perform backup and recovery. The NetBackup Appliance supports NDMP stream handlers for EMC Celerra and NetApp which results in very high deduplication rate. Using Accelerator we can protect shares as mounted file systems. However, this is not a comprehensive backup of filers.
Do you plan to run an Off-site backup or Local backup?	The backup schedule is greatly affected if the backup is run locally or is transferred to an off-site location. The time to transfer a local backup to the off-site location will need to be estimated and considered at the time of scheduling a backup.

Table 2-3 Schedule a backup *(continued)*

Checks to be performed	Additional comments
Is the computer system local or remote?	Determining the total number of systems that are local or remote can help determine the backup cycles.
Do you want to allow the users to run the backups and restores for their computer systems?	This can help to reduce the time it takes to initiate certain operations. However, user-directed operations can also result in higher support costs and the loss of flexibility in storage allocation and usage for backups. User-directed operations can monopolize media and tape drives when you most need them. They can also generate more support calls and training issues while the users become familiar with the new backup system.
Do you plan to back up any system over a network?	Identify the type of networks you plan to use for scheduling backups. Based on the amount of data that you want to back up and the frequency of those backups, you can also consider installing a private network for taking backups. Identifying this information can help you account for the time required to perform the backups over a network and select the best time period when the backup should be taken **Note:** It is recommended that you use SAN Client and dedicated HBA on the NetBackup client for taking backups.
What is your policy for backup expiration?	Identify the backup expiration time period for each of your policies, thus determining the possible restore options. For example, one of the commonly adopted policies is to expire your incremental backups after 2 weeks or 1 month and your full backups after 6 months. With this policy, you can restore any daily file change from the previous weeks or month and restore data from full backups for the previous 6 months

See "What is the retention period?" on page 22.

See "How much data do you want to back up?" on page 19.

See "What do you want to backup?" on page 16.

See "Analyzing your backup requirements" on page 16.

What is the retention period?

Now that you have identified what data to backup and how much data is to be backed up, you now need to identify the length of the retention period for your backup. Retention period is the time period during which data is stored and maintained in a backup system. Upon the completion of the retention period the retained data is finally disposed.

Table 2-4 Identifying the length of the retention period

Factors deciding the retention period	Additional comments
What are the standards specific to your organizational for creating a retention policy?	Most organizations lay out specific guidelines on creating retention policies and the time period they would want to hold the backed-up data. These guidelines are considered vital in determining the retention policy for an organization.
What is your Projects requirement to retain the data?	There can be certain critical projects that may require you to hold the data for a longer period of time than your standard retention policy. Identify such projects and the approximate time required to retain the information. This can help you prioritize and allot specific backup storage to projects with such retention period requirements.
What are the user-specific requirements on retaining data? Are their users who want to retain specific data for a longer period?	There can be user requirements that may need you to alter the generic retention policy to accommodate requests to retain data backed up by specific users or user groups.
What are the business requirements to identify the retention time?	There can be business-specific requirements that mandate you to hold specific data for a longer period. For example, market research, findings of a research and development department.
What are the regulatory or legal department laid requirements to retain the data?	The legal departments or the regulatory bodies of a country may have specific guidelines on retaining data. For example, organizations may require to retain the financial data of their organization for over a specific number of years. Such polices affect the length of the retention period.
What is the size of your NetBackup image database?	The retention period is directly proportional to the number of tapes you need and the size of your NetBackup image database. Your NetBackup image database keeps track of all the information on all your disk drives and tapes. The image database size is tightly tied into your retention period and the frequency of your backups.

See "When should the backup take place?" on page 20.

See "How much data do you want to back up?" on page 19.

See "What do you want to backup?" on page 16.

See "Analyzing your backup requirements" on page 16.

Record your backup requirements

This section provides templates that you can use and customize to record the backup requirements in your organization.

- See "Template to record computer system information" on page 24.

- See "Template to record database information" on page 26.
- See "Template to record application server information" on page 29.

Template to record computer system information

Host name	*<host name>*
Operating system	*<Operating system>*
Operating system version	*<version #>*
Location	*<Location>*
Installed Applications	*<List the applications installed on the computer system that need to be backed up>*
Network	*<Select from the network types>* LAN ☐ SAN ☐ WAN ☐ Others ☐ *<Provide details>*

Network connection type	*<Select the network connection type and provide its details>* Fibre Channel ☐ *<Provide details>* Ethernet ☐ *<Provide details>* Others ☐ *<Provide details>*
Storage	*<Which devices are used to store data? >* Disk Drives ☐ Tapes ☐ Others ☐
Storage - Disk Drives	*<Provide information about the disk drives used to store data >* **Number of Disk Drives connected** **Disk Drive Models used**

	Amount of data stored in each disk drive
	Total amount of data stored on all the disk drives
Storage - Tapes	*<Provide additional information about the tapes used to store data >*
	Number of tapes
	Total amount of data stored on the tapes

Template to record database information

Host name	*<Host name>*
Operating system	*<Operating system>*
Version	*<Operating system version>*
Location	*< Location >*
Application type	*<Name the application type for example, Oracle Database>*
Network	*<Select from the network types and provide additional details. >*

LAN

☐

<Provide details.>

SAN

☐

<Provide details.>

WAN

☐

<Provide details.>

Other

☐

<Provide details.>

Network connection type

<Select the network connection type and provide its details. For example, 10GB Ethernet>

Fibre Channel

☐

<Provide details.>

10GB Ethernet

☐

<Provide details.>

1GB Ethernet

☐

<Provide details.>

Storage

<Which devices are used to store data? >

Disk Drives

☐

Tapes

☐

Others

☐

<Provide details.>

Storage - Disk Drives

<Provide additional information about the disk drives used to store data? >

Number of Disk Drives connected

Disk Drive Models used

Amount of data stored

Total amount of data stored on the tapes

Storage - Tapes

<Provide additional information about the tapes used to store data >

Number of tapes

Total amount of data stored on the tapes

Type of Data

<Provide additional information about the type of data to be stored?>

File System

☐

<Provide details.>

SQL

☐

<Provide details.>

Exchange

☐

<Provide details.>

Oracle

☐

<Provide details.>

VMware

☐

<Provide details.>

Template to record application server information

Host name	*<host name>*
Operating system	*<Operating system>*
Version	*< version>*
Location	*< Location>*
Applications type	*<Name the application type for example, Oracle Database>*

Network	*<Select from the network types and provide additional details. >* LAN ☐ *<Provide details.>* SAN ☐ *<Provide details.>* WAN ☐ *<Provide details.>* Other ☐ *<Provide details.>*
Network connection type	*<Select the network connection type and provide its details. For example, 10GB Ethernet>* Fibre Channel ☐ *<Provide details.>* 10 GB Ethernet ☐ *<Provide details.>* 1GB Ethernet ☐ *<Provide details.>*

Storage

<Which devices are used to store data? >

Disk Drives

☐

Tapes

☐

Other

☐

Storage - Disk Drives

<Provide additional information about the disk drives used to store data? >

Number of Disk Drives connected

Disk Drive Models used

Amount of data stored

Total amount of data stored on the tapes

Storage - Tapes

<Provide additional information about the tapes used to store data? >

Number of tapes

Total amount of data stored on the tapes

Type of Data

<Provide additional information about the type of data to be stored?>

File System

☐

<Provide details.>

SQL

☐

<Provide details.>

Exchange

☐

<Provide details.>

Oracle

☐

<Provide details.>

VMware

☐

<Provide details.>

Chapter 3

Designing your backup system

This chapter includes the following topics:

- Addressing use cases of backup systems for enterprises
- Addressing use cases of backup systems for remote or branch offices
- About NetBackup appliances
- NetBackup Appliance configurations
- Selecting new appliances

Addressing use cases of backup systems for enterprises

The next step after you have analyzed your backup requirements is to start identifying the components that together will design your backup system. While designing a complete and efficient backup system you will also need to identify the core pain points that dictate the choices you make in selecting each component. For example, you are required to backup growing number of clients with large data sets, in this case your pain point would be to ensure that the backup solution you consider can account for expandable storage options

Some of the common pain points that you may come across have been listed below:

- Choosing the right hardware, operating system, mandated IT application, and the backup software. Each of these come in multiple variables and increased interoperability challenges like dealing with too many vendors for maintenance.
- Choosing tapes only for long-term retention.

- Choosing the right Disk storage, as each type as its individual pain points:
  - DAS (Direct-attached storage) requires additional hardware and file system maintenance.
  - SAN (Storage area network) brings more complexity and operational costs.
  - NAS (Network-attached storage) taxes the network.
- Choosing the right solutions to backup clients with large data sets. Large data sets means multiple challenges in dealing with:
  - Large databases and application servers
  - Large NAS Filers
  - Slow networks thus requiring to create a dedicated backup network
  - Unsuccessful scheduled full backups due to issues like exceeded backup window.
- Choosing Virtual Machine protection to address concerns over:
  - Resource constrains
  - Dealing the VM Sprawl, when the number of virtual machines (VM) increases over time, simply because of the ease of creating VMs and not because those VMs are absolutely necessary for the business
  - Contrasting deduplication pools

In Table 3-1 we will be evaluating each of the above pain points as a separate use case and identifying the solutions that Symantec NetBackup Appliance offers to address these paint points:

Table 3-1 Use cases with possible solutions

Pain Point	Possible Solutions using Symantec NetBackup Appliance
Dealing with slow Networks	Multiple connectivity options can be considered: ■ Client deduplication processing ■ Standard Data Transfer over IP ■ Standard Data Transfer over FC ■ Optimized Transfer over IP
Dealing with clients containing large data sets	The power to scale-out in multiple dimensions using: ■ Client Deduplication ■ Media server Deduplication ■ Storage Expansion

Table 3-1 Use cases with possible solutions *(continued)*

Pain Point	Possible Solutions using Symantec NetBackup Appliance
Dealing with issues of backing up clients with large data sets - SAN Client	Protecting clients with large data set - SAN Client ■ High speed streaming through multiple Fiber Channel steams ■ No need for off-host systems (low TCO) ■ Use the processing power of Appliances for deduplication ■ Avoid configuring clients as backup servers - conserve resources for critical applications ■ Replace aging physical and virtual tape libraries
Accommodating backups of storage filers like NetApp and EMC	Protecting NetApp and EMC Filers ■ Adopting remote NDMP to free up resources for backing up NetApp and EMC filers ■ 10 GbE links for faster streaming, multiple links may be trunked for even larger pipes ■ Flexibility to stream to tape for long-term retention ■ Deduplication and replication offloaded from NetApp and EMC filers
Achieving high deduplication rates	Intelligent deduplication Stream Handlers for high deduplication rates The NetBackupAccelerator is used to perform efficient scan of all files and send only changed segments to the appliance during each full backup. The operations necessary to generate full backup are performed on the appliance and master server in the background. Thus the full backup is deduplicated by using lesser MSDP storage space.
Accommodating traditional file servers	Protecting traditional file servers and NAS using optimized synthetics, accelerator and client-side deduplication ■ Highly recommended for any file server ■ Works for any NAS solution through a NAS Client (NFS/CIFS) ■ After the initial full backup, never run full backup again ■ Lowest effect on clients, network, and media server ■ Deduplication may be done at source or NetBackup Media server side

Table 3-1 Use cases with possible solutions *(continued)*

Pain Point	Possible Solutions using Symantec NetBackup Appliance
Adapting to VMware requirements	With NetBackup Appliance direct vSphere Backup can be achieved due to the VMware backup host built into NetBackup 52xx Appliances. ■ For all VMs, 100% off-host backups can be taken with Single Appliance ■ Appliance software integrates VMware Access Host with NetBackup 52xx Appliances ■ All transport methods are supported (SAN, nbd, nbdssl, hotadd) ■ On the host that runs the NetBackup Administration Console or the Backup, Archive, and Restore interface, NetBackup must be at 7.5.0.1 or later. ■ The appliance must be version 2.5 or later. If the master server is on a separate host (not on the backup host), the master server must use NetBackup 7.5.0.1 or later. ■ The VMware policy type must be used. The FlashBackup-Windows policy type is not supported. ■ The appliance does not support iSCSI connections. For more information, refer to the 'About the NetBackup appliance as a VMware backup host' section in the *Symantec NetBackup™ Appliance Administrator's Guide*.

Addressing use cases of backup systems for remote or branch offices

The next step after you have analyzed your backup requirements is to start identifying the components that together will design your backup system. While designing a complete and efficient backup system you will also need to identify the core pain points that dictate the choices you make in selecting each component. For example, you are required to backup growing number of clients with large data sets, in this case your pain point would be to ensure that the backup solution you consider can account for expandable storage options

Some of the common pain points that you may come across have been listed below:

- Managing a tape based backup system can pose the following challenges:
  - A backup server and small tape library
  - Shipping tapes off-site for disaster recovery
  - Integration challenges
  - Managed by non-IT staff or less skilled backup staff under guidance from central site

- Managing a disk based backup system can pose the following challenges:
  - A backup server and deduplication-disk storage
  - Replication to central site
  - Integration challenges
  - Managed by non-IT staff or less skilled backup staff under guidance from central site
- Managing backups over WAN can pose the following challenges:
  - Source deduplication and backups over WAN can be time consuming.
  - Link unavailability equals to increased risk, thus bringing down the RPO (Recovery Point Objective)
  - Slow rehydrated restores leading to a poor RTO (Recovery Time Objective)

Considering the above paint points of remote / branch office, Symantec NetBackup Appliance provide a solution that includes the following key factors:

- Provides an ideal backup-in-a-box for remote office/branch office
- Includes a built-in deduplication and local restores
- Replicates only unique data to central site via optimized duplication
- Manage as an independent domain (managed by AIR) or as remote media server (managed by SLPs)
- Complete protection (physical and virtual) powered by Symantec V-Ray Cloud Gateway
- Fast, policy based Global Disaster Recovery using AIR (Automatic Image Replication)

About NetBackup appliances

NetBackup appliances provide a simplified solution for NetBackup configuration and the daily management of your backup environment. The goal is to provide a solution that eliminates the need to provide dedicated individuals to manage their backup environment.

The appliances are rack-mount servers that run on the Linux operating system. NetBackup Enterprise Server software is already installed and configured to work with the operating system, the disk storage units, and the robotic tape device.

You can determine what role you want to configure the appliance to perform. You can choose to configure a 52xx appliance as follows:

- As a master server appliance
- As a media server for use with an existing master server appliance
- As a media server for use in an existing NetBackup environment

With each of these 52xx configurations, you get the added benefit of internal disk storage.

This appliance allows for easy expansion of existing NetBackup environments that have NetBackup 7.6.0.3 or greater installed. The appliance also includes its own browser-based interface. This interface is used for local administration of the network, internal disk storage, tape libraries and much more.

NetBackup appliances support the following features:

- Two interfaces for appliance configuration and management:
  - The NetBackup Appliance Web Console is a web-based graphical user interface. This interface is compatible with Internet Explorer versions 8.0 and later, and Mozilla Firefox versions 21.0 and later.
  - The NetBackup Appliance Shell Menu is a command line driven interface. For a complete description of all appliance commands, refer to the following document:

    Symantec NetBackup Appliance Command Reference Guide
- MSDP is supported on all 52xx master and media appliances. MSDP offers up to the maximum available capacity on a 52xx appliance.
- Backup of VMware virtual machines. NetBackup appliance version 2.6.0.3 (NetBackup version 7.6.0.3) supports direct backup of VMware virtual machines. The appliance can back up virtual machines without a separate Windows system as backup host.
- Symantec Critical System Protection (SCSP) integration. The SCSP agent is installed and configured when you initially configure your appliance. This agent ensures that your appliance's audit logs are sent to the SCSP server to be validated and verified.
- BMR integration. When the appliance is configured as a master server, you can enable Bare Metal Restore (BMR) from the NetBackup Appliance Web Console.
- IPv4-IPv6 network support. The NetBackup appliances are supported on a dual stack IPv4-IPv6 network. The NetBackup appliance can communicate with, back up, and restore an IPv6 client. You can assign an IPv6 address to an appliance, configure DNS, and routing to include IPv6 based systems. The NetBackup Appliance Web Console can be used to enter information about both IPv4 and IPv6 addresses.

- ACSLS Support. This feature facilitates configuration of NetBackup ACS robotics on the NetBackup appliance. This feature enables the appliance administrator to change the ACSLS entries in the `vm.conf` file on the local appliance.
- NetBackup SAN Client and Fibre Transport. SAN Client is a NetBackup optional feature that provides high-speed backups and restores of NetBackup clients. Fibre Transport is the name of the NetBackup high-speed data transport method that is part of the SAN Client feature. The backup and restore traffic occurs over a SAN, and NetBackup server and client administration traffic occurs over the LAN.
- NetBackup preinstalled. Helps to simplify the deployment and can be easily integrated into an existing NetBackup environment.
- Tape out option. The appliance includes a gigabit, dual-port Fibre Channel host bus adapter (HBA).

  Multiple FC ports can be used for tape out, as long as they are solely dedicated to the tape out function only. For more information, refer to the *Symantec NetBackup Appliance Network Ports Reference Guide*.
- Hardware component monitoring. The appliance can monitor key hardware components such as the CPU, disks, memory, power supply modules, and fans. In addition, the appliance provides an optional Call Home feature that allows proactive monitoring and messaging of these NetBackup components.
- The NetBackup appliances support the core NetBackup software agents. The NetBackup agents optimize the performance of critical databases and applications.

  See the *NetBackup Administrator's Guide Volume I* for more information about the policy types that are supported for each software agent. And for the latest NetBackup appliance compatibility information, refer to the *NetBackup server 7.x hardware compatibility list* on the Symantec Support website.

  http://www.symantec.com/docs/TECH59978
- Flexible hardware configuration. The appliance can be ordered in a variety of configurations to provide the necessary Ethernet ports. Along with the built-in Ethernet ports on the motherboard, expansion cards can be specified to provide additional 1GB or 10 GB Ethernet ports. Dual-port and quad-port expansion cards are supported.

For more information about hardware configuration, refer to the *Symantec NetBackup Hardware Installation and Initial Configuration Guide* and the *Symantec NetBackup Appliance and Symantec Storage Shelf Product Description*.

The following describes how you can incorporate this appliance into your current NetBackup environment:

Replace unsupported media servers	Replace an existing media server that runs on a platform that is not supported in NetBackup 7.6.0.3.
Add deduplication capability	■ Add the appliance to an existing NetBackup environment or replace an existing media server that does not support deduplication. ■ Add NetBackup AdvancedDisk support for non-deduplicated backups. AdvancedDisk can provide faster restore operation but is not space-optimized like MSDP. This is a good solution for backups that include strict tape out schedules. Backup can be expired after import to MSDP and space on AdvancedDisk freed up for next day backups. ■ Configure MSDP partition on the Appliance for deduplication capability.
Add more storage capability	Add storage capability to existing NetBackup 7.6.0.3 and greater environments. ■ Built-in appliance disk storage for 52xx appliances The internal disks can be used for additional backup storage on a 52xx appliance. ■ Additional external storage The Symantec Storage Shelf is an external unit that provides additional disk storage space. You can add up to four of these units to a NetBackup 5220 or 5230 appliance. For a NetBackup 5220 appliance, a factory matched Symantec Storage Shelf must be connected to the appliance. The NetBackup 5230 appliance does not require a matched Symantec Storage Shelf . When you purchase a 5220 appliance and a Symantec Storage Shelf together, the units are matched at the factory for optimum performance. For expample, if you purchase a 5220 appliance with two Symantec Storage Shelf units, the factory-matched unit must be physically connected to the appliance. The second (unmatched) unit must be connected to the first unit, not to the 5220 appliance. If you need or want to add a Symantec Storage Shelf to an existing or an operational NetBackup appliance, your appliance may first require a hardware and/or a memory upgrade. For more information, please contact your NetBackup appliance representative about your expansion needs.

Tape backup	The appliance includes a Fibre Channel host bus adapter card for a TLD tape storage device for archive support.

About the Master Server role

A NetBackup 52xx series appliance can be configured as a master server with its own internal disk storage. You configure and use this appliance much like you would use a regular NetBackup master server. You can schedule backups or start a backup manually. Users with the appropriate privileges can perform restores.

This appliance role provides a simplified administrative interface for the local network, disk, and storage unit management. However, the majority of NetBackup administration such as backup management must be performed through the traditional NetBackup Administration Console.

For complete NetBackup administration information, see the *NetBackup Administrator's Guide for UNIX and Linux, Volume I* and *Volume II*.

About the Media Server role

In this role, a NetBackup 52xx series appliance operates as a media server with its own internal disk storage.

The master server can be a 52xx with appliance software version 2.6.0.3 or later, or a traditional NetBackup master server with NetBackup version 7.6.0.3 or later.

Media server appliances use a simplified administrative interface for the local network and for disk storage management. However, the majority of NetBackup administration such as backup management is performed on the master server.

When you performed the initial configuration on the appliance, you specify the associated master server:

- **For use with a traditional NetBackup master server**
  This appliance role must be used only with a standard NetBackup master server. The NetBackup master server must have NetBackup version 7.6.0.3 or later installed. Symantec recommends that you install the latest version of the NetBackup master server.
- **Specify master server**
  The master server that you specified must be a NetBackup 52xx with appliance software version 2.6.0.3 or later, or a traditional NetBackup master server with version 7.6.0.3 or later.

Table 3-2 describes the supported deduplication configuration for each appliance media server:

Table 3-2 Supported deduplication configurations for NetBackup appliances

Appliance model	Deduplication support on media server
52xx	Media server deduplication pool (MSDP) only

NetBackup Appliance configurations

This section lists the ethernet, Fibre Channel, and storage configurations for NetBackup Appliance 5230.

Figure 3-1 Base A - NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations

Table 3-3 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations for Base A

Model number	Ethernet	Fibre Channel	Storage
Base A-4	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	4 TB
Base A-28	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	28 TB
Base A-40	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	40 TB

Table 3-3 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations for Base A *(continued)*

Model number	Ethernet	Fibre Channel	Storage
Base A-76	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	76 TB

Figure 3-2 Standard B - NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations

Table 3-4 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations for Standard B

Model number	Ethernet	Fibre Channel	Storage
Standard B-4	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	4 TB
Standard B-28	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	28 TB
Standard B-40	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	40 TB
Standard B-76	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	76 TB

Figure 3-3 Enhanced C - NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations

Table 3-5 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations for Enhanced C

Model number	Ethernet	Fibre Channel	Storage
Enhanced C-4	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	4 TB
Enhanced C-28	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	28 TB
Enhanced C-40	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	40 TB
Enhanced C-72	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	76 TB

Figure 3-4 Maximum D - NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations

Table 3-6 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations for FTMS D

Model number	Ethernet	Fibre Channel	Storage
Maximum D-4	▪ 4 X 1 GbE RJ 45 Copper ▪ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	4 TB
Maximum D-28	▪ 4 X 1 GbE RJ 45 Copper ▪ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	28 TB
Maximum D-40	▪ 4 X 1 GbE RJ 45 Copper ▪ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	40 TB
Maximum D-72	▪ 4 X 1 GbE RJ 45 Copper ▪ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	76 TB

Figure 3-5 FTMS E - NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations

Table 3-7 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations FTMS E

Model number	Ethernet	Fibre Channel	Storage
FTMS E-4	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	4 TB
FTMS E-28	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	28 TB
FTMS E-40	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	40 TB
FTMS E-72	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	76 TB

Table 3-8 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations - for 14TB Head Unit

Model number	Ethernet	Fibre Channel	Storage
Base A-14	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	14 TB
Base A-38	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	38 TB
Base A-50	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	50 TB
Base A-96	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	NA	96 TB

Table 3-8 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations - for 14TB Head Unit *(continued)*

Model number	Ethernet	Fibre Channel	Storage
Standard B-4	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	14 TB
Standard B-28	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	38 TB
Standard B-40	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	50 TB
Standard B-76	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	96 TB
Enhanced C-14	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	14 TB
Enhanced C-38	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	38 TB
Enhanced C-50	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	50 TB
Enhanced C-96	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	96 TB
Maximum D-14	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	14 TB
Maximum D-38	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	38 TB
Maximum D-50	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	50 TB
Maximum D-96	■ 4 X 1 GbE RJ 45 Copper ■ 4 X 10 GbE LC Optical	8 X 8 Gb FC LC Optical	96 TB
FTMS E-14	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	14 TB
FTMS E-38	■ 4 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	38 TB

Table 3-8 NetBackup Appliance 5230 ethernet, Fibre Channel, and storage configurations - for 14TB Head Unit *(continued)*

Model number	Ethernet	Fibre Channel	Storage
FTMS E-50	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	50 TB
FTMS E-96	▪ 4 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	10 X 8 Gb FC LC Optical	96 TB

Selecting new appliances

In the previous section we have seen the type of appliances that you can choose from to create your backup solution. This section helps you to select and purchase the components (appliances and storage shelves) based on your requirements. Figure 3-6 diagram illustrates the steps you need to flow while selecting a new appliance.

Figure 3-6 How to begin selecting a new appliance

Selecting a media server

When you plan to buy a media server there are several considerations that you may need to make, so that you can identify the correct model that matches your requirements correctly. Figure 3-7 diagram illustrates the steps you need to flow while selecting a new media server appliance.

Figure 3-7 Selecting a media server

Selecting a master server

When you plan to buy a master server there are several considerations that you may need to make, so that you can identify the correct model that matches your requirements correctly. Figure 3-8 diagram illustrates the steps you need to flow while selecting a new media server appliance.

Figure 3-8 Selecting a master server

Selecting a combined media and master server

When you plan to deploy a combined media and master server there are several considerations that you may need to make, so that you can identify the correct model that matches your requirements. You need to consider your requirements specific for the master server role and the media server role. Refer to Selecting a media server and Selecting a master server for the parameters you need to consider for each role to correctly identify your requirements.

Chapter 4

Capacity Planning checklist

This chapter includes the following topics:

- Checklist for Capacity planning
- Capacity measuring worksheet

Checklist for Capacity planning

What do you want to backup? - computer systems

The following questions provide the considerations to be made to backup computer systems.

Have you listed the Computer systems you need to backup? ☐

Have you noted the host name of each computer system to be backed up? ☐

Have you noted the operating system (and version) installed on each computer system? ☐

Have you noted the details about the Network technology used to connect the computer systems? ☐

Have you separately listed the computer systems connected to the network directly and the ones connected remotely? ☐

Have you noted the location of the resources to be backed up? ☐

Have you listed the total number of disks drives/tapes (and their model type) connected to each system? ☐

Have you listed the applications installed on the computer system? ☐

What do you want to backup? - Databases

The following questions provide the considerations to be made to backup databases.

Have you listed the Databases you need to backup? ☐

Have you noted the host name of each database? ☐

Have you noted the location of each database? ☐

Have you noted the operating system (version) installed on the database? ☐

Have you noted the details about the Network technology used to connect the database? ☐

Have you noted the database types and what are their version numbers? ☐

Have you noted the database engines and what are their version numbers? ☐

Have you noted the method used to backup these databases? ☐

Have you identified the databases that can be backed up while they are offline? ☐

Have you identified, for each database, whether the entire database or the raw partitions need to be backed up? ☐

What do you want to backup? - Application Servers

The following questions provide the considerations to be made to backup Application Servers.

Have you listed the Application servers you need to backup? ☐

Have you noted the host name of each Application server? ☐

Have you noted the server type and application release numbers of each Application server? ☐

Have you noted the location of each server? ☐

Have you noted the details about the Network technology used to connect the application server? ☐

Have you identified the application server that can be backed up while they are offline? ☐

Have you identified the method used to backup these application servers? ☐

How much data do you want to back up?

The following questions provide the considerations to be made for calculating the amount of data to be backed up:

Have you computed the total disk space on each individual system? ☐

Have you identified and added all the data types included in the backup? ☐

Have you identified how compressible is the data that you want to backup? ☐

Will the data be encrypted? ☐

Have you added the space on mirrored disks only once? ☐

Have you added the size of your database backups to your final calculations? ☐

Have you identified the data protection requirements? ☐

Have you added the requirements of the test-backup environment? ☐

Have you added any resulting growth factor to your total backup solution? ☐

Have you computed the amount of data you will need to backup in the next six months to a few years from now? ☐

When should the backup take place?

The following questions provide all the considerations for planning a backup schedule:

Will you perform daily-incremental backups? ☐

When will you perform a full backup? - Weekly ☐

When will you perform a full backup? - Bi-weekly ☐

When will you perform a full backup? - Monthly ☐

Have you identified the number of jobs to be run per day? ☐

Have you identified the window of time that is available to complete each backup? ☐

Would you want to configure a deduplication solution to take backups? ☐

Would you want to consider using the advanced NetBackup features such as synthetic backups, a local snapshot method, or FlashBackup? ☐

Do you plan to run an Off-site backup? ☐

Do you plan to run a Local backup? ☐

Have you identified the total number of local computer systems to be backed up? ☐

Have you identified the total number of remote computer systems to be backed up? ☐

Do you plan to backup any computer system over a network? ☐

Do you want to allow the users to run the backups and restores for their computer systems? ☐

Have you identified the policy for backup expiration? ☐

What is the retention period?

The following questions provide the considerations to be made when estimating the retention period:

What are the standards specific to your organization for creating a retention policy? ☐

Have you identified the projects requirement to retain the data? ☐

Have you identified the user-specific requirements on retaining data? ☐

Are their users who want to retain specific data for a longer period? ☐

Have you identified the business requirements specific to define the retention period? ☐

Have you considered the regulatory or the legal department laid requirements to retain the data? ☐

Have you calculated the size of your NetBackup image database? ☐

Designing your backup system - buying a new Media server appliance

The following questions provide the considerations you need to make for purchasing a NetBackup 5220 Media Server Appliance or a NetBackup 5230 Media Server Appliance:

Which is the Deduplication you want for the media server appliance? - File System ☐

Which is the Deduplication you want for the media server appliance? - VMware ☐

Which is the Deduplication you want for the media server appliance? - SQL ☐

Which is the Deduplication you want for the media server appliance? - Exchange ☐

Which is the Deduplication you want for the media server appliance? - Oracle ☐

What is the deduplication rates in percentage(%) applicable for Initial Full backups? ☐

What is the deduplication rates in percentage(%) applicable for Daily backups? ☐

What is the deduplication rates in percentage(%) applicable for Additional Full backups? ☐

How often are full backups taken? - Weekly ☐

How often are full backups taken? - Monthly ☐

Have you identified the number of incremental backups run per day? ☐

Have you estimated the data growth with each increment (%)? ☐

Have you estimated the Full backups to be taken per year? ☐

How long is the data retained? - Years ☐

Have you estimated the amount(MB) of Daily full backup to Advance Disk? ☐

Have you estimated the amount(MB) of Daily Incremental to AdvancedDisk? ☐

Have you identified the Retention Period (Days) for the AdvancedDisk? ☐

Have you identified the approximate yearly growth (%) for the AdvancedDisk usage? ☐

Have you estimated the Time Span (years) for the AdvancedDisk usage? ☐

For each deduplication use case, the following questions help to identify the Network parameters: ☐

Do you require SAN Transport connectivity for the media server? ☐

Do you required Fibre Channel connectivity for the media server? ☐

Do you require 2 Fibre Channel ports? ☐

Do you require 6 Fibre Channel ports? ☐

What is the estimated High ethernet throughput peak? ☐

What is the estimated Low ethernet throughput peak? ☐

Designing your backup system - buying a new master server appliance

The following questions provide the considerations you need to make for purchasing a NetBackup 5220 Master Server Appliance or a NetBackup 5230 Master Server Appliance:

Have you identified the total number of clients to be connected to the Master Server? ☐

How you identified the estimated data to be incrementally backed up in full (%)? ☐

Have you identified the total number of full backups the Master Server would take per Month? ☐

Have you identified the retention period for a full backup? ☐

Have you identified the total number of incremental backups the Master Server will take per Month? ☐

Have you estimated the approximate Total Number of files to be backed up? ☐

Have you identified the Average File Size (KB) to be backed up? ☐

Have you identified the total disk space used on all servers in the domain? ☐

Media and Master Server (All-in-one)

When you plan to buy a combined media and master server there are several considerations that you may need to make, so that you can identify the correct

model that matches your requirements correctly. You will first need to identify all the parameters that the master server role of the appliance plays and then the parameters that the media server role of the appliance needs to satisfy.

Capacity measuring worksheet

Table 4-1 Capacity measuring worksheet

	File System	Exchange	SQL	Oracle	VMware
Initial Full (%)					
Full Dedupe (%)					
Incremental (%)					
TOTAL DATA (TB)					

Table 4-2 Capacity measuring worksheet

Information type	Information	
Amount of Data (TB)		
Number of Daily Incrementals		
Number of Weekly FULL		
Number of Daily FULL		
Monthly FULL		
Additional FULL		
Data Growth Annually (%)		
Retention Timescale Daily Incremental	Week	Month
Retention Period		
Retention Timescale Weekly Full	Week	Month

Table 4-3 NetBackup Appliance5230 Performance sizing worksheet

Appliance Model	**5230**	**Appliance Version**			**2.5/2.6**								
	LAN 1 Gb				**LAN 10 GbE**				**SAN**				
Type of Data	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**SAN 4 Gb FC**	**TB/ Hr**	**SAN 8 Gb FC**	**TB/ Hr**	**Total data**
File System													
Exchange													
SQL													
Oracle													
VMware													
Total Amount of Data (TB)													
TOTAL Throughput in Hours													

Table 4-4 NetBackup Appliance5220 Performance sizing worksheet

Appliance Model	**5220**		**Appliance Version**		**2.5/2.6**								
	LAN 1 Gb				**LAN 10 GbE**				**SAN**				
Type of data	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**SAN 4 Gb FC**	**TB/ Hr**	**SAN 8 Gb FC**	**TB/ Hr**	**Total data**
File System													
Exchange													
SQL													
Oracle													
VMware													

Table 4-4 NetBackup Appliance5220 Performance sizing worksheet *(continued)*

Appliance Model	**5220**		**Appliance Version**		**2.5/2.6**								
	LAN 1 Gb				**LAN 10 GbE**				**SAN**				
Type of data	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**Client**	**TB/ Hr**	**Target**	**TB/ Hr**	**SAN 4 Gb FC**	**TB/ Hr**	**SAN 8 Gb FC**	**TB/ Hr**	**Total data**
Total Amount of Data (TB)													
TOTAL Throughput in Hours													

Section 2

Best Practices

- Chapter 5. About the best practices section
- Chapter 6. About implementing deduplication solutions
- Chapter 7. Network consideration
- Chapter 8. Storage configuration
- Chapter 9. Generic best practices
- Chapter 10. Best practices checklist

Chapter 5

About the best practices section

This chapter includes the following topics:

- About best practices
- References to maintenance sites

About best practices

This section lists the best practices for working with the appliance hardware and software. It includes the following sections:

- See "About implementing deduplication solutions" on page 64.
- See "About network considerations" on page 71.
- See "About configuring a shared storage pool" on page 82.

References to maintenance sites

It is always a best practice to ensure that your Symantec NetBackup Appliance is up-to-date with the latest updates. For any recent updates, hot fixes, patches, and other technical advisements, you can use the following links:

- Symantec NetBackup Appliance Support website
- http://www.symantec.com/docs/TECH145136
- http://www.symantec.com/docs/TECH150251
- https://sort.symantec.com/netbackup

Chapter 6

About implementing deduplication solutions

This chapter includes the following topics:

- About implementing deduplication solutions
- General recommendations
- Oracle
- Microsoft SQL
- DB2
- Sybase
- Lotus Notes

About implementing deduplication solutions

This section lists the recommendations for implementing the Media server-based deduplication (MSDP) and client side deduplication solutions for various databases and applications.

General recommendations

We begin by taking a look at some general best practices that should be considered when you implement a deduplication solution:

- Implement NetBackup database or application agents wherever possible to take advantage of database or application specific stream handlers.

- Database dumps typically result in lower deduplication rates and are not recommended when agents and/or stream handlers are available to perform the task.
- Enable compression at the media server level to achieve higher deduplication rates for databases or applications.
- Leverage client direct backups (client side deduplication) only when there are enough CPU cycles available on the database or application server.
- Use Accelerator and VRay technology wherever possible to further minimize the traffic effect on the network.
- There can be a discrepancy in the MSDP value displayed by the NetBackup Appliance software and the actual backup space available or used in the MSDP partition. This discrepancy is caused due to the additional utilization of the MSDP reserve of around 4.4% storage space.
  There can be a discrepancy in the MSDP value displayed by the NetBackup Appliance software and the actual backup space available or used in the MSDP partition. This discrepancy is due to MSPD Engine reserving 4.4% of the MSDP partition space for internal databases and processing. The reserved space helps to prevent file system from filling up and affect its performance.

See "About implementing deduplication solutions" on page 64.

Oracle

To achieve higher deduplication rates while performing Oracle database backups, implement one of the following options:

Table 6-1 Best practices to perform Oracle database backups

Stream based backups (NetBackup for Oracle Agent with RMAN)	■ Implement FILESPERSET = 1 in RMAN backup script for ASM-based backups ■ FILESPERSET can be increased to higher number depending on type of database and change rate. Be cautious and gradually increase to validate the performance improvement and deduplication ratios. **Note:** FILESPERSET = 4 or FILESPERSET = 5 seems to work well in most scenarios with a little reduction in deduplication ratios. ■ Turn off Oracle compression while performing backups (this is OFF by default). ■ Increase number of channels for faster backups and restores. **Note:** Setting FILESPERSET > 1 increases performance but reduces dedupe ratios hence Symantec recommends that you begin by experimenting with the different levels of FILESPERSET and identify the most suitable option.
Proxy based backups (NetBackup for Oracle Agent without snapshots)	■ Leverage proxy method to enable data movement by NetBackup. ■ Turn off Oracle compression while performing backups (this is OFF by default). ■ Increase number of channels for faster backups and restore.
Proxy based backups with Snapshot Client (NetBackup for Oracle Agent)	■ Leverage proxy method to enable data movement by NetBackup. ■ Enables faster recovery with Instant Recovery using latest snapshots.
Oracle Dump backups (No NetBackup for Oracle Agent)	Leverage IMAGE MODE while dumping to local disk for higher deduplication rates while performing dump backups with NetBackup standard client

See “About implementing deduplication solutions” on page 64.

Microsoft SQL

To achieve higher deduplication rates while performing SQL server backups, implement one of the following options:

Table 6-2 Best practices to perform SQL server backups

NetBackup for SQL Agent	Use the NetBackup for SQL Agent for better deduplication rates.
`pd.conf`	Ensure COMPRESSION is set to 1 and MATCH_PDRO = 0 in `pd.conf` file on the media server for better deduplication rates.
NO_COMPRESSION	Make sure NO_COMPRESSION setting is enabled on SQL Server 2008 and higher.
BLOCKSIZE	Use default BLOCKSIZE for SQL database backups.
BUFFERCOUNT	BUFFERCOUNT defines number of I/O buffers leveraged for a backup process. Use 2 buffers per stripe for good deduplication performance
MAXTRANSFERSIZE	Leverage this parameter for faster backup speeds. Be careful, that you have enough memory while defining both BUFFERCOUNT and MAXTRANSFERSIZE. Otherwise, the backups could result in error 11's and 13's.
Defragmentation	Defragmentation of the SQL databases will also affect the deduplication rates. With SQL databases, more frequently defragmentation is performed, lower the deduplication rates. Instead of performing defragmentation regularly, only perform when certain thresholds are reached.
STRIPES	This parameter determines the number of simultaneous backup streams per single backup operation. Use multiple stripes for faster backups. STRIPES parameter with SQL backups does not seem to have any negative effect on the deduplication rates.

See "About implementing deduplication solutions" on page 64.

DB2

To achieve higher deduplication rates while performing DB2 data server backups, implement one of the following options:

Table 6-3 Best practices to perform DB2 data server backups

NetBackup for DB2 agent	Use NetBackup for DB2 agent for better deduplication rates
`pd.conf`	Make sure the `pd.conf` file has COMPRESSION set to 1 on the media server and SEGKSIZE = 128.

Table 6-3 Best practices to perform DB2 data server backups *(continued)*

COMPRESS	Do not use COMPRESS parameter with db2 database backup script.
DEDUP_DEVICE	Leverage DB2's new parameter "DEDUP_DEVICE" which basically allows for DB2 backup command to identify that the data is being sent to a deduplication device hence resulting in better deduplication rates. This requires DB2 database version to be at least 9.5 Fix Pack 8 and above.
Defragmentation	Database fragmentation can negatively effect the deduplication rates. It is highly recommended to verify that DB2 database is defragmented.
Data change rates	Based on the data change rates in the DB2 database, perform the following: ■ Minimal data change rate Limit the number of parallel streams to just 1 for better deduplication rates. Basically, this would be PARALLELISM parameter in DB2 database backup script. This enables the number of tablespaces to be read in parallel by a backup utility to just 1. This will affect the overall backup performance but will achieve better deduplication rates. Increase the number of sessions to generate multiple backup jobs per database instance to achieve higher backup speeds. ■ High data change rate requiring high backup speeds: Consider the following for better deduplication rates with high data change rates. Align number of containers in a DB2 database with the number of open sessions in the db2 database backup script to achieve higher deduplication rates. This option needs to be tested on a test/dev environment prior to implementing in production. This would also require additional assistance from the DB2 administrator to understand the number of containers defined in the database.

See "About implementing deduplication solutions" on page 64.

Sybase

To achieve higher deduplication rates while performing Sybase database backups, implement one of the following options:

Table 6-4 Best practices to perform Sybase database backups

NetBackup for Sybase agent	Use NetBackup for Sybase agent for better deduplication rates.
`pd.conf`	Make sure the `pd.conf` file has COMPRESSION value set to 1 on the media server and SEGKSIZE set to a value of 128.
COMPRESS	Make sure that COMPRESS parameter is not used in the Sybase backup scripts. Otherwise, the deduplication rates are going to be very low.
STRIPES	Number of stripes defined in a Sybase backup script doesn't seem to impact the overall deduplication performance.

See "About implementing deduplication solutions" on page 64.

Lotus Notes

To achieve higher deduplication rates while performing Lotus notes database backups, implement one of the following options:

Table 6-5 Best practices to perform Lotus notes data server backups

NetBackup for Lotus Notes agent	Use NetBackup for Lotus Notes agent for better deduplication rates
`pd.conf`	Make sure the `pd.conf` file has the following settings ■ COMPRESSION set to 1 ■ MATCH_PDRO = 0 ■ LOCAL_SETTINGS = 0 on the media server ■ SEGKSIZE = 128

Table 6-5 Best practices to perform Lotus notes data server backups *(continued)*

COMPRESSION	Make sure that COMPRESSION is turned off for the following: ■ Use LZ1 compression for attachments is disabled on all mailboxes and at the database level ■ Use Domino Attachment and Object Service is disabled on all mailboxes and at the database level ■ Compress database design is disabled on all mailboxes and at the database level ■ Not using a 3rd party compression application for attachments. ■ Compress document data is disabled on all mailboxes and at the database level
Compaction	Make sure that compaction is run at a scheduled interval instead of user initiated compaction (weekly if possible).

See “About implementing deduplication solutions” on page 64.

Chapter 7

Network consideration

This chapter includes the following topics:

- About network considerations
- About Fibre Channel connectivity
- About SAN zone configurations
- Validating network bandwidth

About network considerations

This section provides generic guidelines and best practices to configure the network settings of your appliance in a given architecture. It provides the hardware consideration and the best possible settings to be considered for configuring your appliance network.

- Enable SAN Client & Fibre Transport (FT) mode data transfer with Network Transport method for improved efficiency of backups.
- Use network bonding for improved throughput and backup performance.
- Use Resilient Network feature of NetBackup to overcome remote office backup bandwidth issues related to latency and to connection intermittence.
- Use 10GbE network infrastructure end-to-end wherever possible for maximum performance.
- Use of client-side duplication to alleviate network congestion, increase concurrency over a given network bandwidth.
- Use of WAN optimization settings to address remote office or WAN backup requirements.

Along with above considerations, this chapter includes the following sections:

- See "About Fibre Channel connectivity " on page 72.
- See "About SAN zone configurations" on page 73.
- See "Validating network bandwidth" on page 76.

About Fibre Channel connectivity

The NetBackup Appliance supports multiple data transfer features that use Fibre Channel (FC) connectivity to transfer data at high bandwidth:

Table 7-1 Data transfer features that use FC

Data transfer feature	Description
SAN Client	This feature provides high-speed backups and restores of NetBackup clients. The backup and restore traffic occurs over FC, and the NetBackup server and client administration traffic occurs over the LAN.
Optimized Duplication to a NetBackup 5230	When used with FC, Optimized Duplication copies the backup images from a NetBackup 5220 or 5230 appliance (source) to a NetBackup 5020 or 5030 appliance (destination). Optimized Duplication jobs will first attempt to use Fibre Transport (if configured, and will try all FT links), otherwise Ethernet connectivity will be used.
NetBackup for VMware	This feature provides backup and restore of the VMware virtual machines that run on VMware ESX servers. When using this feature with the SAN Transport backup method, SAN LUNs hosting the VMware datastore should be visible to the media server appliance by the FC ports. Specific ports are not allocated for this function – any port not allocated to another function may be used.
Tape Out	NetBackup 5220 appliances support FC connections to TLD tape storage devices allowing for backup data to be written to tape. Appliance software version 2.5 and later includes official support for ACSLS. Connections to tape devices may be direct, or by an FC Switch.

See "About network considerations" on page 71.

About SAN zone configurations

When configuring SAN for yourNetBackup Appliance it is important that the network is designed using the SAN zones recommended by Symantec. These SAN zones include **Fibre Transport (FT) Backup Zones** and **Fibre Transport (FT) Storage Zones**. SAN zones are typically configured on the SAN switch within the SAN.

Use the following guidelines when planning a SAN deployment with NetBackup Appliance. Adhering to these guidelines will increase the probability of an optimal FC configuration:

- Create zones with only a single initiator per zone. Multiple targets in a single zone are acceptable, only if all of the targets are similar. Tape target resources should be in separate zones from disk target resources, regardless of initiator. However, both sets of resources may share the same initiator.
- Keep attention to performance degradation when a port is configured for multiple zones. If you use a single port as an initiator or a target for multiple zones, this port can become a bottleneck for the overall performance of the system. You must analyze the aggregate required throughput of any part of the system and optimize the traffic flow as necessary.
- For fault tolerance, spread connectivity across HBA cards and not ports. To ensure the availability of system connections, if you incorporate a multi-path approach to common resources, pair ports on separate cards for like zoning. This configuration helps you avoid the loss of all paths to a resource in the event of a card failure.
- It is recommended to perform SAN zoning based on WWN (World Wide Name). If switch port configurations or cabling architectures need to change, the zoning does not have to be recreated.

Table 7-2 lists the details of recommended SAN zone configurations for the NetBackup Appliances:

Table 7-2 SAN zone configurations

Zone	Description
FT Backup Zone	A Fibre Transport backup zone should include only the Fibre Transport traffic between the SAN clients and the appliance. The backup zone should include the following HBA ports: ■ The target port of the HBA—connect this port to a Fibre Channel switch port. If you have two HBAs, you can use both of them. The use of two ports provides redundancy. You must define the appliance target port by physical port ID or World Wide Port Name (WWPN). The target mode driver WWPNs are not unique because they are derived from the Fibre Channel HBA WWPN. ■ Ports on the SAN client HBAs that connect to the appliance—connect each SAN client HBA port to ports on the same Fibre Channel switch. You can define SAN client ports by either port ID or WWPN. However, if you use one method for all devices, zone definition and management is easier. The ports on the SAN clients use the standard initiator mode driver. To promote multistream throughput, each SAN client should detect all target mode devices of the appliance HBA port or ports in the zone. Each appliance HBA target port exposes two target mode devices. ■ Define the zones on the switch so that the client ports and the HBA target ports are in the same zone.

Table 7-2 SAN zone configurations *(continued)*

Zone	Description
FT Storage Zone	A Fibre Transport storage zone carries the Fibre Transport traffic from a 5220 or 5230 appliance to a 5020 deduplication appliance. The traffic can be either for duplication or for backups. For backups, the data first travels to the 5220 or 5230 appliance and is then sent to the 5020 duplication appliance for storage. The storage zone should include the following HBA ports: ■ The initiator port of the HBA in the 5220 appliance—connect this port to a Fibre Channel switch port. It does not have to be the same switch as the backup zone. The 5220 appliance is the source for the duplication. The initiator ports use the standard initiator mode driver. ■ The 5020 deduplication appliance ports—connect the target ports (Port 1) of the HBAs in slots 1, 2, and / or 3 to the same Fibre Channel switch. The 5020 deduplication appliance is the target of the duplication jobs. ■ Define the zones on the switch so that the 5220 or 5230 appliance initiator port **Note:** Only one initiator port and one target port can be configured for the same zone. Multiple initiator ports and target ports in the same zone are not supported.
External tape storage zone	If you use a tape library as storage, create a separate zone for that traffic. The tape storage zone does not use NetBackup Fibre Transport; it uses the standard initiator mode driver. The tape storage zone should include a port or ports on the FC HBA in slot 3 of a 5200, 5220, or 5230 appliance.

Note: The NetBackup appliances can be used as the NetBackup for VMware agent (backup host) when using the NetBackup for VMware feature. However, SAN multipathing is not supported when using the NetBackup appliances as a backup host. Multipathing can provide SAN I/O high-availability and higher backup throughput. Please ensure that a multipathing environment is not used with the NetBackup appliances and the NetBackup for VMware feature.

Figure 7-1 displays the targets ports to be used when a Model D or Model E of a 5230 NetBackup Appliance is configured as a FTMS:

Figure 7-1 Target ports

See "About network considerations" on page 71.

Validating network bandwidth

It is recommended to test your network bandwidth before deployment just to ensure that it does not contain any bandwidth bottlenecks. Making sure that the network is performing well prevents any unexpected surprises when performance testing replications, backups and restores with appliances. A variety of tools can be used to test network bandwidth.

You can use the `Nbperfchk` command in all appliances that can measure network and disk read/write speeds as the I/O passes through NetBackup and NetBackup Appliances. It can be used at pre-deployment stages to measure network speeds before initiating AIR replication between master server domains, or measuring disk write speeds on Appliance storage to check for any storage I/O performance problems before performing a backup and restore demonstration to the customer. Be sure to configure the appliance's network configuration and storage configuration before running any network or storage performance tests. Nbperfchk can be run from the Appliance's Shell Menu: Support->Nbperfchk

To use nbperfchk for network bandwidth tests between two appliances, run nbperfchk as a reader on one appliance and a writer on another, example:

```
Reader
symmaster-a.Support> Nbperfchk run
Please enter options:
nbperfchk -i tcp::5000 -o null

Writer
Symmaster-b.Support> Nbperfchk run
Please enter options:
nbperfchk -i zero: -o tcp:symmaster-a:5000
```

In the above example, the symmaster-b appliance is sending data to symmaster-a's 5000 TCP/IP port. The commands provide the following outputs:

Output for the reader

```
symmaster-a.Support > Nbperfchk run
Please enter options:
nbperfchk -i tcp::5000 -o null:
Statistics log are recorded in nbperfchk_results.log
current rcv buff: 262144, set to 524288
current snd buff: 262144, set to 524288
final receive size 262144, send size 262144
     226 MB @  113.1 MB/sec, 226 MB @  113.1 MB/sec, at 1369103091
     566 MB @  113.1 MB/sec, 339 MB @  113.2 MB/sec, at 1369103094
     905 MB @  113.1 MB/sec, 339 MB @  113.1 MB/sec, at 1369103097
    1245 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103100
    1585 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103103
    1925 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103106
    2265 MB @  113.1 MB/sec, 339 MB @  113.1 MB/sec, at 1369103109
    2604 MB @  113.1 MB/sec, 339 MB @  113.2 MB/sec, at 1369103112
    2944 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103115
    3284 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103118
    3624 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103121
    3964 MB @  113.2 MB/sec, 339 MB @  113.1 MB/sec, at 1369103124
    4303 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103127
    4643 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103130
    4983 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103133
    5322 MB @  113.2 MB/sec, 339 MB @  113.1 MB/sec, at 1369103136
```

Output for the writer

```
symmaster-b.Support > Nbperfchk run
Please enter options:
nbperfchk -i zero: -o tcp:symmaster-a:5000
Statistics log are recorded in nbperfchk_results.log
current rcv buff: 262144, set to 524288
current snd buff: 262144, set to 524288
final receive size 1048576, send size 262144
     340 MB @  113.3 MB/sec, 340 MB @  113.3 MB/sec, at 1369103067
     680 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103070
    1020 MB @  113.2 MB/sec, 340 MB @  113.2 MB/sec, at 1369103073
    1360 MB @  113.3 MB/sec, 340 MB @  113.4 MB/sec, at 1369103076
    1701 MB @  113.4 MB/sec, 341 MB @  113.7 MB/sec, at 1369103079
    2040 MB @  113.3 MB/sec, 339 MB @  112.9 MB/sec, at 1369103082
    2381 MB @  113.3 MB/sec, 340 MB @  113.3 MB/sec, at 1369103085
    2721 MB @  113.3 MB/sec, 340 MB @  113.3 MB/sec, at 1369103088
    3060 MB @  113.2 MB/sec, 339 MB @  112.9 MB/sec, at 1369103091
    3400 MB @  113.2 MB/sec, 340 MB @  113.3 MB/sec, at 1369103094
    3740 MB @  113.2 MB/sec, 340 MB @  113.3 MB/sec, at 1369103097
    4080 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103100
    4420 MB @  113.2 MB/sec, 339 MB @  113.2 MB/sec, at 1369103103
    4759 MB @  113.2 MB/sec, 339 MB @  113.1 MB/sec, at 1369103106
    5099 MB @  113.2 MB/sec, 340 MB @  113.2 MB/sec, at 1369103109
output: Connection reset by peer
```

In the above example, the average network throughput is 113.2 MB/sec. If this network throughput is insufficient for the amount of data being protected, the network infrastructure needs to be examined and additional bandwidth needs to be added.

See “About network considerations” on page 71.

Chapter 8

Storage configuration

This chapter includes the following topics:

- About storage configuration
- About configuring a shared storage pool
- About moving a storage partition for better performance

About storage configuration

The NetBackup Appliance Web Console enables you to manage the storage configuration. You can use the **Manage > Storage > Partitions** and **Manage > Storage > Disks** pane to manage the storage space.

The Symantec NetBackup 5220 and 5230 appliance is available for use with up to four Symantec storage shelves. The storage shelves provide you with additional disk storage space. After you have physically connected the storage shelves, use the NetBackup Appliance Web Console to manage the storage space.

Figure 8-1 provides a bird's-eye view of how storage space is configured within your 52xx appliance.

Figure 8-1 NetBackup 52xx Appliance storage space

Figure 8-2 lists the tasks that you can perform on the appliance storage space.

Figure 8-2 Storage operations

All the tasks that can be performed on the NetBackup Appliance Web Console can also be performed by using the `Manage > Storage` shell menu.

For more information about `Main > Manage > Storage` commands, refer to *NetBackup™ Appliance Command Reference Guide*.

About configuring a shared storage pool

NetBackup Appliances are pre-tuned for optimum performance by Symantec. This section provides the best practices for architecting an environment with NetBackup 52xx series to obtain the most optimal performance. These best practices can help you avoid over-commitment during concurrent active stream counts, this is important to protect against I/O performance degrade in any storage pool. Lets consider the following examples to understand theses best practices being implemented in a common environment:

About the environment.

- There is a NetBackup domain consisting of two media servers and one shared storage pool. The storage pool uses independent storage units to direct backup operations from their associated clients, as well as to perform other operations such as duplications and image replication
- By default, the configuration of a storage pool resource does not limit the number of I/O streams (jobs) from all sources. This is due to the fact that storage pools of different types, technologies, and architecture can vary in performance.

Issues faced in the environment

- It is possible to over saturate a pool with I/O as a result of reading or writing too many streams from various operations including:
  - Backup jobs
  - Duplication jobs
  - Replication jobs
- This issue can occur regardless of the stream limitation settings for the individual storage unit configurations.
- Such over saturation issues tend to further worsen in case of SLP and AIR driven policies, due to the multiplicity of operations they can initiate to a single storage pool.
- When this over-commitment occurs, the performance of the target storage pool can degrade quickly, causing delays in operations, and potentially missed Service Level Agreements (SLA).

Recommendation 1:

The value for the **Maximum I/O streams** and **Maximum concurrent jobs** should be taken into consideration when calculating the total number of potential concurrent streams written to or read from a given storage pool from all operations such as backups, duplications, replications, and so on. For more information on the method to calculate the basic stream count for backups, See "Calculating the basic stream count for backups " on page 84.

In case of over saturation two key changes are recommended as best practices:

- Adjustment of the **Maximum I/O Streams** count configuration of the storage pool.

  To configure the **Maximum I/O streams** value, select and edit the appropriate disk pool on the master server from the available list of disk pool devices in the NetBackup Administration Console.
  - On the NetBackup Administration Console follow the path **Media and Device Management > Devices > Disk Pools**.
  - At the bottom of the Change Disk Pool window, adjust the Maximum I/O Streams value by clicking on the check box, and specifying the value desired.
- Adjustment of the storage unit **Maximum concurrent jobs** value for each of the storage units that each media server uses to push data to the shared target storage pool.

  To configure the storage unit's maximum concurrent jobs parameter, select and edit the appropriate storage unit on the master server from the available list of storage units in the NetBackup Administration Console.
  - On the NetBackup Administration Console follow the path **NetBackup Management > Storage > Storage Units**.
  - Adjust the Maximum concurrent jobs to a desired value based on the number of write operations for both backup and duplication jobs. The default value is set to '1'.

    Note: The **Maximum I/O streams** value for the storage pool will take precedence if it is less than the combined storage units' 'maximum concurrent jobs' ability to send jobs to the shared storage pool.

Supposing that the two storage units sharing one disk pool have a combined max job count of 110 (with max concurrent jobs for each storage unit set to 55).

- If the **Maximum I/O streams** for the pool = 90, then the combined maximum job count allowed to be active will be 90.
- If 60 jobs are submitted to one storage unit and only 20 on the other, 5 jobs will still queue on the first storage unit even though the target storage pool could potentially handle them all

Recommendation 2: An additional consideration can be made with respect to the design of the media servers and their associated storage units that point to the shared storage pool as follows:

- Currently the media servers are configured each with an independent storage unit, both of which push data to the same storage pool. This architectural setup can introduce a complexity which may multiply the number of write operations directed toward a single shared storage pool, especially if the storage pool's maximum I/O stream limit value has been defined
- A simplification of the storage unit use can help assist in avoiding the complexity of the environment and potential over-commitment of the storage pool resource, especially when the source clients have many data selections or backup directives.
- If the two media servers are reconfigured to share the same storage unit that points to the shared storage pool. This ensures the maximum number of concurrent write streams during backup and write-side of duplication operations are limited based by the storage unit's **Maximum concurrent jobs** value.

Calculating the basic stream count for backups

To calculate the basic stream count for backups multiply the following values together:

- Number of policies with concurrent backup windows
- Clients in each selected policy
- Backup selections in each selected policy
- Number of concurrent jobs per storage unit value
- Number of storage units using the given storage pool

Note: Additional stream counts should be considered when using storage lifecycle Policies to perform duplications, replications, and other related operations.

See "About configuring a shared storage pool" on page 82.

About moving a storage partition for better performance

This section describes how to move a storage partition from a base unit to an expansion disk. If all or a part of your MSDP partition resides on the Appliance base unit (base disk), it is recommended that you move the MSDP partition to an expansion disk. This applies to 5220 and 5230 appliances and is needed for optimum performance. The base unit should ideally be used in case the external storage is full and you are yet to expand the storage to additional storage shelves

While moving a storage partition from a base unit to an expansion disk the following guidelines should be considered:

- To schedule high performance backups, it is recommended to move the AdvancedDisk partition or MSDP partition from the base unit to the expansion disk . For example, moving the MSDP partition would result in the backup to MSDP to span across 450MB/s and 850MB/s storage which leads to performance improvements.
- The approximate time required to move 4TB from a base unit to an expansion disk is ~2.45hours on a light load system. This can be considered as the basis to calculate the time for moving additional TB of data.
- The amount of data being backed up should be limited when moving a storage partition. If the backup is not limited the time required to move a partition can increase and be double the actual time required. The best practice is to limit the backup coming in during the move, if this precaution is not taken the time to move 4TB the move can increase up to 5 hours

You can move a storage partition using the following options:

- Using the **Manage > Storage > Partitions** from the NetBackup Appliance Web Console, See "Moving a partition" on page 85.
- Using the `Manage > Storage > Move` command from the NetBackup Appliance Shell Menu, See "Moving a partition using the NetBackup Appliance Shell Menu" on page 87.

Moving a partition

This procedure describes the process to move a partition from one storage disk to another.

Note: The Catalog partition cannot be moved. The Catalog partition must always be present on the base unit.

To move a partition

1. Log on to the NetBackup Appliance Web Console.
2. Click **Manage > Storage > Partitions**.
3. Go to the partition that you want to move and click **Move** next to it.
4. Enter the details on the **Move** dialog.

   See "Move *<partition>* dialog" on page 86.

5 Click **OK** to move the partition.

Note: The partition size and the workload on the system determines the time taken to move a partition.

---

6 The Move dialog displays the progress details and status of the move operation.

Click **OK** once the operation is complete. The Manage > Storage > Partitions page is automatically refreshed.

Move *<partition>* dialog

The Move *<Partition Name>* window displays the following parameters:

Parameter	Description	Example
Source Disk	Displays the name of disk that currently holds the selected partition.	76YTGD2BA7CBACB4F416D631CE (Base)
Partition Size	Displays the selected partition's size on the source disk.	300 GB
Target Disk	Click the drop-down list and select the target disk to which you want to move the partition. **Note:** The Target disk must be different from the Source disk.	9DB0FD2BA7CBACB4F416D631CE (Expansion)
Unallocated Size	Displays the unallocated size on the target device.	100 GB
Size	Type the storage size in GB, TB, or PB that you want to move from the current disk to the new disk. **Note:** It is an optional field. If the size is not specified, the appliance moves the entire partition. **Note:** The size to be moved cannot be greater than the Unallocated Size on the target disk.	35 GB

Moving a partition using the NetBackup Appliance Shell Menu

In the NetBackup Appliance Shell Menu use the `Manage > Storage > Move` command to move storage partition from one disk to another disk. To move a partition from the NetBackup Appliance Shell Menu use the following procedure:

To move a partition from the NetBackup Appliance Shell Menu:

1. Log onto the NetBackup Appliance Shell Menu as an administrator.
2. To move a partition use the following command:

   `Move` *`Partition SourceDiskID TargetDiskID`* `[[Size] [Unit]]`

   In this command:

   - *`Partition`* refers to the storage partition like AdvancedDisk, Configuration, MSDP and so on.
   - *`SourceDiskID`* refers to the disk ID of the source disk. Use the `Storage > Show Distribution` command to view the disk ID and the partitions on the disk. For example, S0001FB362501ABDA0000009se.
   - *`TargetDiskID`* refers to the disk ID of the target disk. Use `Storage > Show Distribution` command to view the disk ID and the partitions on it. For example, S2301FB362501ABDA0000009se.
   - `[[Size]]` refers to the partition size. Partition size must be greater than 0. If you specify a partition size that is greater than the actual partition size, appliance moves the whole partition. The default value is [1].
   - `[[Unit]]` refers to unit size (GB/TB/PB). The default value is [PB].

   The following example displays the initiated procedure when you run the `Move` command:

```
Storage > Move AdvancedDisk S0001FB362501ABDA0000009se
S2301FB3BC00540A62501ABDA0000009se 5 GB

- [Info] Performing sanity check on disks and partitions...
(5 mins approx)

- [Warning] Do not reboot the appliance while the partition move is in
progress.

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Main > Manage > Storage view commands 111

Manage > Storage > Move
```

```
- [Info] The estimated time to move the partition can range from
0 hours, 1 minutes to 0 hours, 2 minutes depending on the
system load.

The greater the system load the longer it takes to complete the
move operation.

>> Do you want to continue? (yes/no) yes

Moving part '1/1' disks... Done

- [Warning] No recipients are configured to receive software
notifications.

Use 'Settings->Alerts->Email Software Add' command to configure
the appropriate Email address.

- [Info] Succeeded.
```

Moving the MSDP partition from a base disk to an expansion disk for optimum performance

If all or a part of your Media Server Deduplication Pool (MSDP) partition resides on the appliance base unit (base disk), it is recommended that you move the MSDP partition to an expansion disk. This recommendation applies to 5220 and 5230 appliances and is needed for optimum performance.

The following procedures explain how to move the MSDP partition from a base disk to an expansion disk. The base disk resides on the appliance base unit. The expansion disk resides on a storage shelf that is attached to the appliance. A 5220 or a 5230 appliance can have up to two expansion disks.

Consider the following scenarios:

- Scenario 1 - The MSDP and AdvancedDisk partitions are configured on the base disk. The expansion units are physically attached to the appliance but have not been added yet.
- Scenario 2 - This covers the following cases:
  - The MSDP partition exists on the base disk. The expansion units are configured and partitions exist on them.

- The MSDP partition exists on the base disk. The AdvancedDisk partition is not configured on the base disk. The expansion units are physically attached to the appliance but have not been added yet.

Select the scenario that applies to you and follow the appropriate procedure outlined below.

Scenario 1 - To move the MSDP partition from a base disk to an expansion disk

1 Log on to the NetBackup Appliance Web Console.

2 Click **Manage > Storage > Disks**. Check the partitions that are on the Base disk. Suppose that you have MSDP, AdvancedDisk, Catalog, and Configuration partitions on the base disk as shown below.

3 Ensure that the base disk is fully allocated by resizing the non-MSDP partitions (like AdvancedDisk). To ensure that the base disk is full, resize the AdvancedDisk partition to a value that is just below the maximum value displayed in the slider.

Click the **Partitions** tab and then click **Resize** next to the AdvancedDisk partition. Enter a size in the **New Size** field that is slightly below the maximum value displayed in the slider. In this example, the AdvancedDisk partition is being resized to 39.48 TB. The maximum value that it can be resized to is 39.49 TB.

Click **OK** to resize.

Click **OK** again after the resize operation is complete. The page is refreshed automatically and reflects the updated size.

4 Click the **Disks** tab. Click the **Add** link next to the expansion unit. Click **Yes** to confirm the addition and **OK** when it finishes. Repeat this process for the second expansion unit.

Note that the Unallocated space increases.

5 Check the space occupied by MSDP partition. In the **Partitions** section, click the **MSDP** link next to the pie chart.

Check the **Distributions for MSDP** section. In this example, the MSDP partition resides on the base disk and occupies 260 GB.

Note that the expansion disk must have at least 260 GB of unallocated space when you move the MSDP partition to the expansion disk at a later point.

6 Click the **Partitions** tab. Go to the MSDP partition and click **Resize** next to it. Enter a value that is slightly below the Unallocated Size. In this example, the Unallocated Size is 47.29 TB and the MSDP is being resized to 47 TB. Ensure that the Unallocated size that remains must be more than the MSDP size on the base disk (260 GB or more).

Click **OK** to resize.

Click **OK** again after the resize operation is complete. The page is refreshed automatically and reflects the updated size.

7 Check how the MSDP partition is distributed across disks. In the **Partitions** section, click the **MSDP** link next to the pie chart.

Check the **Distributions for MSDP** section. In this example, a part of the MSDP partition resides on the base disk.

8 Click the **Partitions** tab. Go to the MSDP partition and click **Move** next to it.

9 Move the MSDP partition from the base disk to the expansion disk. In the **Move <MSDP>** window, select the expansion disk that has enough Unallocated size as the Target disk.

10 Click **OK** to move the partition.

Note: The partition size and the workload on the system determine the time it takes to move a partition.

---

11 The **Move** dialog displays the progress details and status of the move operation. Click **OK** once the operation is complete. The **Manage > Storage > Partitions** page is automatically refreshed.

12 Click the MSDP link. The MSDP partition resides on the expansion disks.

The following procedure explains how to move the MSDP partition from a base disk to an expansion disk when the expansion disk has partitions configured on it.

Scenario 2 - To move the MSDP partition from a base disk to an expansion disk

1. Log on to the NetBackup Appliance Web Console.
2. Click **Manage > Storage > Partitions**
3. Check if the MSDP partition is located on the base disk. In the **Partitions** section, click the **MSDP** link next to the pie chart.
4. Check the **Distributions for MSDP** section. If the **Type** is Base for any of the disks, all or a part of the MSDP partition resides on the base disk. In this example, the MSDP partition is located on the base disk as well as the Expansion disk.

If the type is Expansion for all the disks, the MSDP partition doesn't exist on the base disk. In this case, you do not need to move the MSDP partition. You can ignore the rest of the procedure.

5. Go to the MSDP partition and click **Move** next to it.

6 On the **Move <MSDP>** window, click the drop-down list and select the target disk to which you want to move the partition. The target disk must be an expansion disk.

7 Click **OK** to move the partition.

Note: The partition size and the workload on the system determine the time it takes to move a partition.

---

8 The **Move** dialog displays the progress details and status of the move operation. Click **OK** once the operation is complete. The **Manage > Storage > Partitions** page is automatically refreshed.

Chapter 9

Generic best practices

This chapter includes the following topics:

- Generic best practices
- About Notification settings
- About the IPMI sub-system
- Disaster recovery best practices
- Job performance
- Architecture
- NetBackup Catalog Backup
- Patching with the SLP (storage lifecycle policies)
- VMware backups using appliances

Generic best practices

The generic best practices section includes a list of some good practices that can help you setup your appliance and improve its performance. This chapter includes the following sections:

- See "About Notification settings" on page 98. describes the importance for enabling the Notifications and Registration settings for your NetBackup Appliance.
- See " About the IPMI sub-system" on page 99. describes the importance of IPMI sub-systems and why it is vital to configure the IPMI system for your NetBackup Appliance.

- See “Disaster recovery best practices” on page 99. provides the different configuration options that can help aid in a disaster recovery process if a disaster strikes.
- See “Job performance ” on page 101. lists the best practices to improve the performance of the backup jobs run from your NetBackup Appliance.
- See “Architecture” on page 101. list the best practices for defining your NetBackup Appliance architecture.
- See “NetBackup Catalog Backup” on page 102. list the best practices for backing up the NetBackup Catalog from your NetBackup Appliance.
- See “Patching with the SLP (storage lifecycle policies)” on page 103. list the procedure to perform patch updates when an SLP is involved.
- See “VMware backups using appliances” on page 103. list the best practices for performing VMware backups from your NetBackup Appliance.

See “About best practices” on page 63.

About Notification settings

You can use the **Settings > Notification > Alert Configuration** from the NetBackup Appliance Web Console to apply the Call Home settings. AutoSupport in appliance uses the data that is gathered by Call Home to provide proactive monitoring for the appliance. If Call Home is enabled, the appliance uploads hardware and software information (or the Call Home data) to Symantec AutoSupport server periodically at an interval of 15 minutes.

If the appliance encounters an error state, all hardware logs from past three days are gathered along with the current log. The logs are then uploaded to the Symantec AutoSupport server for further analysis and support. These error logs are also stored on the appliance. You can access these logs from `/log/upload/<date>` folder. If there is a problem with a piece of hardware, you might want to contact Symantec Technical Support. The Technical Support engineer uses the serial number of your appliance and assesses the hardware status from the Call Home data.

Note: For Call Home to work correctly, ensure that your appliance has Internet access either directly, or through a proxy server to reach the Symantec AutoSupport servers.

NetBackup Appliance supports all the SNMP servers in the market. However, the following SNMP servers are tested and certified for using with version 2.6.0.x:

- ManageEngine™ SNMP server

- HP OpenView SNMP server

Also ensure that you register the appliance and your contact information using the **Settings > Notification > Registration** menu. Registering your NetBackup appliance helps to make sure that you are alerted to product updates and other important information about your appliance.

About the IPMI sub-system

Ensure that the IPMI sub-system is configured for your appliances. The Intelligent Platform Management Interface (IPMI) sub-system is beneficial when an unexpected power outage shuts down the connected system. This sub-system operates independently of the operating system and can be connected using the IPMI port, located on the rear panel of the appliance.

An IPMI lets you monitor and manage your appliance from a remote location by using the Integrated Storage Manager (ISM) console. Once the operating system is restarted, the IPMI system exposes the management data and structures to the operating system. From the remote location, you can use a laptop or you can use a keyboard, monitor, and mouse (KVM) to access the appliance.

Some of the main uses of IPMI are the following:

- Manage a system remotely in the absence of an operating system
- Change BIOS settings
- Turn on, turn off, or recycle the system
- Situations where local access using a monitor is not possible or preferred like branch offices, remote data center, or headless systems.
- Avoid expensive and messy cabling and hardware like keyboard, monitor, and mouse (KVM) solutions.

Note: You can also use the IPMI sub-system to reimage your NetBackup Appliance.

For the detailed steps on configuring the IPMI sub-system, refer to the *IPMI Configuration* section from the *Symantec NetBackup Appliance Administrator's Guide*.

Disaster recovery best practices

NetBackup offers a few different configuration options that can help aid in a disaster recovery process if a disaster strikes.

Note: Use the following topology configurations as a general guide. Contact your Symantec account representative to establish what topology configuration best fits your particular environment.

Single domain configuration:

- Create backups of the MSDP catalog. The backup protects the critical MSDP information about the contents of the backup data that exists on the NetBackup appliance.

  A policy is automatically created when configuring the NetBackup appliance for the first time as well as when adding MSDP storage during a Storage > Resize operation.

  Review the policy configuration and make changes to its schedules, backup window, and residence as required. Make sure to activate the policy to protect the catalog.

  See "MSDP catalog backup policy creation during initial configuration" in the *Symantec NetBackup Appliance Hardware Installation and Initial Configuration Guide* for more information.

- Create the appliance Master as a virtual machine, using Site Recovery Manager to replicate data from the protected site to the recovery site.

- Store catalog backups at an off-site location in case a recovery is necessary. You can use tape or cloud for restoration to a rebuilt master server at the disaster recovery site.

- Configure a setup using VCS Global Cluster Option. Global Cluster Option to VCS enables linking clusters from separate locations together and connecting applications across clusters. This connection provides complete service level protection against an entire site failure by providing applications failover to the remote site.

  An application is installed and configured on both clusters-local and remote, but is online on a system in local cluster and is configured to fail over globally on the remote cluster. The data is located on shared disks within each cluster and is replicated across clusters to ensure data concurrency.

  In an event of a disaster affecting an entire region, one can create a comprehensive Disaster Recovery solution by combining the capabilities of application clustering with data replication.

  Note: Clustering environments are not supported on the NetBackup appliance.

Multi-domain configuration:

- Configure Auto Image Replication to replicate backups that are generated in one NetBackup domain to storage in another NetBackup domain.

Job performance

This section provides the best practices for setting up backup and deduplication jobs. Table 9-1 lists the best practices for running a backup or a deduplication job on your NetBackup Appliance:

Table 9-1 Best practices to improve job performance

Best practice	Description
Distribute backup and deduplication jobs evenly:	■ Distribute backup and deduplication jobs evenly across the available backup window. ■ Do not front-load or back-load the job window. ■ Limit the number of jobs and I/O at disk pool level for improved results in backup performance.
Monitor job activity	Monitor job activity and note any abnormal buffer times or delay. In case of any large abnormalities, contact Symantec Support for configuration changes that may potentially improve performance.
Evaluate Disk Polling Service (DPS) Proxy settings	Evaluate whether the Disk Polling Service (DPS) Proxy are set to the following: ■ `DPS_PROXYNOEXPIRE` ■ `DPS_PROXY` (default `SEND/RECV` timeouts)
Avoid competing concurrent jobs like backup and restore (or Tape Out)	Competing concurrent jobs highly impact the job performance. Tape Out operations should be scheduled outside of backup window. Backup and replication can run concurrently up to the recommended 32 replication (Opt Dupe) streams without affecting performance significantly.

Architecture

This section lists the best practices to be considered for planning the network architecture around theSymantec NetBackup Appliance.

- Comprehensively gather the data protection requirements like SLA's, disaster recovery, retention periods, tape out requirements, and so on.
- Classify the data by type (for example, file system, database, images) to calculate proper and efficient deduplication rates.
- Segregate each data type to its own separate storage pool.

- Ensure 52xx Appliances do not exceed 85% capacity within the disk pool to ensure maximum performance.

See "Generic best practices" on page 97.

NetBackup Catalog Backup

The NetBackup catalog is the internal database that contains information about NetBackup backups and configuration. Backup information includes records of the files that have been backed up and the media on which the files are stored. The catalogs also contain information about the media and the storage devices associated with its associated clients and the general infrastructure of the environment.

As NetBackup needs the catalog information so that it may perform restores of client backups, duplications, and other operations, it is important to configure a catalog backup policy before using NetBackup for normal day-to-day operations. It is also important to schedule the catalog backups to occur on a regular basis. Without regular catalog backups, an unexpected failure within the NetBackup may cause future operations to fail as well as a potential for a long and intensive recovery process by manual image import process.

The NetBackup Appliance are designed to be a "drop-in", disk-centric storage replacement and/or augmentation to existing traditional open-systems NetBackup architecture. As such, there are some additional considerations and best practices to ensure proper protection of the NetBackup catalogs in these environments:

- Configure the NetBackup Catalog backup policy to store the catalog images on a non-deduplication storage unit - ideally an AdvancedDisk pool.
- Always back up the catalog to a different storage host than the one local to the same master server. This helps to avoid losing the backup of the catalog, in the event of a system factory reset or system re-image.
- Back up the catalogs often to ensure subsequent backups, duplications, replications, and other catalog-related events are protected.
- Configure the Catalog backup policy to use email alerts to send the disaster recovery file to multiple mailboxes.

Note: For more information on NetBackup catalog refer to the *Protecting the NetBackup catalog section* from the *Symantec NetBackup 7.5 Administrator's Guide for UNIX and Linux, Volume I* you can find the link to this guide on tech note DOC5157.

See "Generic best practices" on page 97.

Patching with the SLP (storage lifecycle policies)

When planning to update a 52xx NetBackup Appliance positioned as a media server in an existing NetBackup domain, it can be tricky to “halt” all operations directed to the appliance while the update procedure is occurring, especially when SLP operations are involved. An effective way is to suspend SLP operations by using the “suspend secondary operation” option from the NetBackup Administration Console on the master server for each operation directed to the intended 52xx media server.

To perform a patch updated, along with the SLP operations:

1. After the update is complete, deactivate the 52xx media server.
2. Suspend secondary operations for all SLP functions targeting the 52xx as a duplication destination.
3. Allow all the jobs to complete, or manually cancel them from the master server using the NetBackup Administration Console.
4. Proceed with the standard patching process as detailed in the patch release notes.
5. Reactivate the 52xx media server.
6. Reactivate SLP secondary operations.

See “Generic best practices” on page 97.

VMware backups using appliances

The following guidance is based on the example of an environment with a 10Gbps end to end bandwidth connection, a 60 hour window for full backups, and a 12 hour window for incremental backups. Using this scenario, additional solutions can be extrapolated based on scale:

- Based on average snapshot creation time frame of 1 minute (depending on the vCenter server, ESX & Datastore performance), the total number of snapshots supported per backup host (on an average) is 2500 (1 snapshot per datastore averaged simultaneously). The count of VM guests per proxy server shall be increased by load balancing jobs between ESX servers.
- The number of LAN-based media servers required (shared resources for virtual machines) to perform full backups of 2500 VM guests with 60 hour backup window will be approximately 2 ~ 4 considering the data to be backed up is roughly ~ 500TB. o In 8GB Fabric end-to-end environments, the number of media servers required will increase to 3 ~ 4.

- Considering a 5% change rate on a daily basis, the number of media servers required to perform an incremental backup of 2500 VM guests within a 12 hour backup window will be approximately. o In 8GB Fabric end-to-end environments, the number of guests can increase to approximately 2592.
- Considering an average of 20 VM guests per ESX host and 16 ESX hosts per cluster, the number of ESX clusters supported per backup host is approximately 8.
- The recommended number of snapshots per datastore is 1 (average 512 IOPS with 64K block size).
- The recommended number of backup requests per ESX server is 1.
- The average total number of jobs per cluster at any given point in time, based on the aforementioned recommendations is 48. However, based on best-practice recommendations, it is advised to limit the number of snapshots per vCenter server to 40 at any given point in time as it depends on the load factors of the vCenter server.

See “Generic best practices” on page 97.

Chapter 10

Best practices checklist

This chapter includes the following topics:

- Best practices checklist

Best practices checklist

Table 10-1 Implementing deduplication solutions

Oracle	SQL	DB2	Sybase	Lotus notes
Agent				
▪ NetBackup for Oracle agent with RMAN (Stream-based backups) ▪ NetBackup for Oracle Agent without snapshots (Proxy based backups) ▪ NetBackup for Oracle Agent (Proxy based backups with Snapshot Client) ▪ No NetBackup for Oracle Agent (Oracle Dump backups)	NetBackup for SQL Agent	NetBackup for DB2 agent	NetBackup for Sybase agent	NetBackup for Lotus Notes agent
pd.conf settings for the media server				
	`COMPRESSION = 1`	`COMPRESSION = 1`	`COMPRESSION = 1`	`COMPRESSION = 1`

Table 10-1 Implementing deduplication solutions *(continued)*

Oracle	SQL	DB2	Sybase	Lotus notes
	MATCH_PDRO = 0			MATCH_PDRO = 0
		SEGKSIZE = 128	SEGKSIZE =128	SEGKSIZE = 128
				LOCAL_SETTINGS = 0
Compression				
Turn off Oracle compression for the following agent: ■ NetBackup for Oracle Agent with RMAN ■ NetBackup for Oracle Agent without snapshots		COMPRESSION turned off	COMPRESSION turned off	Disable: ■ LZ1 compression ■ Domino Attachment and Object Service ■ Compress database design ■ Compress document data
Defragmentation				
	Avoid frequent defragmentation. To be performed only when certain thresholds are reached.	Avoid frequent defragmentation.		
STRIPES				
Not applicable	Use multiple stripes.	Not applicable	Number of stripes has no impact on deduplication.	Not applicable
Other parameters				

Table 10-1 Implementing deduplication solutions *(continued)*

Oracle	SQL	DB2	Sybase	Lotus notes

▪ For stream-based backups `FILESPERSET = 1` in RMAN backup script for ASM-based backups
▪ For Oracle Dump backups leverage `IMAGE MODE` while dumping to local disk
▪ For stream-based backups and proxy based backups, increase number of channels.
	▪ BLOCKSIZE = default
	▪ BUFFERCOUNT = 2 buffers per stripe
	▪ Leverage MAXTRANSFERSIZE
	▪ Enable NO_COMPRESSION for SQL Server 2008 and higher
		▪ Enable DEDUP_DEVICE parameter
		▪ Data change rates
		  ▪ Minimal data change rate, parallel streams = 1
		  ▪ High data change rate requiring high backup speeds - Align number of containers in a DB2 database with the number of open sessions in the db2 database backup script
				Compaction - Run compaction at a scheduled interval weekly instead of user initiated compaction.

Table 10-2 Networking best practices

Consideration	Description
Generic best practices	▪ Use Resilient Network feature of NetBackup to overcome remote office backup bandwidth issues related to latency and connection intermittence. ▪ Use 10GbE network infrastructure end-to-end wherever possible for maximum performance.
Fibre Channel implementations	▪ Enable SAN Client - For high-speed backups and restores of NetBackup clients over Fibre Channel. Multipathing can provide SAN I/O high-availability and higher backup throughput. ▪ Enable Optimized Duplication to a NetBackup 5230 - To copy the backup images from a NetBackup 5220 or 5230 appliance (source) to a NetBackup 5020 or 5030 appliance (destination). ▪ Enable NetBackup for VMware to backup and restore of the VMware virtual machines that run on VMware ESX servers. SAN multipathing is not supported when using the NetBackup appliances as a backup host ▪ Implement Fibre Channel connection from NetBackup 5220 and 5230 appliances to TLD tape storage devices allowing for backup data to be written to tape.

Table 10-2 Networking best practices *(continued)*

Consideration	Description
SAN zone configurations - FT Backup Zone	■ Only include the Fibre Transport traffic between the SAN clients and the appliance. ■ Target port of the HBA—connect this port to a Fibre Channel switch port. ■ In case of two target ports, define the appliance target port by physical port ID or World Wide Port Name (WWPN). ■ Connect each SAN client HBA port to ports on the same Fibre Channel switch. ■ Define the zones on the switch so that the client ports and the HBA target ports are in the same zone.
SAN zone configurations - FT Storage Zone	■ Carries the Fibre Transport traffic from a 5220 or 5230 appliance to a 5020 deduplication appliance. ■ initiator port of the HBA in the 5220 appliance—connect this port to a Fibre Channel switch port. ■ Define the zones on the switch so that the 5220 or 5230 appliance initiator port ■ Only one initiator port and one target port can be configured for the same zone. Multiple initiator ports and target ports in the same zone are not supported.
SAN zone configurations - External tape storage zone	For a tape library as storage, create a separate zone for that traffic. The tape storage zone should include a port or ports on the FC HBA in slot 3 of a 5200, 5220, or 5230 appliance.

Network bonding	■ Use network bonding for improved throughput and backup performance.
	■ It is a useful network feature that significantly increases network scalability allowing multiple TCP streams to be balanced across a number of network ports.
	■ The commonly used network bonding modes with NetBackup Appliances are:
	  ■ `802.3ad bonding mode` - This mode works by balancing the TCP frames across switch ports.
	  ■ `balance-alb bonding mode` - This mode works by balancing the TCP frames across ports by using the operating system itself for frame balancing.

Network architecture	■ Comprehensively gather the data protection requirements. ■ Classify and segregate the data by type. ■ Ensure that 52xx Appliances do not exceed 85% capacity within the disk pool

Table 10-3 Working with Storage Partition

Storage Partition	Minimum supported size	Maximum supported size	Supported Platforms	Other considerations
AdvancedDisk	1GB	Maximum available capacity	5200, 5220, 5230	To schedule high performance backups, it is recommended to move the AdvancedDisk partition from the base unit to the expansion disk .
Catalog	250 GB (Master server)	4 TB (Master server)	5200, 5220, 5230 (master server only)	■ It is important to configure a catalog backup policy before using NetBackup for normal day-to-day operations. ■ Schedule catalogs backups often to ensure subsequent backups, duplications, replications, and other catalog-related events are protected. ■ Configure the NetBackup Catalog backup policy to store the catalog images on a non-deduplication storage unit - ideally an AdvancedDisk pool. ■ Always back up the catalog to a different storage host than the one local to the same master server. ■ Configure the Catalog backup policy to use email alerts to send the disaster recovery file to multiple mailboxes.
Configuration	25 GB	500 GB	5200, 5220, 5230	
MSDP	5 GB	Maximum available capacity	5200, 5220, 5230	To schedule high performance backups, it is recommended to move the MSDP partition from the base unit to the expansion disk.

Table 10-4 Generic best practices

Best practice	Description
Locate the NetBackup Appliance serial number	Note and refer to the NetBackup Appliance serial number when you report an issue to Symantec support. You can use either of the following options to locate the NetBackup Appliance serial number. ■ **Monitor > Hardware > Health details** from the NetBackup Appliance Web Console. ■ `Monitor > Hardware ShowHealth Appliance [Item]` Command from the shell menu.
Enable Call Home and AutoSupport	Use the **Settings > Notification > Alert Configuration** from the NetBackup Appliance Web Console to apply the Call Home settings. AutoSupport in appliance uses the data that is gathered by Call Home to provide proactive monitoring for the appliance.
Ensure that the IPMI sub-system is configured for your appliances	The Intelligent Platform Management Interface (IPMI) sub-system is beneficial when an unexpected power outage shuts down the connected system.
Enable Bare Metal Restore (BMR)	Use the **Manage > Host > Advanced** to enable BMR from NetBackup Appliance Web Console. BMR is the server recovery option of NetBackup that automates and streamlines the server recovery process. Thus making it unnecessary to manually reinstall the operating systems or configure hardware.
Perform Single domain disaster recovery configurations	Create the appliance Master as a virtual machine, using Site Recovery Manager to replicate data from the protected site to the recovery site. Store catalog backups at an off-site location in case a recovery is necessary. Configure a setup using VCS Global Cluster Option for complete service level protection against an entire site failure by providing applications failover to the remote site
Perform Multi-domain disaster recovery configurations	Configure Auto Image Replication to replicate backups that are generated in one NetBackup domain to storage in another NetBackup domain.
Improve Job performance	■ Distribute backup and deduplication jobs evenly across the available backup window. ■ Limit the number of jobs and I/O at disk pool level for better performance. ■ Monitor job activity and note any abnormal buffer times or delay. ■ Evaluate the Disk Polling Service (DPS) Proxy settings - `DPS_PROXYNOEXPIRE` and `DPS_PROXY` (default `SEND/RECV` timeouts)

Section 3

Performance tuning

- Chapter 11. How to monitor the performance of your appliance
- Chapter 12. Role-based Performance Monitoring
- Chapter 13. Optimize network settings and improve performance
- Chapter 14. Storage configurations
- Chapter 15. NetBackup Appliance tuning procedures and Performance Monitoring

Chapter 11

How to monitor the performance of your appliance

This chapter includes the following topics:

- About monitoring the performance of your appliance
- Performance Monitoring matrix

About monitoring the performance of your appliance

This section helps you to identify the processes and parameters that affect the performance of your NetBackup appliance. To help understand how to use your appliance with the most optimized settings, it is important to first understand the various factors that affect its performance. Table 11-1 lists all the core factors that can help to improve the performance of your appliance, when configured in the correct manner:

Table 11-1 Factors affecting the performance of your NetBackup Appliance

Factor Type	Factors	Description
Role configured	When considering the performance of an appliance you need to consider the following roles: ■ Master server - See "What affects the performance of a Master Server?" on page 118. ■ Media server - See "What affects the performance of a media server (MSDP)?" on page 119. ■ All-in-one Appliance - See "What affects the performance of an all-in-one appliance?" on page 123.	The performance of your appliance greatly depends on the role it is configured as. For example, the performance of an appliance configured as all-in-one appliance will vary with the role of a media server or a master server.
Network settings	When considering the performance of an appliance you need to consider the following network parameters: ■ SAN Fiber Channel setup - See "SAN Fiber Channel setup" on page 126. ■ Network bonding - See "Network bonding" on page 127. ■ VMware VADP - See "VMware VADP" on page 128. ■ Jumbo frame implementation - See "Jumbo frame implementation for increased MTU" on page 129.	The network architecture in which an appliance is used and the network settings applied to an appliance affect the backup and restore operations. For example, implementing a Fibre Transport media server to backup data from SAN Clients provides one of the fastest methods to backup data, however it also presents very resource-intensive workload on the appliance
Storage configurations	When considering the performance of an appliance you need to consider the following storage configurations: ■ PureDisk I/O and RAID level settings - See "Deduplication disk I/O and RAID level settings" on page 131. ■ RAID Controller operations - See "RAID Controller operations" on page 132. ■ Deduplication load balancing - See "Deduplication load balancing " on page 135. ■ Storage lifecycle Policies - See "Storage Lifecycle Policies" on page 135. ■ Auto Image Replication (AIR) - See "Auto Image Replication (AIR)" on page 135. ■ AdvancedDisk settings - See "AdvancedDisk settings" on page 136. ■ Tape Out operations - See "Tape Out operations" on page 136.	The quantity of a data backed up and the rate at which data is backed up is greatly dictated by the type of storage you select that the corresponding storage configurations made for your appliance.

Performance Monitoring matrix

Table 11-2 the following table lists the process that takes place in a Symantec NetBackup Appliance and its impact on the key resources of an appliance.

The relative impact on the resources is depicted using the following symbols:

🔴 Denotes that the resource (column) is highly impacted due to the corresponding (processes) listed in the rows.

🟡 Denotes that the resource (column) is moderately impacted due to the corresponding (processes) listed in the rows.

🟢 Denotes that the performance of the resource (column) is improved due to the corresponding (processes) listed in the rows.

⊘ Denotes that the resource (column) is not impacted or is not related to the corresponding (processes) listed in the rows.

Table 11-2 Process and resource impact matrix

Processes	CPU Cores	CPU clock	Memory	Disk I/O
Master Server				
Performance of the EMM database request	🔴	🔴	🔴	🔴
File-based catalog information workloads	🟡	🟢	🔴	🔴
Media server				
Backup tasks	🔴	🔴	🔴	🔴
Segmenting	🔴	🔴	🔴	🟡
Finger print operation of backup streams	🔴	🔴	🔴	🟡
Looking up in the deduplication segment Database – Metabase	🟡	🟡	🔴	🔴

Table 11-2 Process and resource impact matrix *(continued)*

Processes	CPU Cores	CPU clock	Memory	Disk I/O
Receiving and storing deduplicated segments on the disk	🟢	🟡	🟡	🔴
Rebasing	🟡	🟡	🟡	🟢
Restore	🔴	🔴	🔴	🔴
Tape out from MSDP	🔴	🔴	🔴	🔴
CRQP (Content Router Queue Processing)	🟡	🟡	🟡	🔴
Initial Optimized Duplication	🟡	🟡	🔴	🔴
SAN Client				
MSDP implementation	🟡	🟡	⊘	🟡
AdvancedDisk implementation	🟢	🟢	⊘	🔴
Network Bonding				
1 GbE NIC's bonded together	🟢	🟢	⊘	🟢
10 GbE NIC's bonded together	🟢	🟢	⊘	🟢
VMware VADP	🟢	🟡	⊘	🟡
Jumbo frame implementation	🟢	🟢	⊘	🟢

Table 11-2 Process and resource impact matrix *(continued)*

Processes	CPU Cores	CPU clock	Memory	Disk I/O
RAID Rebuild Process	🟢	🟢	🔴	🔴
BBU Learn Cycle	🟢	🟢	⊘	🔴
RAID Consistency Check	🟡	🟡	⊘	🟡
RAID Patrol Read	🟡	🟡	⊘	🟡

See "About monitoring the performance of your appliance" on page 112.

Chapter 12

Role-based Performance Monitoring

This chapter includes the following topics:

- Role-based configuration as a factor affecting performance
- What affects the performance of a Master Server?
- What affects the performance of a media server (MSDP)?
- What affects the performance of an all-in-one appliance?

Role-based configuration as a factor affecting performance

This section lists and describes the factors that how the role you configure your appliance as affect the performance of your appliance. NetBackup 5220 and 5230 Backup Appliance can be deployed in all three major backup roles in the datacenter:

- As a dedicated Master server - See "What affects the performance of a Master Server?" on page 118.
- As a dedicated Media server workhorse - See "What affects the performance of a media server (MSDP)?" on page 119.
- As an all in one appliance covering both Master and Media server roles - See "What affects the performance of an all-in-one appliance?" on page 123.

What affects the performance of a Master Server?

When an appliance is configured as a dedicated Master server there are a number of parameters that can influence the performance and needs to be considered. lists the parameters that need to be considered when you configure the roles as a master server.

Table 12-1 Parameters influencing the performance of a master server

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these processes?	Comments
The performance of a NetBackup master server depends on the following two diverse loads:	These processes require both CPU/Memory and disk I/O performance.	When you consider NetBackup Appliance 5220 and 5230 models, they provide the following features to optimize the resources used.	
EMM database	For a master server to perform well, it depends on the performance of the EMM database, which is based on: ■ Utilization of the complete CPU functionality and clock frequency The clock rate typically refers to the frequency at which a CPU is running. It is measured in the SI unit Hertz. ■ CPU and memory performance to handle the EMM database requests.	NetBackup Appliance 5220 model has 2 CPUs with four cores and NetBackup 5230 model has 2 CPUs with six cores.	Real world experience with NetBackup 5220 as a dedicated NetBackup Master server has demonstrated that appliance can handle 15000 backup jobs daily.

Table 12-1 Parameters influencing the performance of a master server *(continued)*

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these processes?	Comments
File-based catalog information workloads	The performance of the disk I/O affects the master server's ability to execute and maintain the file-based catalog processes. The number of cores per CPU help to determine the type of disk I/O performance of a maser server.	■ Both NetBackup 5220 and 5230 models have a formidable amount of RAM even in the basic configurations and very good disk I/O performance. ■ This allows NetBackup 5220 and 5230 Appliances to play a role of the dedicated Master Server in a very busy environment. ■ Scalability and diverse interfaces available in the appliances allow the unrestricted communication with the NetBackup Clients and the NetBackup Media servers and make NetBackup 5220/5230 Appliance ideal candidate for master server from the connectivity performance perspective.	

See "Role-based configuration as a factor affecting performance" on page 117.

See "What affects the performance of a media server (MSDP)?" on page 119.

See "What affects the performance of an all-in-one appliance?" on page 123.

What affects the performance of a media server (MSDP)?

NetBackup 5220/5230 Appliance as the dedicated MSDP media server is the most common type of deployment. In this kind of scenario there are many factors that influence performance of the media server:

There are two distinctive types of deduplication scenarios that can be major performance differentiators:

- **NetBackup Client deduplication**
  In this scenario NetBackup client does part of the deduplication work. NetBackup Client will process backup data with the integrated deduplication plug-in (segments data and creates fingerprints) and send generated fingerprints to the

NetBackup appliance for database lookup. This activity reduces the workload on the appliance and reduces the amount of data sent over the LAN from the NetBackup Client to NetBackup Appliance while creating minimal load on the client.

- **NetBackup Media Server deduplication**
  Media server-based deduplication places far greater workload on the appliance than the client-based deduplication since server processor is performing fingerprinting operations as well. Media server deduplication is a resource-intensive workload and running other concurrent operations that are resource-intensive will affect performance significantly. The appliance CPU cores play a primary role in the performance followed by RAM and disk I/O.

Table 12-2 Parameters influencing the performance of a media server

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these processes?	Comments
In both types of deduplication scenarios the simplified workflow of standard deduplication load consists of the following tasks: ▪ Backup tasks ▪ Segmenting ▪ Hashing backup streams ▪ Looking up in the deduplication segment Database – Metabase ▪ Finally receiving and storing deduplicated segments on the disk .	Deduplication as described places strain on the system resources ▪ **CPU clock and CPU cores** - Each backup stream is assigned to a single CPU core while the speed of processing of the streams is limited by CPU clock. Number of the CPU cores and sustained high CPU clock frequency are important for deduplication performance. ▪ **RAM** - The RAM is important for processing of deduplication segments and for Metabase performance, ▪ **Disk I/O** - while disk I/O have to be capable of handling incoming data processed by CPU and then sent to the file system where deduplicated segments are stored. ▪ **Veritas Filesystem (VxFS)** - used for deduplicated segments storage on the appliance is capable of achieving high performance. It is important to keep in mind that file system performance will degrade as free space approaches 100% utilization, with 90% utilization being the recommended watermark level.	NetBackup 5220 Backup Appliance with its Intel Xeon quad core CPU and NetBackup 5230 with its latest generation Intel Xeon hexacore (six cores) CPU's provide powerful processing capabilities.	To avoid resource congestion, ensure that when rehydration of data takes place no other concurrent operations run in parallel. During POC planning, the amount of client data has to be considered to not fill up the appliance file system and subsequently reduce both the backup and restore performance. All major subsystems of the appliance that are CPU, RAM, and Disk play an important role when it comes to deduplication performance. Running client-based deduplication which is lighter on the CPU than media server deduplication is a good practice, however careful consideration has to be taken to avoid running out of free memory. **Note:** In some specific cases there is a possibility that Client side deduplication performs slower than Media server deduplication. One such rare example is, backup of SQL Server transaction logs on the underpowered SQL Server. These cases are rare but possible and they are mentioned in the context of the exception that proves the rule.

Table 12-2 Parameters influencing the performance of a media server *(continued)*

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these processes?	Comments
Scheduled rebasing According to a predetermined schedule, once a day, rebasing is run to group segments from the same backup together on the disk to improve the restore performance.	Operation like rebasing has a very positive effect on performance, backup image segments are grouped together on the disk which improves disk I/O throughput.		It is important to keep in mind that file system performance will degrade as free space approaches 100 % utilization. The watermark level is 90% utilization.
Restore Restore operation requires full rehydration of data which is the most resource intensive process on the NetBackup MSDP.		NetBackup 5220/5230 Backup Appliance can restore data using multiple restore streams.	
Tape out from MSDP	Tape Out operation is very resource-intensive operation and requires full rehydration of the backup image. Performance of the tape out operation is limited by how tape drives handle multiple streams. Unlike restore operations that can benefit from appliance performance with multiple concurrent restore streams, tape drives can handle only one stream per tape drive thus limiting tape out performance.		Limit the number of I/O streams to the recommended value of 96. This can be done in the properties of storage unit under Max I/O streams text box.

Table 12-2 Parameters influencing the performance of a media server *(continued)*

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these processes?	Comments
CRQP (Content Router Queue Processing) It is one of the regular maintenance operations on MSDP that processes fingerprint database (CRDB) transaction logs (`tlogs`). This operation is necessary for the maintenance of the deduplication storage pool and is scheduled to run twice a day.	During CRQP activity there is a hit on the disk I/O and CPU/RAM resources in the range of 10% - 20% depending on the amount of tlogs to process and this has to be accounted for when planning for high performance tasks that will run concurrently with CRQP. Details of the CRQP activity can be monitored through spooled log: `/disk/log/spoold/storaged.log`. For more information, refer to Symantec Tech note TECH156743 for more details.		
Initial Optimized Duplication	Initial Optimized Duplication is an resource-intensive process and places a stress on the operating system. This severely affects the deduplication performance if executed concurrently with the backup.		

See "Role-based configuration as a factor affecting performance" on page 117.

See "What affects the performance of a Master Server?" on page 118.

See "What affects the performance of an all-in-one appliance?" on page 123.

What affects the performance of an all-in-one appliance?

NetBackup 5220/5230 Appliance is versatile and can handle multiple roles in the environment. It is possible to use both Master and Media server functionality within limits.

Table 12-3 Parameters influencing the performance of an all-in-one appliance

Which are the process executed for this role?	Which are the resources used / affected due to the process?	How NetBackup 5220 and 5230 help to optimally perform these process?	Comments
Master server workload type is intensive on CPU clock, disk I/O and RAM	For more information on how the resources are used in an all-in-one appliance, See "What affects the performance of a Master Server?" on page 118.	NetBackup 5220/5230 Backup Appliance is versatile and can handle multiple roles in the environment.	NetBackup 5220/5230 Backup Appliance in the master/media server role should be considered for small datacenter environments with limited number of jobs and medium deduplication workload.
Media server load is intensive on CPU cores, RAM and disk I/O	For more information on how the resources are used in an all-in-one appliance, See "What affects the performance of a media server (MSDP)?" on page 119.	If properly balanced an appliance can handle both workloads .	

See "Role-based configuration as a factor affecting performance" on page 117.

See "What affects the performance of a media server (MSDP)?" on page 119.

See "What affects the performance of a Master Server?" on page 118.

Chapter 13

Optimize network settings and improve performance

This chapter includes the following topics:

- Optimize network settings and improve performance
- SAN Fiber Channel setup
- Network bonding
- VMware VADP
- Jumbo frame implementation for increased MTU

Optimize network settings and improve performance

The Datacenter network environment is usually the most important factor when sizing for network performance. This section helps you to optimize the network settings for your 52xx appliance.

When considering the performance of an appliance you need to consider the following network parameters:

- SAN Fiber Channel setup - See "SAN Fiber Channel setup" on page 126.
- Network bonding - See "Network bonding" on page 127.
- VMware VADP - See "VMware VADP" on page 128.
- Jumbo frame implementation - See "Jumbo frame implementation for increased MTU" on page 129.

SAN Fiber Channel setup

NetBackup 5220/5230 Backup Appliance can act as a powerful Fiber Transport media server ingesting data from SAN Client's using standard SAN Fiber Channel setup. From the performance perspective SAN Client provides one of the fastest methods to send data from NetBackup client to the appliance and presents a very resource-intensive workload on the appliance.

SAN Client can send data either to MSDP or AdvancedDisk on the appliance. Each of these destinations presents different workloads on appliance resources.

Table 13-1 Performance determinant with SAN Client setup

Implementation Type	Description	Guidelines
SAN Client with MSDP implementation	You cannot implement a NetBackup client-based deduplication when SAN Client is used.	Media server deduplication mode is very resource-intensive on the appliance, especially on the CPU, and all guidelines for the Media server-based deduplication performance sizing apply in this scenario. In addition to the CPU workload caused by the deduplication process, the HBA itself presents additional load utilizing 5 Mhz of CPU clock cycles per every 1 MB/s of data throughput as a general rule of thumb. This load is significant and should be calculated as additional load on the appliance. Combined with Media server-based deduplication requirements, this will lower throughput calculation significantly based on how much bandwidth is used for the SAN Client data.
SAN Client with AdvancedDisk implementation	AdvancedDisk workload primarily uses disk I/O resources of the appliance.	The amount of data sent to the AdvancedDisk on the appliance should not be more than the appliance disk I/O capability. When sizing for the AdvancedDisk and SAN Client, maximum disk I/O throughput of 600 MB/s should be considered as a conservative number.

Careful planning has to be done during architecture and performance sizing operations to achieve maximum performance. The following measures can be taken in addition to improve performance using a SAN Fibre Channel setup:

- Having additional HBA ports dedicated to FTMS will help with overcoming some limits on scaling (number of SAN Clients per port) and redundancy (some customers require redundant connectivity), but for the performance sizing limitation is still ingestion capability of the appliance.

- Best possible throughput of one SAN target port working in the 8 Gb SAN environment can reach 780 MB/s (1560 Mb/s for two FTMS ports in the target mode) when fully saturated. For 5220 this will represent maximum throughput possible on the PCI bus. NetBackup 5230 Appliance has more advanced architecture and can handle more I/O bandwidth on the PCI bus.
- Symantec OS used with the appliances is based on Linux OS and all FTMS/SAN Client limitations on Linux apply, for example number of streams to buffer size ratio.
  NetBackup 5220/5230 Appliance is preconfigured with 8 streams in total for the appliance. In many cases this is not a limiting factor with the notable exception of Oracle backup where the number of streams can be very high.
- The number of FT streams on Linux and NetBackup Appliance is in direct relation with the buffer size and if the number of streams is increased the buffer size has to be reduced. Although it is possible to change the number of streams and reduce buffer size from the root prompt, deploying such a configuration in a production environment requires a support exception.

See "Network bonding" on page 127.

See "VMware VADP" on page 128.

See "Jumbo frame implementation for increased MTU" on page 129.

Network bonding

Network bonding has been available in the Linux environment for quite some time. This is a very useful network feature that significantly increases network scalability allowing multiple TCP streams to be load balanced across a number of network ports.

The commonly used network bonding modes with NetBackup Appliances are:

- **802.3ad bonding mode** - This mode works by balancing the TCP frames across switch ports.
- **balance-alb bonding mode** - This mode works by balancing the TCP frames across ports by using the operating system itself for frame balancing

They are both active-active in a sense that all NIC's or NIC ports are actively involved in the load balancing and provide load balancing for both incoming and outgoing data.

The following guidelines can help you to improve the performance of your appliance considering network bonding:

- Network bonding has to be done across interfaces of the same type, it is impossible to bond 1 Gb/s and 10 Gb/s NIC's together.

- Network Interface Cards do affect the CPU cycles to process data but this workload is not considered as significant on 1 Gb/s or even 10 Gb/s interfaces. The improved PCI communication and throughput in the NetBackup 5220 and 5230 Appliance hardware has a positive affect on the CPU performance. These appliances allow for faster processing of the data bus interrupts with positive effects on CPU utilization during high network loads.
- When a number of 10 GbE NIC's bonded together and transferring data at the maximum will cause some CPU utilization. Exact CPU utilization is hard to quantify since it depends on a number of TCP parameters like MTU, network latency, and others.

See "SAN Fiber Channel setup" on page 126.

See "VMware VADP" on page 128.

See "Jumbo frame implementation for increased MTU" on page 129.

VMware VADP

The VADP (vStorage APIs for Data Protection) interface allows for direct connection to the storage array where virtual machines are stored. VADP enables backup products, like NetBackup, to perform a centralized, efficient, off-host LAN free backup of virtual machines. There are a number of variables in the VMware and NetBackup setup that can influence performance in this scenario. Some of these variables or considerations have been listed below

- VMware environment depends heavily on the storage performance and this is visible during backup operations.
- From the appliance side we should not oversee AdvancedDisk or deduplication capabilities of the appliance and enough leeway should be left for other workload resource utilization. For example HBA's and NIC's are using CPU resources as well and their usage has to be calculated into the overall workload.
- In case when MSDP storage on appliance is used to store backed up VMware data, the appliance performance will be limited by target deduplication processing capabilities of the appliance model and appropriate sizing should take this into consideration. All recommendations applicable to target deduplication apply to the VMware VADP backup to the MSDP pool on the appliance.

See "SAN Fiber Channel setup" on page 126.

See "Network bonding" on page 127.

See "Jumbo frame implementation for increased MTU" on page 129.

Jumbo frame implementation for increased MTU

Jumbo frames are the expression used to describe TCP frames with increased Maximum Transmission Unit – MTU to 9000. They can be very useful in improving throughput for some workloads and even reducing CPU utilization of the appliance.

Note: Jumbo frames are not covered by IEEE RFI's and are not considered network standard due to which they might not be supported by all network environments

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Implementation of Jumbo frames ensures the following performance improvements:

- Increased MTU allows for faster transport of data when NetBackup client is sending large streams of data to the appliance, typically in the Media server based deduplication or the AdvancedDisk backup scenario. In these cases significant improvement in the LAN throughput is noticed.
- In order for the increased MTU to work, all other network devices in the same segment have to be configured with the same MTU, otherwise MTU will be negotiated down to the lowest MTU configured on the network device connected to the same network segment. This usually means that VLAN has to be created and that both NetBackup Client, all network equipment (switches, routers and other equipment) and the appliance have to be configured with the same MTU size.

Although increased MTU equates to a better throughput the following pointers need to be taken into consideration, prior to implementing Jumbo frames:

- NetBackup client based deduplication workload segments and hashes the data on the client and sends a number of smaller packets of data to the appliance. In this case, increased MTU size will not have a positive effect and should be avoided.
- Maximum MTU size that should be set is 9000 since this represents a limit of the TCP CRC (Cyclic Redundancy Check). A CRC is a method of checking for errors in data that has been transmitted on a communications link. Although this point is argued, it is without doubt that TCP CRC will have a risk of failing to protect data integrity if MTU is higher.

See “SAN Fiber Channel setup” on page 126.

See “Network bonding” on page 127.

See “VMware VADP” on page 128.

Chapter 14

Storage configurations

This chapter includes the following topics:

- Storage configurations
- Deduplication disk I/O and RAID level settings
- RAID Controller operations
- Deduplication load balancing
- Storage Lifecycle Policies
- Auto Image Replication (AIR)
- AdvancedDisk settings
- Tape Out operations

Storage configurations

When considering the performance of an appliance you need to consider the following storage configurations:

- Deduplication disk I/O and RAID level settings - See "Deduplication disk I/O and RAID level settings" on page 131.
- RAID Controller operations - See "RAID Controller operations" on page 132.
- Deduplication load balancing - See "Deduplication load balancing " on page 135.
- Storage Lifecycle Policies - See "Storage Lifecycle Policies" on page 135.
- Auto Image Replication (AIR) - See "Auto Image Replication (AIR)" on page 135.
- AdvancedDisk settings - See "AdvancedDisk settings" on page 136.
- Tape Out operations - See "Tape Out operations" on page 136.

Deduplication disk I/O and RAID level settings

On the traditional storage array deduplication disk I/O and RAID level are bases for the performance measurement. With the NetBackup MSDP technology, as with vast majority of other deduplication technology currently on the market, deduplication disk I/O loses its primary performance measurement status. This being said, deduplication disk I/O still plays important part in the overall system performance, and should not be disregarded.

The following guidelines can help improve the deduplication disk I/O and RAID level settings:

- NetBackup 5220/5230 Backup Appliance deduplication disk I/O comes under pressure during rehydration of the backup images stored in the MSDP or the AdvancedDisk backup/restore operations. These operations are heavily dependent on the deduplication disk I/O throughput.
- A traditional hard disk by its nature is very slow, mechanical devices cannot support concurrent I/O operations effectively. Storage array LUN's consisting of RAID groups are good in distributing load across a number of hard disks and thus improving disk storage I/O performance.
- RAID protocols have their own limitations and RAID 6 and RAID 5 have a disadvantage of slower performance during I/O write operations than RAID 1
- To further optimize the performance of the storage pool and avoid oversaturation, two key adjustments are recommended to the:
  - ‘Maximum I/O Streams’ count configuration of the storage pool. For the NetBackup 5220/5230 series appliance-based storage pools, Symantec recommends up to an optimal value of 98 streams per pool.
  - ‘Maximum concurrent jobs’ value for each of the storage units that each media server uses to push data to the shared target storage pool.

Note: Deduplication disk I/O throughput depends on the appliance storage configuration with the general rule of more disks meaning better performance. NetBackup 5220/5230 Appliance with 4TB storage configuration has a significantly lower deduplication disk I/O than a 24TB or better storage configurations. This is a general rule of thumb for any storage array and disk type, increased number of spindles provides better throughput at high disk I/O, especially when the number of streams is high.

See “RAID Controller operations” on page 132.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

See "Auto Image Replication (AIR)" on page 135.

See "AdvancedDisk settings" on page 136.

See "Tape Out operations" on page 136.

RAID Controller operations

RAID controller plays a very important role in the performance of the appliance. There is a number of operations performed by the RAID controller that can severely influence performance disk and they are analyzed in this section. Table 14-1 lists the RAID processes performed by the RAID controller and the effect it has on the performance of the appliance:

Table 14-1 RAID Controller operations

RAID process	Description	Guidelines
RAID Rebuild Process	Disk storage on the NetBackup 5220/5230 Appliances is protected using RAID6 wherein a hot spare disk is made available on each shelf. In case of disk failure, the hot spare disk will be used to replace the data disk and a RAID rebuild process will be initialized.	RAID rebuild is very demanding on the disk I/O and RAID controller resources. Since we are using 2TB and 3TB hard disks in appliances, there is a significant amount of data to move and a lot of RAID calculations to perform. This resource intense operation causes a major slowdown of appliance performance, affecting most appliance operations especially tape out, restore or AdvancedDisk operations, since they rely heavily on disk I/O for performance. Placing a load like Backup, Restore, Tape Out, etc. on the appliance while performing RAID rebuild will slow down the rebuild operation, and significantly extend the amount of time needed for the RAID rebuild to finish.

Table 14-1 RAID Controller operations *(continued)*

RAID process	Description	Guidelines
BBU Learn Cycle **Note:** This process applies only to the NetBackup 5220 Backup Appliance.	NetBackup 5220 Backup Appliance has Li-ion Battery Backup Unit (BBU) used to protect the RAID controller write cache in the case of complete loss of power. If for any reason BBU is not operational, the RAID controller will switch off write cache (making it write-through) and this in turn will significantly slow down appliance disk I/O and affect performance of all operations on the appliance.	BBU learn cycle usually takes around 3-4 hours to complete the full cycle of discharge and recharge. Appliance status displays that the battery is going through the learn cycle. Although this performance drop is unavoidable, it is a rare event since it happens once in 30 days and high performance operations should be planned around it. If RAID is going through the rebuild process it is recommended to reschedule BBU Learn cycle to avoid a slowdown in RAID rebuild performance. This can be done by the Symantec customer support engagement. It is possible to set amount of time until the next BBU Learn Cycle by contacting the Symantec Support. Symantec Support can help you to set the number of seconds before next BBU Learn Cycle starts, counting from the last appliance restart. Although this method is not very exact, it allows for some kind of predictability and makes it possible to plan for high performance operations on appliance around this time. For more information on setting BBU Learn Cycle clock, refer to the tech note TECH204348.
RAID consistency check	This is a regular consistency check operation performed on all LUN's on the RAID controller every 30 days. This check helps confirm that the integrity of RAID group is intact.	It can influence the performance of the disk I/O operations but is not as significant as BBU Learn cycle. The default utilization of resources will be limited to 30% when the consistency check operation takes place. It is recommended to avoid overlapping high performance loads with consistency check. For example, if the BBU Learn cycle on the NetBackup 5220 Backup Appliance if overlapped with consistency check, it will slow down consistency check performance significantly. It is recommended to schedule these operations separately.
RAID Patrol Read	RAID Patrol Read reads check physical hard disks for media errors. This operation is scheduled to run every seven days and is run simultaneously on a small number of physical disks at the same time.	Patrol reads do not affect performance significantly since they are limited to the few disks at a time, but they still affect disk I/O on the checked disks. It is a best practice to make sure that patrol reads do not overlap other maintenance or recovery operations.

RAID Controller commands

Table 14-2 lists the commands to view the status of RAID processes:

Note: Ensure that all the MegaCLI commands are executed under the strict guidance of Symantec Support.

Table 14-2 RAID Controller commands

Description	Command
Monitor progress of the RAID rebuild	`/opt/MegaRAID/MegaCli/MegaCli64 -PDRbld -ShowProg -PhysDrv[Enclosure ID:Slot number of the hotspare disk] -aN`
Check whether consistency checker is running	`/opt/MegaRAID/MegaCli/MegaCli64 -ldcc -progdsply -Lall -aall`
To check whether Patrol Read is running:	`/opt/MegaRAID/MegaCli/MegaCli64 -adppr -info -aall`
To check BBU status:	`/opt/MegaRAID/MegaCli/MegaCli64 -adpBbuCmd -GetBbuStatus -aAll`
To configure RAID rebuild process to use maximum of RAID controller resources for the RAID rebuild (no operations should be active on the appliance):	`/opt/MegaRAID/MegaCli/MegaCli64 -AdpSetProp -RebuildRate 100 -a0`
After rebuild process finishes change should be returned to the default value):	`/opt/MegaRAID/MegaCli/MegaCli64 -AdpSetProp -RebuildRate 30 -a0`

See “Deduplication disk I/O and RAID level settings” on page 131.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

See “Auto Image Replication (AIR)” on page 135.

See “AdvancedDisk settings” on page 136.

See “Tape Out operations” on page 136.

Deduplication load balancing

Media server deduplication places a lot of pressure on resources and with implementation of Deduplication load balancing across multiple appliances or "build your own "media servers. This kind of load balancing can improve performance of deduplication processing on the appliance by offloading it to other servers but it is important to understand it's limits.

Although part of the CPU workload is offloaded to load balancing servers, memory utilization and disk I/O can become bottlenecks. Correct number of deduplication load balancing servers is usually reached by gradually incrementing number of additional servers until optimal performance is achieved. Two servers usually present optimal number but this might depend on the environment.

See “Deduplication disk I/O and RAID level settings” on page 131.

See “Auto Image Replication (AIR)” on page 135.

See “AdvancedDisk settings” on page 136.

See “Tape Out operations” on page 136.

See “RAID Controller operations” on page 132.

See “Storage Lifecycle Policies” on page 135.

Storage Lifecycle Policies

Storage Lifecycle Policies are widely used for duplication of backup images. Due to the nature of SLP this duplication happens 30 minutes after the backups have finished and many times this duplication process overlaps with other processes on appliance like backup, restore, tape out or other SLP process. SLP by its nature is not resource intensive once initial seeding is done. Initial seeding workload is very similar to restore workload, placing a lot of stress on the appliance resources and should be done over LAN instead of WAN. SLP performance can be significantly influenced by the high latency or high packet loss WAN connection.

See “RAID Controller operations” on page 132.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

Auto Image Replication (AIR)

NetBackup AIR is similar to SLP with the difference that NetBackup catalog is updated at the end of replication. This places additional workload on the Master

server on the destination side and in case this is all in one Master/Media server appliance this has to be accounted for during performance planning.

See “Deduplication disk I/O and RAID level settings” on page 131.

See “RAID Controller operations” on page 132.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

See “Auto Image Replication (AIR)” on page 135.

See “AdvancedDisk settings” on page 136.

See “Tape Out operations” on page 136.

AdvancedDisk settings

AdvancedDisk is formatted across the appliance and storage shelves. It provides very good performance both for backup and tape out. It is used often if you have demanding tape out schedules and MSDP performance does not satisfy these strict requirements.

AdvancedDisk is formatted with VxFS and standard Storage Foundation. NetBackup tools can be used for the purpose of monitoring its performance (using commands like `vxstat`, `vxtrace`, `nbperfcheck` from the Netbackup Appliance Shell Menu).

See “Deduplication disk I/O and RAID level settings” on page 131.

See “RAID Controller operations” on page 132.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

See “Auto Image Replication (AIR)” on page 135.See “AdvancedDisk settings” on page 136.See “Tape Out operations” on page 136.

Tape Out operations

Tape Out operation is very resource-intensive operation and requires full rehydration of the backup image.

Performance of the tape out operation is limited by how tape drives handle multiple streams. Unlike restore operations that can benefit from appliance performance with multiple concurrent restore streams, tape drives can handle only one stream per tape drive thus limiting tape out performance.

The following guidelines help to improve the performance of a Tape Out operation from MSDP:

- To achieve best results any concurrent operation is discouraged.
- Better performance improvements can be achieved if tape out is done after the rebasing operation is complete.
- It is very important to stream the data to tape drives on or above the tape drive minimum data rate. If stream throughput drops below the tape drives minimum data rate while tape out operation is in progress, the tape drive will stop writing and will start repositioning tape to the last saved segment while waiting for the new data. This is known as the “shoe shining” effect and will slow down the tape out performance significantly.

  Note: Minimum streamed throughput of tape drives depends on the tape drive model and manufacturer. Generations of LTO 4 tape drives usually have minimum data rates of 40 MB/s (uncompressed data) and 80 MB/s (compressed data). Single MSDP rehydration streams have to perform better than this to prevent slowdown of the tape out performance. Another popular tape drive model is HP LTO5 drive (47 MB/s uncompressed and 94 MB/s for compressed data).

- Best possible scenario is to have multiple tape drives receiving multiple streams from appliance MSDP (one stream per drive).
- The number of tape drives to use depends on many environment parameters. If tape out restore speed is not satisfactory causing "shoe shining" on the tape drives, it is best to try to reduce the number of tape drives used out for tape gradually until an optimal number of tape drives is found for that particular customer environment.

See “Deduplication disk I/O and RAID level settings” on page 131.

See “RAID Controller operations” on page 132.

See “Deduplication load balancing ” on page 135.

See “Storage Lifecycle Policies” on page 135.

See “Auto Image Replication (AIR)” on page 135.

See “AdvancedDisk settings” on page 136.

See “Tape Out operations” on page 136.

Chapter 15

NetBackup Appliance tuning procedures and Performance Monitoring

This chapter includes the following topics:

- About tuning procedures and performance monitoring
- NetBackup Client performance
- Other Performance Monitoring commands

About tuning procedures and performance monitoring

Procedures and tuning parameters provided here are used in the field to improve the performance of certain appliance operations. Before tuning the appliance the following pointers should be considered:

- These parameters are not universally valid and they are not applicable for all deployments or scenarios. It is strongly recommended to test the appliance performance before and after tuning is done to make sure that there is an improvement.
- The provided commands in most cases do not have set parameters, rather they have a possible range or just a variable that needs to be replaced to fit a specific environment. It is highly recommended to understand and analyze commands and their effect before applying them.
- The provided output examples do not have real appliance performance data, they are given to provide information on the expected format of the output.

This section contains the following sub-sections:

- See "NetBackup Client performance " on page 139.
- See "Other Performance Monitoring commands" on page 142.

NetBackup Client performance

This section describes how to measure and improve the NetBackup Client side performance. There are a number of variables that can influence NetBackup client disk I/O performance. These variables need careful planning and approach when backing up high performance NetBackup clients. Some of the key variables that can influence NetBackup client disk are:

- Quality of storage array
- Non-backup related concurrent disk I/O workloads, like an antivirus scan running during backup cycle

  Note: The disk I/O throughput on the NetBackup Client and NetBackup Appliance disk I/O throughput are different. The NetBackup Appliance disk I/O throughput is not related to the NetBackup Client performance.

- RAID groups hosting multiple LUN's with diverse workload and many others

As deduplication disk I/O represents a major choke point on the NetBackup Client side and it is very important to plan for an optimal number of backup job streams to saturate NetBackup Client I/O throughput. Rule of thumb is to use number of disks in the storage array LUN RAID group reduced by 2 to get the maximum number of streams. This rule is a good starting point but it is important to keep in mind that other datacenter environment variables will influence the outcome.

Using tools like `nbperfchk` to test NetBackup client disk I/O and troubleshoot potential bottlenecks on the data path to the appliance is essential during system tuning exercise.

Using nbperfchk to validate disk performance on NetBackup Appliances

The `Nbperfchk` command can also be used to test storage write speeds. If disk write speeds fall below 130 MB/s, there may be a potential issue with the underlying storage configuration in the appliance and Symantec Technical Support should be contacted to investigate. To test disk write speeds with nbperfchk, specify a path into the appliance storage being tested as the output path (-o argument value) for nbperfchk:

Table 15-1 Appliance storage paths

Appliance Storage	Storage Path	Example
5220 MSDP	/disk	nbperfchk -I zero: -o /disk/nbperfchk.tst -s 64g -syncend
5220 AdvancedDisk	/advanceddisk/advol	nbperfchk -I zero: -o /advanceddisk/advol/nbperfc -s 64g -syncend

Following are example runs of nbperfchk testing writes into MSDP and AdvancedDisk storage: 1) Nbperfchk write test into MSDP:

```
symmaster-a.Support> Nbperfchk run
Please enter options:
nbperfchk -I zero: -o /disk/nbperfchk.tst -s 64g -syncend
Statistics log are recorded in nbperfchk_results.log
    3448 MB @ 1723.2 MB/sec, 3448 MB @ 1723.2 MB/sec, at 1369103472
    9380 MB @ 1875.6 MB/sec, 5932 MB @ 1977.3 MB/sec, at 1369103475
   12736 MB @ 1591.3 MB/sec, 3356 MB @ 1117.7 MB/sec, at 1369103478
   12736 MB @ 1157.1 MB/sec,    0 MB @    0.0 MB/sec, at 1369103481
   12736 MB @  909.1 MB/sec,    0 MB @    0.0 MB/sec, at 1369103484
   12736 MB @  748.6 MB/sec,    0 MB @    0.0 MB/sec, at 1369103487
   12736 MB @  636.3 MB/sec,    0 MB @    0.0 MB/sec, at 1369103490
   12736 MB @  553.4 MB/sec,    0 MB @    0.0 MB/sec, at 1369103493
   12736 MB @  489.5 MB/sec,    0 MB @    0.0 MB/sec, at 1369103496
   12736 MB @  438.9 MB/sec,    0 MB @    0.0 MB/sec, at 1369103499
   12736 MB @  397.8 MB/sec,    0 MB @    0.0 MB/sec, at 1369103502
   12736 MB @  363.7 MB/sec,    0 MB @    0.0 MB/sec, at 1369103505
   12736 MB @  335.0 MB/sec,    0 MB @    0.0 MB/sec, at 1369103508
   12736 MB @  310.4 MB/sec,    0 MB @    0.0 MB/sec, at 1369103511
   12736 MB @  289.3 MB/sec,    0 MB @    0.0 MB/sec, at 1369103514
   12736 MB @  270.8 MB/sec,    0 MB @    0.0 MB/sec, at 1369103517
   12736 MB @  254.5 MB/sec,    0 MB @    0.0 MB/sec, at 1369103520
   18182 MB @  342.8 MB/sec, 5446 MB @ 1815.4 MB/sec, at 1369103523
   19936 MB @  355.8 MB/sec, 1753 MB @  583.9 MB/sec, at 1369103526
   19936 MB @  337.7 MB/sec,    0 MB @    0.0 MB/sec, at 1369103529
   < output removed for brevity >
   59456 MB @  265.2 MB/sec,    0 MB @    0.0 MB/sec, at 1369103694
   59456 MB @  261.7 MB/sec,    0 MB @    0.0 MB/sec, at 1369103697
   59456 MB @  258.3 MB/sec,    0 MB @    0.0 MB/sec, at 1369103700
```

```
   63330 MB @  271.6 MB/sec, 3873 MB @ 1289.9 MB/sec, at 1369103703
Starting file sync to flush buffers...
Sync completed in 19.21 seconds
   65536 MB @  258.2 MB/sec
```

2) Nbperfchk write test into AdvancedDisk:

```
symmaster-a.Support> Nbperfchk run
Please enter options:
nbperfchk -I zero: -o /advanceddisk/advol/nbperfchk.tst -s 64g -syncend
Statistics log are recorded in nbperfchk_results.log
    3776 MB @ 1886.3 MB/sec, 3776 MB @ 1886.3 MB/sec, at 1369103913
    9104 MB @ 1819.1 MB/sec, 5328 MB @ 1774.4 MB/sec, at 1369103916
   13036 MB @ 1627.9 MB/sec, 3931 MB @ 1309.2 MB/sec, at 1369103919
   13036 MB @ 1183.9 MB/sec,    0 MB @    0.0 MB/sec, at 1369103922
   13036 MB @  930.2 MB/sec,    0 MB @    0.0 MB/sec, at 1369103925
   13036 MB @  766.0 MB/sec,    0 MB @    0.0 MB/sec, at 1369103928
   13036 MB @  651.1 MB/sec,    0 MB @    0.0 MB/sec, at 1369103931
   13036 MB @  566.2 MB/sec,    0 MB @    0.0 MB/sec, at 1369103934
   13036 MB @  500.9 MB/sec,    0 MB @    0.0 MB/sec, at 1369103937
   13529 MB @  270.3 MB/sec,  493 MB @  164.4 MB/sec, at 1369103961
   < output removed for brevity >
   59278 MB @  315.0 MB/sec,    0 MB @    0.0 MB/sec, at 1369104099
   59278 MB @  310.1 MB/sec,    0 MB @    0.0 MB/sec, at 1369104102
   59278 MB @  305.3 MB/sec,    0 MB @    0.0 MB/sec, at 1369104105
   59278 MB @  300.6 MB/sec,    0 MB @    0.0 MB/sec, at 1369104108
   59278 MB @  296.1 MB/sec,    0 MB @    0.0 MB/sec, at 1369104111
   59278 MB @  291.7 MB/sec,    0 MB @    0.0 MB/sec, at 1369104114
   59278 MB @  287.5 MB/sec,    0 MB @    0.0 MB/sec, at 1369104117
   59278 MB @  283.4 MB/sec,    0 MB @    0.0 MB/sec, at 1369104120
   59278 MB @  279.4 MB/sec,    0 MB @    0.0 MB/sec, at 1369104123
   59278 MB @  275.5 MB/sec,    0 MB @    0.0 MB/sec, at 1369104126
   59278 MB @  271.7 MB/sec,    0 MB @    0.0 MB/sec, at 1369104129
   59614 MB @  269.5 MB/sec,  336 MB @  112.1 MB/sec, at 1369104132
   63779 MB @  284.5 MB/sec, 4164 MB @ 1387.7 MB/sec, at 1369104135
Starting file sync to flush buffers...
Sync completed in 18.65 seconds
   65536 MB @  268.4 MB/sec
```

All three examples show disk write throughput of more than 130 MB/s, which demonstrates good write performance for MSDP and AdvancedDisk storage.

Other Performance Monitoring commands

This section lists the other commands that can be used to monitor the performance of your NetBackup Appliance.

- To check the VxFS (Veritas File System) fragmentation, use the following commands:

  ```
  sudo /opt/VRTS/bin/fsadm -t vxfs -E <filesystem mount point>
  sudo /opt/VRTS/bin/fsadm -t vxfs -D <filesystem mount point>
  ```

- To test disk I/O capabilities of the specific appliance using dd command, use the following commands:

  Write performance testing:

  ```
  nb5220:/home/maintenance # for i in 1 2 ; do time (dd if=/dev/zero
  of=/cat/xyz$i bs=64k count=409600 oflag=direct); done
  ```

  Read performance testing:

  ```
  nb5220:/home/maintenance# for i in 1 2 ; do time (dd if=/cat/xyz$i
  of=/dev/null bs=64k iflag=direct); done
  ```

See “About monitoring the performance of your appliance” on page 112.

See “Role-based configuration as a factor affecting performance” on page 117.

See “Storage configurations” on page 130.

Appendix A

NetBackup Appliance 5220 configurations

This appendix includes the following topics:

- NetBackup Appliance 5220 configurations

NetBackup Appliance 5220 configurations

This section lists the ethernet, Fibre Channel, and storage configurations for NetBackup Appliance 5220.

Figure A-1 Model A - NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations

Table A-1 NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations for Model A

Model number	Ethernet	Fibre Channel	Storage
A-4	6 X 1 Gb E RJ 45 Copper	NA	4 TB
A-24	6 X 1 Gb E RJ 45 Copper	NA	24 TB
A-36	6 X 1 Gb E RJ 45 Copper	NA	36 TB
A-48	6 X 1 Gb E RJ 45 Copper	NA	48/60 TB
A-72	6 X 1 Gb E RJ 45 Copper	NA	72 TB

Figure A-2 Model B - NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations

Table A-2 NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations for Model B

Model number	Ethernet	Fibre Channel	Storage
B-4	6 X 1 GbE RJ 45 Copper	2 X 8 Gb FC LC Optical	4 TB
B-24	6 X 1 GbE RJ 45 Copper	2 X 8 Gb FC LC Optical	24 TB
B-36	6 X 1 GbE RJ 45 Copper	2 X 8 Gb FC LC Optical	36 TB
B-48	6 X 1 GbE RJ 45 Copper	2 X 8 Gb FC LC Optical	48/60 TB
B-72	6 X 1 GbE RJ 45 Copper	2 X 8 Gb FC LC Optical	72 TB

Figure A-3 Model C - NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations

Table A-3 NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations for Model C

Model number	Ethernet	Fibre Channel	Storage
C-4	■ 6 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	4 TB
C-24	■ 6 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	24 TB
C-36	■ 6 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	36 TB
C-48	■ 6 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	48/60 TB
C-72	■ 6 X 1 GbE RJ 45 Copper ■ 2 X 10 GbE LC Optical	2 X 8 Gb FC LC Optical	72 TB

Figure A-4 Model D - NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations

Table A-4 NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations for Model D

Model number	Ethernet	Fibre Channel	Storage
D-4	6 X 1 GbE RJ 45 Copper	6 X 8 Gb FC LC Optical	4 TB
D-24	6 X 1 GbE RJ 45 Copper	6 X 8 Gb FC LC Optical	24 TB
D-36	6 X 1 GbE RJ 45 Copper	6 X 8 Gb FC LC Optical	36 TB
D-48	6 X 1 GbE RJ 45 Copper	6 X 8 Gb FC LC Optical	48/60 TB
D-72	6 X 1 GbE RJ 45 Copper	6 X 8 Gb FC LC Optical	72 TB

Figure A-5 Model E - NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations

Table A-5 NetBackup Appliance 5220 ethernet, Fibre Channel, and storage configurations for Model E

Model number	Ethernet	Fibre Channel	Storage
E-4	▪ 6 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	6 X 8 Gb FC LC Optical	4 TB
E-24	▪ 6 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	6 X 8 Gb FC LC Optical	24 TB
E-36	▪ 6 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	6 X 8 Gb FC LC Optical	36 TB
E-48	▪ 6 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	6 X 8 Gb FC LC Optical	48/60 TB
E-72	▪ 6 X 1 GbE RJ 45 Copper ▪ 2 X 10 GbE LC Optical	6 X 8 Gb FC LC Optical	72 TB

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