WHITE PAPER: DATA PROTECTION

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Veritas NetBackup for Microsoft Exchange Server Solution Guide

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White Paper: Veritas NetBackup for Microsoft Exchange Server Solution Guide

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1. Goal of this Paper

This paper sets out to be informative and educational in describing a number of solutions for protecting and recovering Microsoft Exchange installations. The challenges associated with protecting an Exchange environment, as well as multiple strategies that address them are covered in an easy to comprehend format. Upon completion of reading this paper, the reader should be well positioned to describe available data protection solutions for Microsoft Exchange as provided by NetBackup, the NetBackup for Exchange Server agent, and the NetBackup Snapshot Client.

1.1. Intended Audience

Anyone looking for information surrounding NetBackup and data protection solutions for Microsoft Exchange is encouraged to read this paper. Those with limited exposure to or experience with data protection solutions for Exchange will benefit from the content presented.

If you've ever asked any of the following questions, you are a member of the target audience for this paper:

- Is NetBackup able to recover individual mailboxes and recover mailbox items at a granular level?
- What value and advantage does NetBackup provide for Exchange that isn't available otherwise?
- What advantage is there to using Volume Shadow Copy Service (VSS) snapshots?
- When should off-host backups be considered?

1.2. Solution Overview

NetBackup provides a comprehensive data protection solution including centralized administration and reporting, media management, automated policy based backups, and restore. NetBackup for Microsoft Exchange Server extends the capabilities of NetBackup to include online backups and restores of Exchange databases. Additionally, NetBackup for Microsoft Exchange Server also provides a solution for protecting Exchange data at the mailbox level, facilitating granular recovery of mailboxes, messages, contacts, notes, tasks, and schedules.

An overview of the feature set provided by NetBackup for Exchange includes:

- Online backups
- Full, incremental, differential, and copy-only backups
- Redirected restores
- Individual mailbox backup with granular restore
- Integrated Snapshot Client support for VSS and off-host backups

1.3. Technology Issues Solved With These Solutions

Microsoft Exchange can be protected with the stock out-of-the-box "Backup" solution that is included with Microsoft Windows Server. "Backup" is also sometimes referred to as the "Windows Backup" program, or "NTBackup". Limitations associated with the basic "Backup" solution are numerous. Specific to protecting and recovering Microsoft Exchange, there is no support for mailbox level protection, there is no support for VSS, and there is no support for off-host backups.

1.3.1. Granular Mailbox Protection

There are essentially two basic levels of Exchange protection available. The first is referred to as database level protection, where VSS compliant snapshots or the Exchange backup API are used to perform full or incremental database backups. These backups can be used to recover individual databases within an Exchange storage group, or an entire storage group. This method of backup is suitable for recovery from disasters or hardware failures.

The second basic type of Exchange protection is commonly referred to as a brick level backup. This type of backup uses MAPI (Messaging API) to protect Exchange mailboxes at a granular level. Mailbox backups are executed separately from Exchange storage group backups. Mailbox backups cannot be used to recover a database or storage group, but they can be used to recover individual mailboxes or mailbox content at a granular level. This method of backup is suitable for recovering accidentally deleted items.

Individual mailbox restores, or granular recovery of items within a mailbox isn't supported by the Windows Backup utility. Microsoft does provide information detailing what a customer would need to do in order recover this data using what is referred to as recovery storage groups.

NetBackup for Microsoft Exchange server includes the ability to perform both storage group and brick level mailbox backups (dependant on the version of Microsoft Exchange being protected).

Additional mailbox protection and recovery information is included in Appendix I.

1.3.2. Volume Shadow Copy Services

Exchange Server 2003 introduced support for backup in conjunction with Windows Server 2003 VSS. With respect to Exchange, VSS acts as a mechanism for creating point-in-time copies of data that can be used for consistent Exchange storage group backup and recovery. Underlying VSS components are properly defined as providers, writers, and requestors.

Additional VSS information is available in Appendix II.

NetBackup incorporates support for VSS in conjunction with the Snapshot Client feature, detailed in a subsequent section of this paper.

1.3.3. Off-host Backup

Off-host backup with respect to Exchange refers to the ability to use a VSS compliant snapshot that has been mounted on an alternate host for the purpose of performing a storage group backup. The initial snapshot occurs on the Exchange server, and is then transported via a SAN or iSCSI network to an alternate host. The alternate host, for instance, may be a NetBackup media server. The VSS snapshot is used on the alternate host as source data for the Exchange backup. This methodology virtually removes any overhead induced by the backup process from the Exchange server, allowing users to send and receive e-mail without delays or being forced to wait longer for transactions to complete.

Off-host technology can be used in conjunction with performing full, copy, incremental or differential storage group backups. This solution requires use of the NetBackup Snapshot Client, and is supported for use in conjunction with NetBackup for Exchange.

2. Technology Overview

Protecting Microsoft Exchange includes backing up Exchange databases and log files. In addition to these items, data related to the Exchange installation should also be protected. Related data includes active directory information, certificate services data, system replication services data, system state data (including the IIS metabase), and any cluster information applicable to the Exchange installation.

NetBackup provides a comprehensive set of data protection technologies which address the requirements and suggestions presented by Microsoft with regard to protecting Exchange environments.

2.1. Challenges Addressed with this Technology

Challenges in protecting and recovering Exchange are numerous. This subsection provides an overview of challenges and recommends solutions architected to overcome them.

2.1.1. Standard Solution

The standard solution provided by “Backup” (the utility provided by Microsoft) provides basic backup and recovery functionality for Exchange environments. As previously stated, “Backup” doesn’t provide granular mailbox recovery, support the use of VSS snapshots with Exchange, or support performing off-host backups. These limitations can become gating factors when architecting an appropriate solution for a given Exchange environment. Considerations that should be taken into account relative to the standard solution include:

- Mailbox recovery facilitates the ability to recover individual mailboxes as well as granular recovery of individual mailbox items. Some Exchange environments may desire this functionality in an effort to respond to restore requests. The unfortunate substitute for not having this capability is denying the restore request, or performing the restore by means of a recovery storage group. Using a recovery storage group to recover individual mailboxes is time consuming, administratively intensive, and requires storage space for an entire storage group.
- Backup is all about being able to recover data based on a recovery point objective, as well as a recovery time objective. VSS snapshots enable the ability to perform multiple daily backups of Exchange databases.

Frequent backups enhance the goal of an improved recovery point objective. Additionally, VSS snapshots also work with “Instant Recovery”, enabling a reduced recovery time objective.

- Off-host backups provide a method of removing the backup processing workload from the Exchange server and placing it on an alternate host, a NetBackup media server for instance. Exchange servers that are highly utilized processing online transactions benefit from this technology in that users will experience the same transaction service level regardless of how frequently the Exchange databases are being protected. The possible alternatives to using this technology include reduced transactional response times for users while the Exchange server is being backed up, fewer Exchange backups (resulting in an increased recovery point), or the need to deploy additional Exchange servers in an effort to reduce overall processing workload.

The standard solution includes additional limiting factors which may be less obvious:

- Centralized administration isn’t possible with the basic “Backup” utility. The requirement to protect Exchange server System State information requires that “Backup” be executed locally on each Exchange server. While Exchange database backups can be performed remotely, system state backups are not able to be performed remotely with the “Backup” utility.
- Reporting is less than optimal, and may incur additional administrative overhead when using the “Backup” utility. Reports may need to be collated among multiple “Backup” instances in order to facilitate comprehensive “roll-up” reporting that reflects operational status of an environment.
- Duplicating backups performed with the “Backup” utility presents another significant challenge. Tracking any duplicates that may be rotated off-site presents yet another challenge.

The limiting factors presented here aren’t intended to serve as an exhaustive list. They are mentioned so that the need for enhanced solutions becomes clear. Organizations with more than a single small Exchange server can benefit from the solutions recommended in this paper.

2.1.2. Good, Better, and Best Solutions

NetBackup is easily customized to accommodate a variety of Exchange data protection solutions. Presented in this subsection are “Good”, “Better”, and “Best” solutions that extend the basic capabilities found in the standard “Backup” utility.

- Good Solution

  This solution uses the NetBackup Exchange agent and provides Exchange database backup and restore functionality. Also provided is the ability to protect and recover mailboxes at a granular level. The “Good” solution is superior to the standard “Backup” utility in that it provides centralized administration and reporting, the ability to use integrated NetBackup technologies such as compression, encryption, media management, storage units, and Storage Lifecycle Policies, while adding a mailbox protection strategy.

- Better Solution

  The “Better” solution uses the NetBackup Exchange agent and supplies all the advantages of the “Good” solution, with the added ability to perform VSS snapshot backups local to the Exchange server. This added capability requires the use of NetBackup Snapshot Client software.

- Best Solution

  The “Best” solution uses the NetBackup Exchange agent and Snapshot Client components used in the “Better” solution, with the added ability to perform off-host backups.

The following table summarizes features of the standard "Backup" solution, as well as the recommended "Good", "Better" and "Best" NetBackup solutions:

Solution Comparison				
Solution	Standard	Good	Better	Best
Recommended for	Exchange deployments with basic backup and recovery requirements.	Exchange deployments requiring centralized management and possible mailbox recovery.	Exchange deployments requiring centralized management, possible mailbox recovery, a need for frequent backups and fast recovery.	Exchange deployments requiring centralized management, possible mailbox recovery, frequent backups with minimal impact to the Exchange server, and fast recovery.
Basic Exchange database backup and recovery	✓	✓	✓	✓
Centralized management	X	✓	✓	✓
Mailbox backup with granular recovery	X	✓	✓	✓
VSS Snapshot support	X	X	✓	✓
Off-host backup support	X	X	X	✓

Table 1: Solution Comparison

The next table characterizes performance speed for backup and recovery, as well as the impact of backup on the Exchange server platform:

Relative Performance Comparison				
Solution	Standard	Good	Better	Best
Restore Speed	●●●○○	●●●○○	●●●●●	●●●●●
Backup Speed	●●●○○	●●●○○	●●●●○	●●●●●
Reduced Backup Impact	○○○○○	○○○○○	●●●●○	●●●●●

Table 2: Performance Comparison

3. Architecture

In this section the "Good", "Better", and "Best" solutions are examined in greater detail. Insight is provided regarding the applicable Exchange environment, as well as any required hardware and software for each solution.

3.1. Good Solution

The targeted Exchange environment for the "Good" solution consists of:

- A range of Exchange servers beginning with a single lightly loaded server to multiple moderately loaded servers

  Exchange database backups will place an additional processing load on these servers. Highly utilized Exchange servers will likely be impacted by backup processing to the point where transactional response times become elongated.

- A desired recovery point objective that takes into consideration the frequency at which backups can be performed

  The time required to perform a full database backup directly correlates to possible recovery points. Take for example the case where a full backup is executed daily. In theory, if a service interruption occurred that required a restore, restoring the last full backup would take the recovery point back a maximum of 24 hours plus the time it took to perform the restore job.

- A need for centralized administration and reporting

  The core NetBackup product provides numerous benefits which include centralized administration and reporting.

- Possible requirements for mailbox or granular mailbox recovery

  Some customers have decided not to perform mailbox backups as they typically run slower and longer when compared to database backups, and cannot be used to recover a database. Other customers have innovatively decided to protect a subset of mailboxes with this level of protection, specifically mailboxes belonging to their executive staff.

  NetBackup supports full and incremental mailbox backups, and also supports single instance backups of attachments sent to a distribution list residing within the same Exchange storage group. This functionality combined with the ability to use exclude lists enables faster mailbox backups while consuming less backup media.

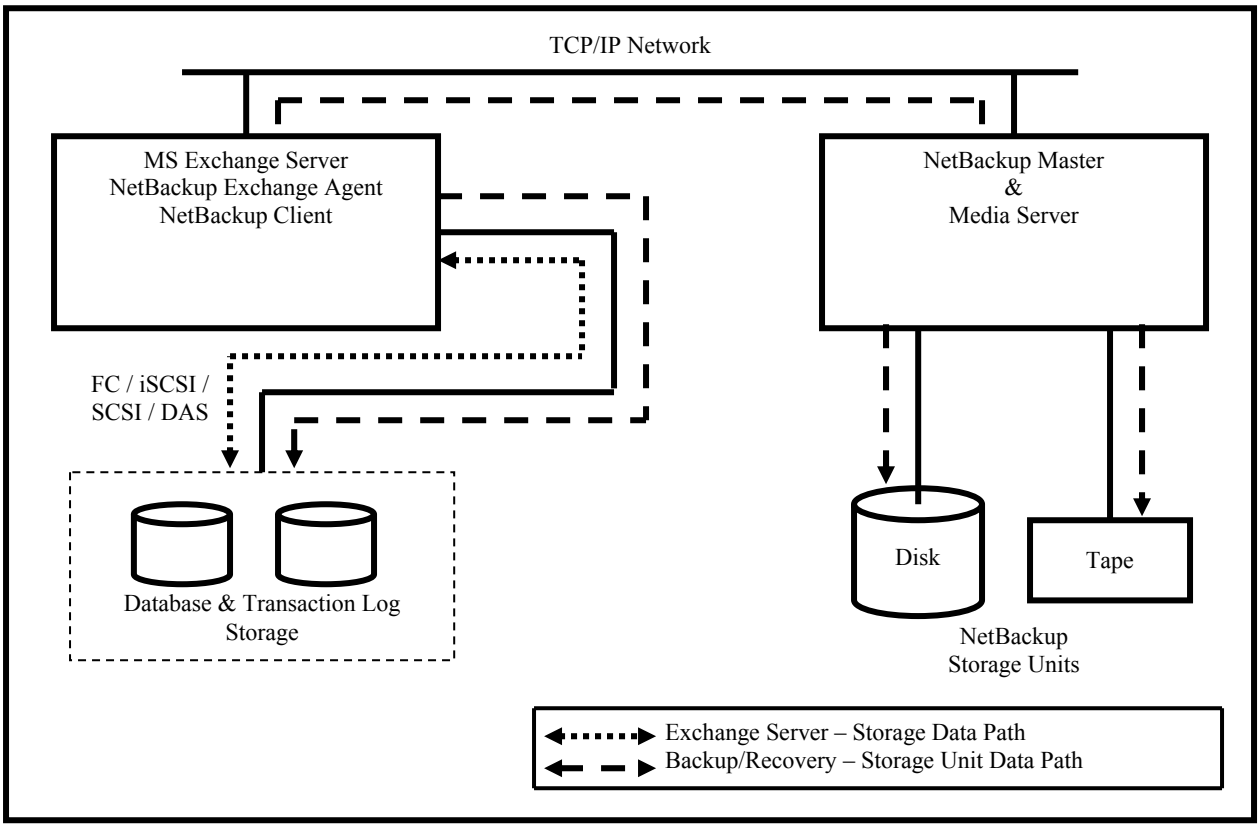
- Possible requirements for duplication and/or offsite vaulting of backup media

  Customers that duplicate Exchange backups can benefit from the ability to duplicate backups inline (concurrent with the initial backup) or after the fact with a Storage Lifecycle Policy. Additionally, the NetBackup Vault option facilitates efficient processing and tracking of removable media sent off site for disaster recovery preparedness.

Hardware for the “Good” solution includes NetBackup master and media server platforms. Both master and media server functions can be co-located on a single host, and can even be co-located on the Exchange server if desired. Also required is backup media. Disk, removable tape, and virtual tape media are all supported.

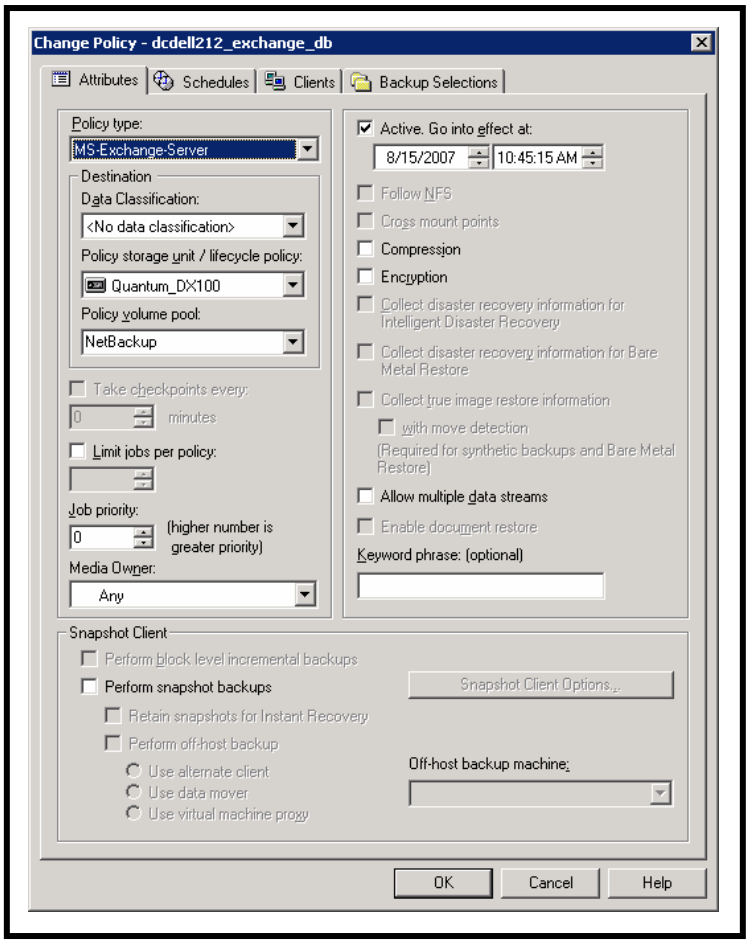
Software for the “Good” solution includes NetBackup server and NetBackup for Microsoft Exchange server software. Additional software licenses for tape or virtual tape libraries, enterprise disk foundation disk storage devices, or the NetBackup Vault option may also be required.

An example configuration for the “Good” solution:



Graphic 1: “Good” Solution block diagram

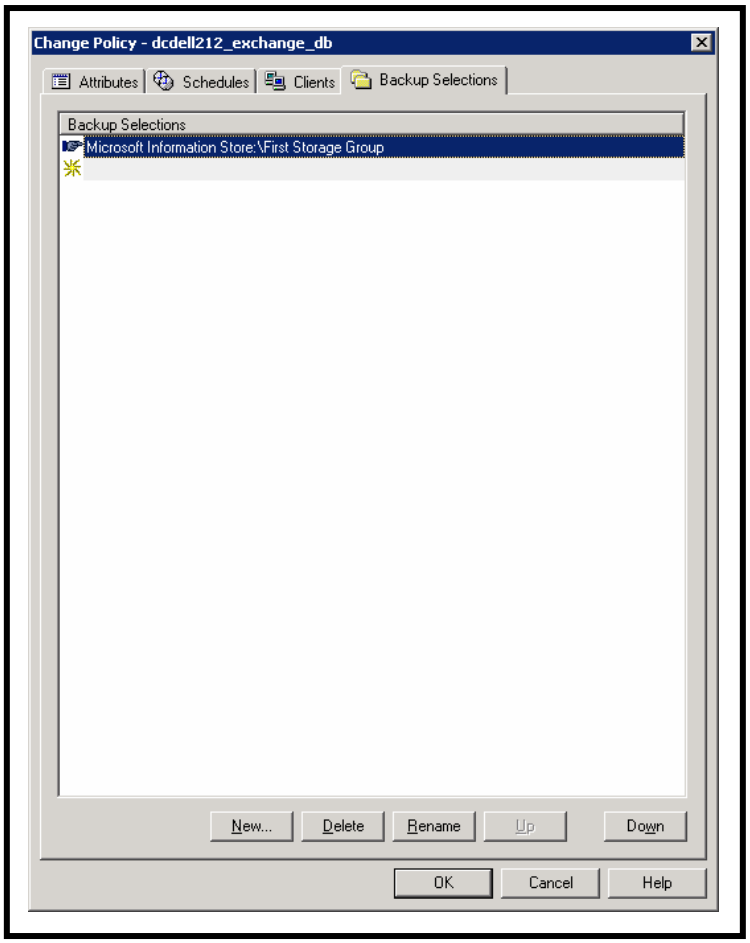
The NetBackup policy for this configuration is simple and straightforward. Select a policy type equal to “MS-Exchange-Server”, and select a “Policy storage unit / lifecycle policy”:



Graphic 2: “Good” Solution NetBackup policy attributes

NetBackup schedules can be created to reflect when full, incremental differential or incremental cumulative backups should be executed. Retention periods for each backup type can also be selected on the schedule.

The NetBackup policy “Backup Selections” can be populated by using available directives. In this example, Exchange databases associated with a storage group are selected for backup. A directive has been used to populate the backup selections list with “Microsoft Information Store:\First Storage Group”:



Graphic 3: "Good" Solution NetBackup policy backup selection

3.2. Better Solution

The targeted Exchange environment for the "Better" solution consists of:

- A range of Exchange servers beginning with a single lightly loaded server to multiple moderately loaded servers

  Dependant on the VSS provider used, Exchange database backups will place some additional processing load of these servers. Snapshot only backups are likely to incur a minimal increase in loading, whereas copying snapshots to a storage unit will incur a moderate increase in loading. Highly utilized Exchange servers will likely be impacted by copying snapshots to a storage unit to the point where transactional response times become elongated.

- Recovery point and time objectives that require frequent backups and instant recovery performance.

  *Note NetBackup 6.5.2 includes planned support for instant recovery. This function substantially improves recovery time. Optionally, Exchange VSS snapshots will be able to be retained on disk only. This function increases the opportunity to execute frequent snapshot backups to disk without the requirement of writing the snapshot data to a storage unit.

- A need for centralized administration and reporting

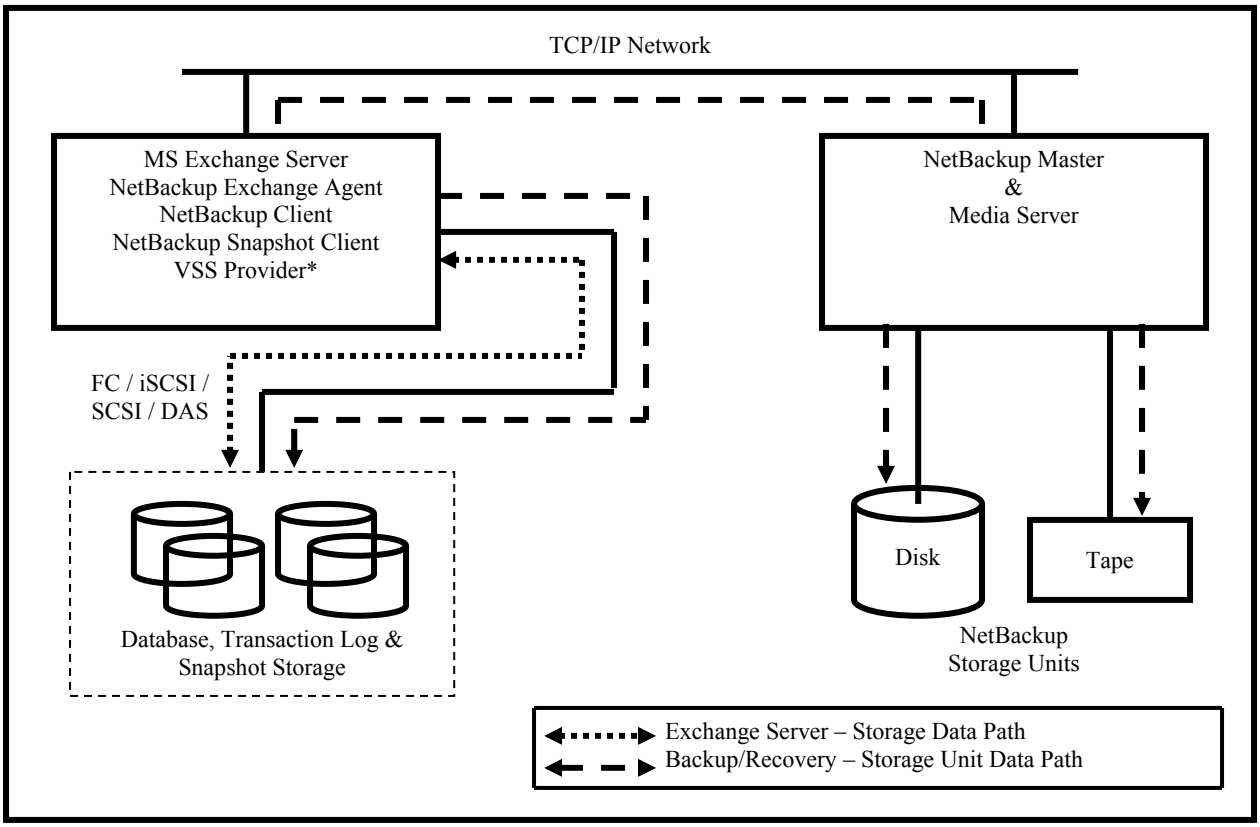
- Possible requirements for mailbox or granular mailbox recovery

- Possible requirements for duplication and/or offsite vaulting of backup media

Hardware for the "Better" solution includes NetBackup master and media server platforms. Both master and media server functions can be co-located on a single host, and can even be co-located on the Exchange server if desired. Also required is backup media. Disk, removable tape, and virtual tape media are all supported. Additionally, a VSS snapshot provider is required, which can be hardware or software based. Software based VSS providers are resident on the Exchange server platform, hardware VSS providers are resident within a disk array or disk enclosure.

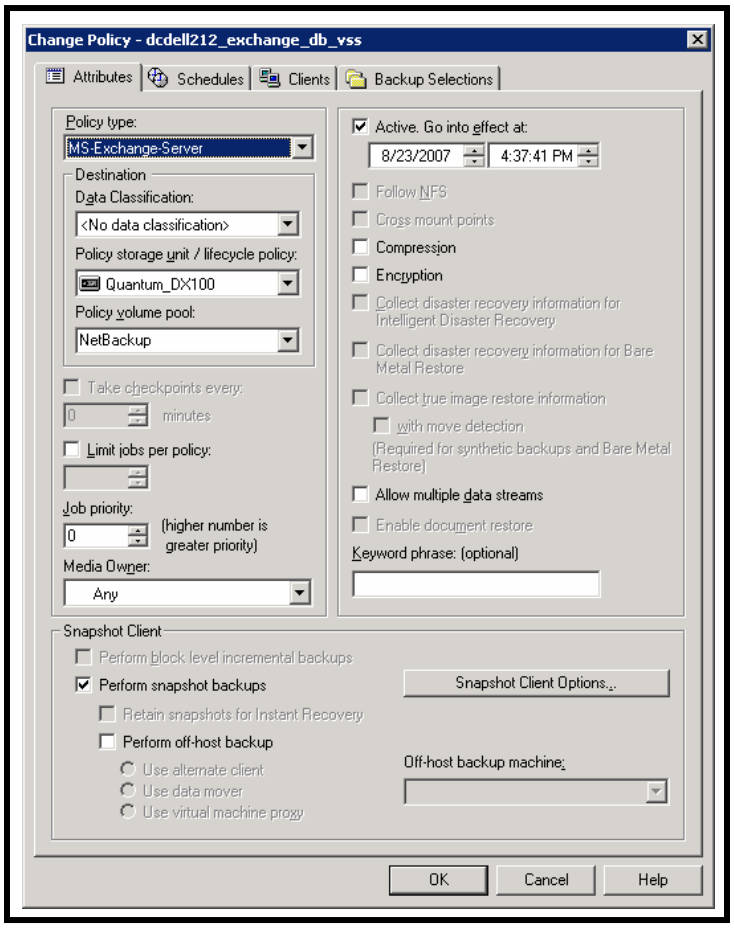
Software for the "Better" solution includes NetBackup server and NetBackup for Microsoft Exchange server software. A NetBackup Enterprise Client license (which includes the Snapshot Client feature) is also required in order to use VSS snapshots. Additional software licenses for tape or virtual tape libraries, enterprise disk foundation disk storage devices, or the NetBackup Vault option may also be required.

An example configuration for the "Better" solution:



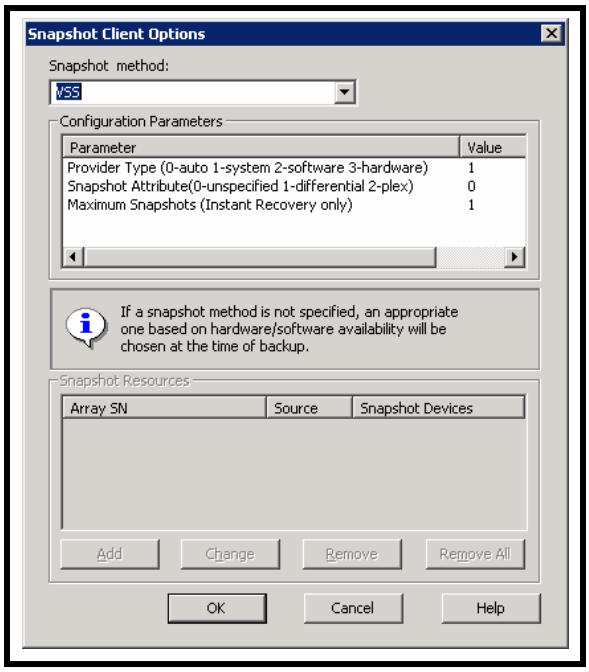
Graphic 4: "Better" Solution block diagram

The NetBackup policy for this configuration includes configuring the snapshot provider. The policy type is set to "MS-Exchange-Server", and a "Policy storage unit / lifecycle policy" is selected. Additionally, the Snapshot Client is configured by selecting the "Perform snapshot backups" checkbox:



Graphic 5: “Better” Solution NetBackup policy attributes

Clicking the “Snapshot Client Options” button opens an additional dialog window where snapshot specific parameters can be set:



Graphic 6: "Better" Solution snapshot client options

About the "Snapshot Client Options" window:

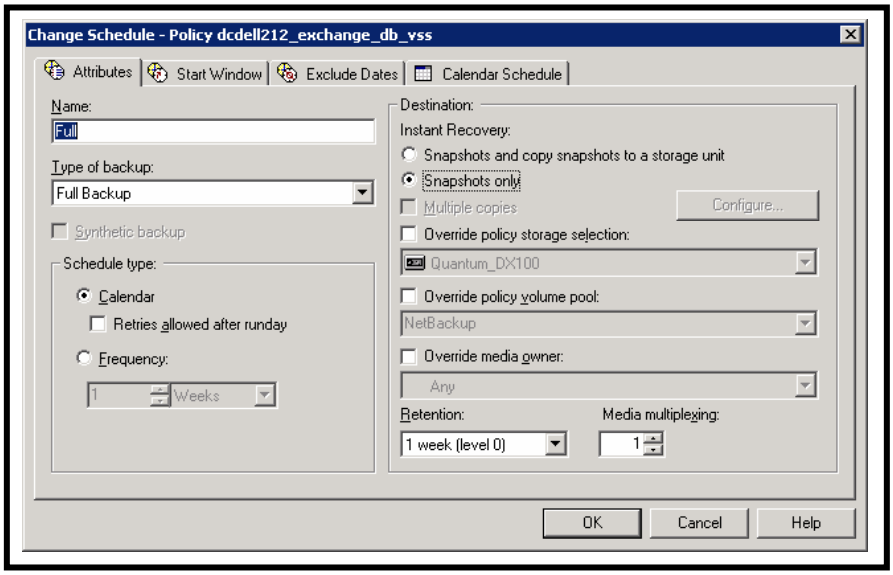
- The "Snapshot method" pull down menu should be set to equal "VSS"
- The "Configuration Parameters" section contains parameters and values that can be assigned to them.

The following table defines each parameter and is provided as reference:

VSS Configuration Parameters		
Parameter	**Value**	**Description**
Provider Type	0 – Auto	The VSS provider is automatically selected based on the providers available for the snapshot volumes
	1- System	The default Microsoft VSS provider is used
	2 – Software	The Veritas Storage Foundation for Windows VSS provider is used
	3 – Hardware	A hardware VSS provider is used
Snapshot Attribute	0 – Unspecified	The value of zero or "unspecified" indicates that this snapshot cannot be used for Instant Recovery.
	1 - Differential	The value of one or "differential" implies the use of a space optimized or copy-on-write type of snapshot. An example is the EMC CLARiiON SnapView snapshot method.
	2- Plex	The value of two, or "plex" implies the use of a mirrored type of snapshot. An example is the EMC CLARiiON SnapView clone method.
Maximum Snapshots (Instant Recovery only)	1 or more	This option defines the number of snapshots retained for instant recovery. When this threshold is reached the oldest snapshot is deleted and a new snapshot is taken. *Instant Recovery is a planned NetBackup 6.5.2 enhancement.

Table 3: Snapshot Client configuration parameters

With planned NetBackup 6.5.2 enhancements, the Snapshot Client will also facilitate configuring NetBackup policy schedules such that snapshots can be used in two ways. One method is to use snapshots and also copy the snapshot to a storage unit. The second method is to use snapshots only. It is possible to have multiple schedules in the same policy. This creates great flexibility in taking regular frequent snapshots, as well as taking snapshots and copying them to a storage unit at less frequent intervals:



Graphic 7: Schedule Instant Recovery snapshot options

3.3. Best Solution

The targeted Exchange environment for the "Best" solution consists of:

- A range of Exchange servers that can include highly utilized servers.

Exchange database backups will place virtually no additional processing load off these servers. Highly utilized Exchange servers will only be impacted during the VSS snapshot creation process.

- A desired recovery point objective that takes into consideration the frequency at which backups can be performed.

  * NetBackup 6.5.2 includes planned support for VSS snapshots with instant recovery. This function substantially improves recovery time. Optionally, Exchange VSS snapshots will be able to be retained on disk only. This function increases the opportunity to execute frequent snapshot backups to disk without the requirement of writing the snapshot data to secondary storage media. See Appendix II for additional VSS information.

- A need for centralized administration and reporting

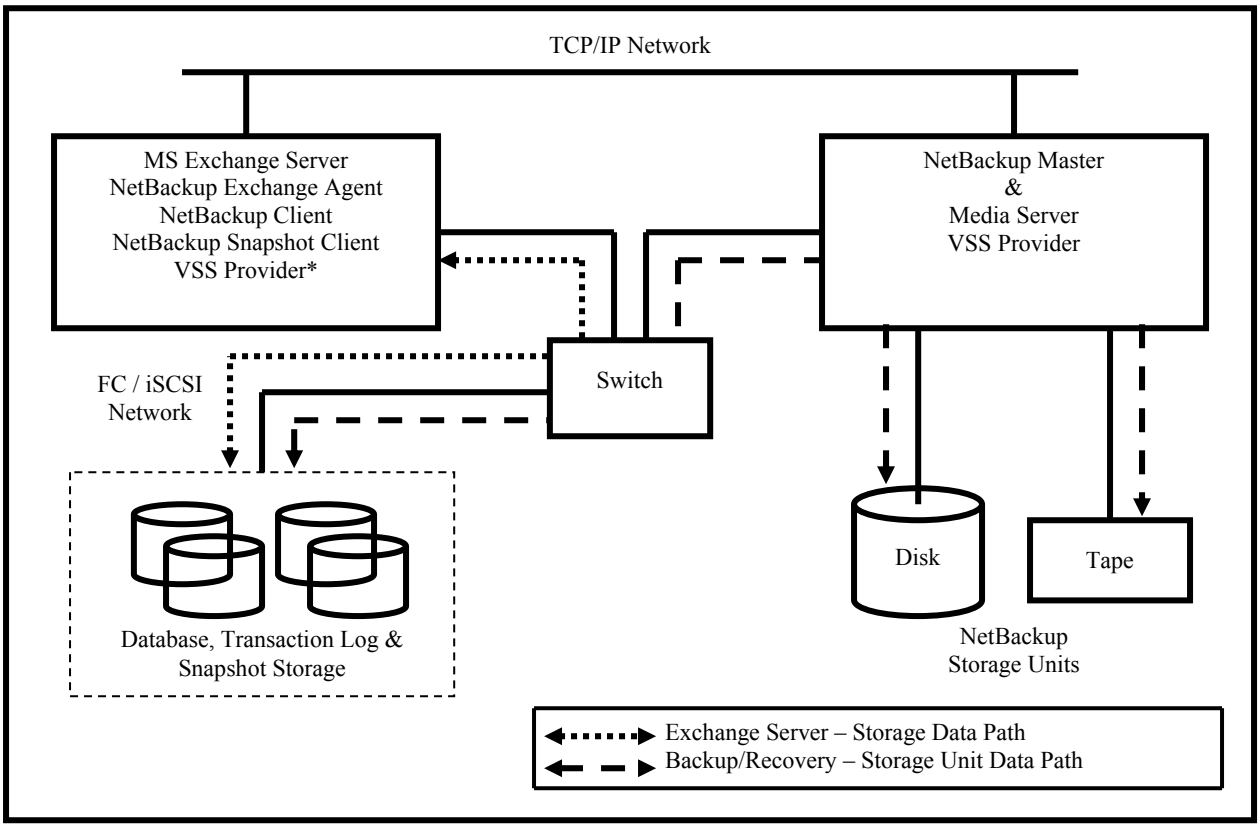
- Possible requirements for mailbox or granular mailbox recovery

- Possible requirements for duplication and/or offsite vaulting of backup media

Hardware for the “Best” solution includes NetBackup master and media server platforms. Both master and media server functions can be co-located on a single host, and can even be co-located on the Exchange server if desired. Also required is backup media. Disk, removable tape, and virtual tape media are all supported. A VSS snapshot provider is required, which can be hardware or software based. The VSS provider has to be accessible by both the Exchange server and the alternate client that will be used to copy the snapshot to a storage unit. This typically implies the use of disk that is SAN connected to both host platforms.

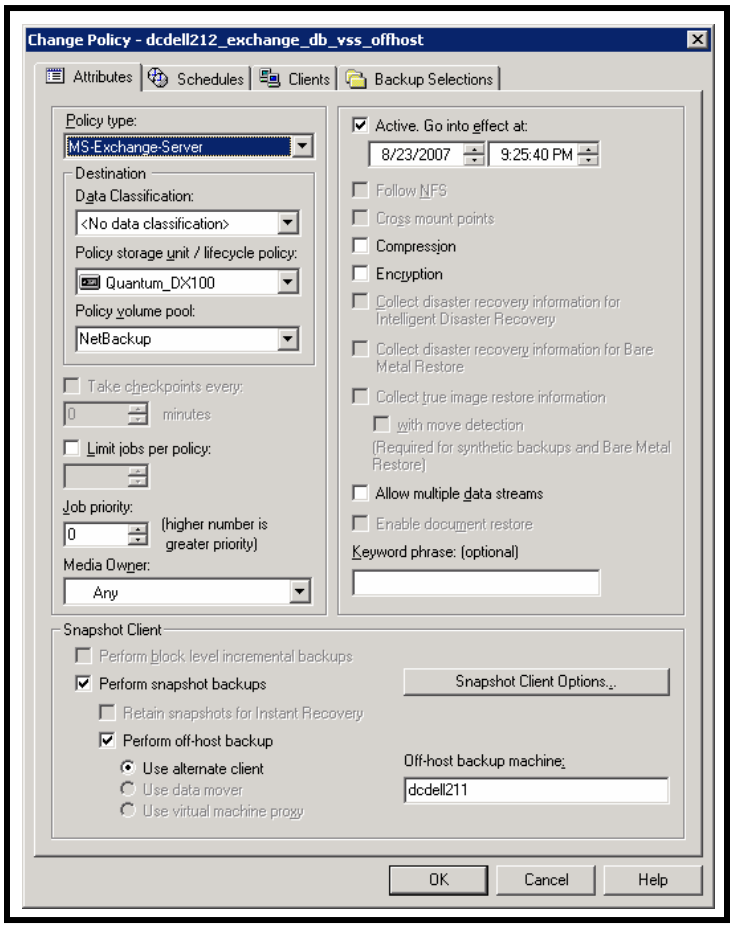
Software for the “Best” solution includes NetBackup server and NetBackup for Microsoft Exchange server software. A NetBackup Enterprise Client license (which includes the Snapshot Client feature) is also required in order to use VSS snapshots. Additional software licenses for tape or virtual tape libraries, enterprise disk foundation disk storage devices, or the NetBackup Vault option may also be required.

An example configuration for the “Best” solution:



Graphic 8: “Best” Solution block diagram

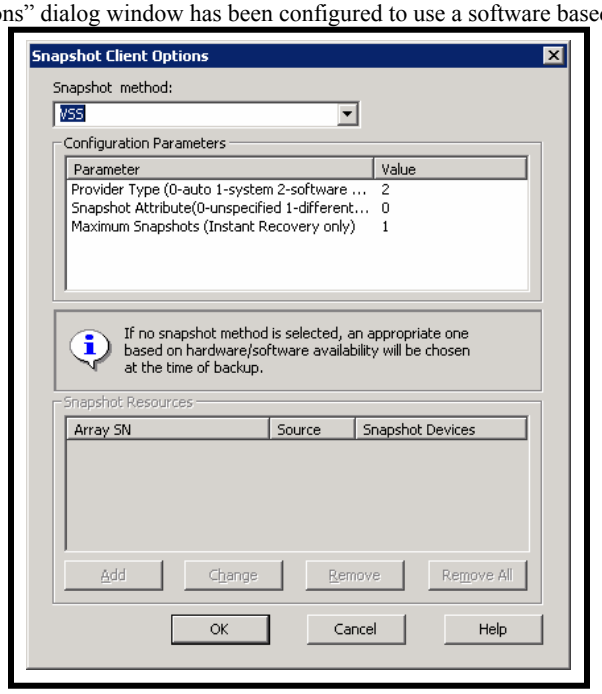
The NetBackup policy for this configuration includes configuring the snapshot mechanism as well as specifying off-host backup parameters. The policy type is set to “MS-Exchange-Server”, and a “Policy storage unit / lifecycle policy” is selected. Additionally, the Snapshot Client is configured:



Graphic 9: "Best" Solution NetBackup policy attributes

Note that the "Perform snapshot backups" and "Perform off-host backup" checkboxes have been selected. Also note that the "Use alternate client" radio button has been selected. Additionally, the "Off-host backup machine" field has been populated to reflect the name of the client that will be used to copy the snapshot to a storage unit.

The “Snapshot Client Options” dialog window has been configured to use a software based VSS provider:



Graphic 10: “Best” Solution snapshot client options

4. Additional Resources

A variety of additional resources are available at **http://www.symantec.com/enterprise/support/index.jsp** to assist in understanding NetBackup, NetBackup for Microsoft Exchange, and the NetBackup Snapshot Client:

- NetBackup Administrator’s Guides
- NetBackup for Microsoft Exchange Server Administrator’s Guide
- NetBackup Snapshot Client Administrator’s Guide
- Veritas NetBackup Database Agent Compatibility matrix
- Veritas NetBackup Snapshot Client OS Arrays and Database Compatibility matrix

In addition, a wide variety of material is available from Microsoft providing a vast array of information related to Exchange and VSS. The following is an example of available resources:

- Best Practices for Using Volume Shadow Copy Service with Exchange Server 2003

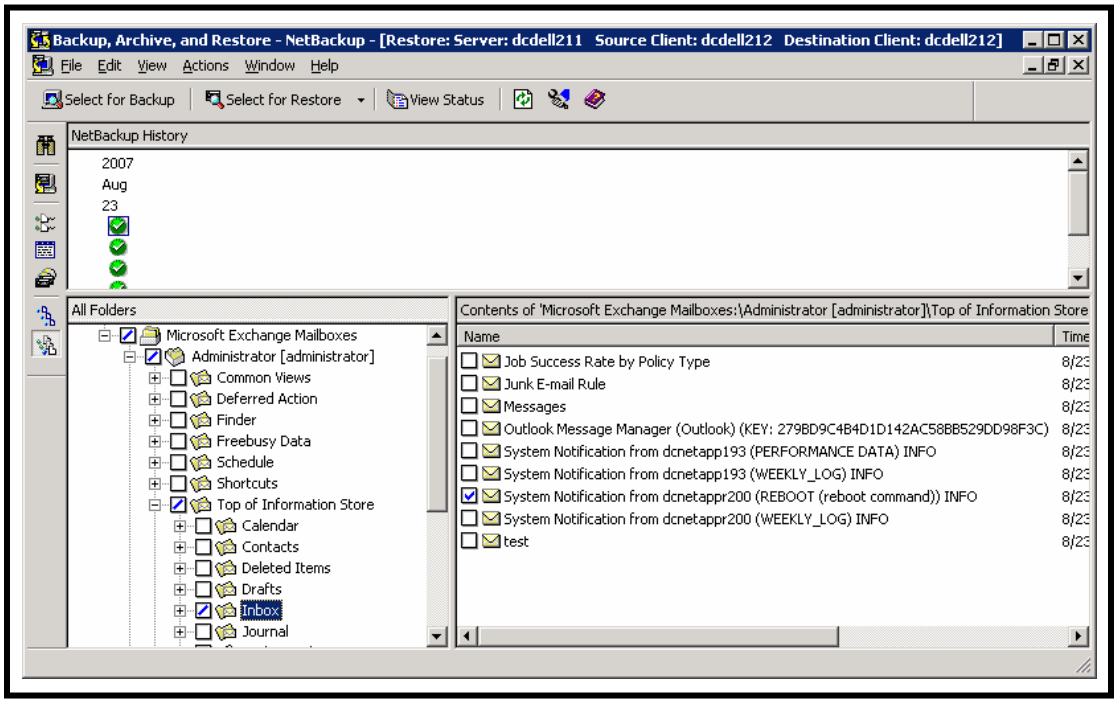
  http://technet.microsoft.com/en-us/library/aa996004.aspx

- Exchange 2007 System Requirements

  http://technet.microsoft.com/en-us/library/1e80857c-b870-4a6d-a0f4-ff7b3a7be037.aspx

5. Appendix I – Mailbox Backup and Recovery

Mailbox level backups facilitate recovery of individual mailboxes, or granular recovery of individual mailbox items. In the example shown, an individual message from the administrator's inbox has been selected for recovery:

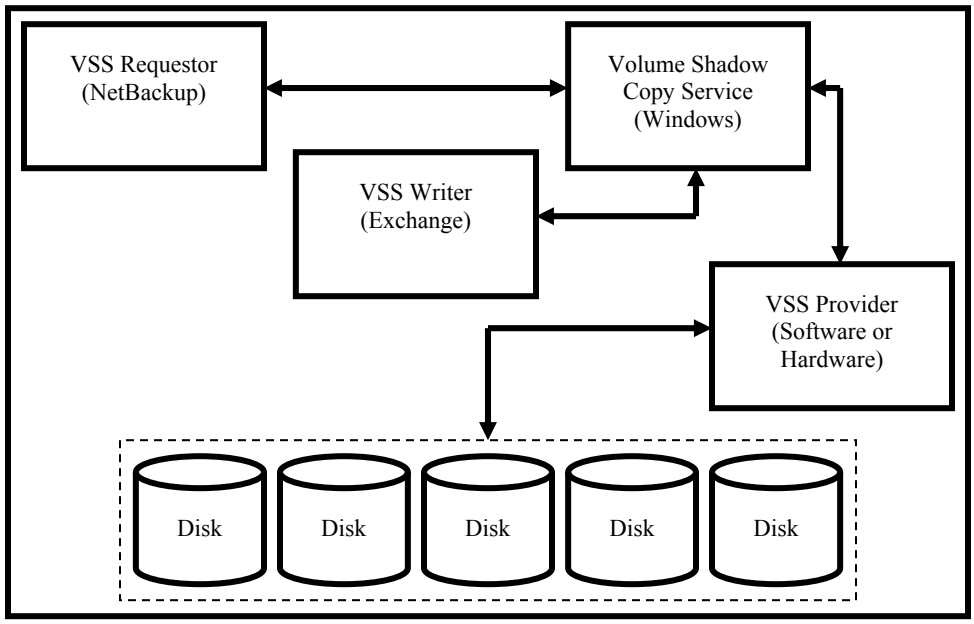


Graphic 11: Granular recovery from an Exchange mailbox

It is important to note that granular recovery of calendar, contact, draft, deleted items, journal, notes, sent items, or folders is also possible.

6. Appendix II – VSS Overview

VSS is a set of API's that effectively creates a foundation that allows backups to occur on online volumes. VSS components include requestors, writers, and providers. The example block diagram provided here puts these components in perspective:



Graphic 12: VSS Block diagram

In the case on an Exchange VSS enabled backup, NetBackup is the VSS requestor, the component that initiates the backup process. A VSS writer specific to and included with Exchange prepares databases for backup. The VSS provider creates snapshots as directed by the VSS requestor. A variety of VSS providers are available and supported for use with NetBackup and Exchange.

VSS providers fall into two general categories in that they are typically referred to as software based or hardware based. An example of a software based VSS provider would be Veritas Foundation Suite for Windows. Hardware based VSS providers typically include a disk array capable of providing a VSS compliant snapshot.

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