Technical Report

Best practices for Microsoft Exchange Server using NetApp SnapCenter

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Abstract

This best practice guide is intended for storage and application administrators so that they can successfully deploy Microsoft Exchange Server 2013, 2016, and 2019 on NetApp® storage using NetApp SnapCenter® technology for data protection.

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Executive summary

Microsoft Exchange Server is a widely used messaging platform for email communication, group scheduling, and calendaring for collaboration purposes. Failure at any level of storage, server, or networking could result in unacceptable operational and financial losses. Therefore, you must carefully plan data protection, disaster recovery, and high availability to enable quick recovery with little or no data loss. This guide delivers best practice guidance for using NetApp® SnapCenter® technology. SnapCenter tightly integrates with Microsoft Exchange Server to enable application-consistent, online, Volume Shadow Copy Service (VSS)-based backups and point-in-time (PiT) or up-to-the-minute restorations of Exchange databases.

Purpose and scope

The best practices and recommendations described in this guide enable database architects and storage administrators to plan a highly available and easy-to-manage Microsoft Exchange Server environment and meet stringent SLAs.

Audience

This document describes best practices and offers insight into design considerations for deploying Microsoft Exchange Server on NetApp storage systems running NetApp ONTAP® software. The goal of this guide is the effective and efficient deployment of storage and end-to-end data protection and retention planning. The scope of this guide is limited to technical design guidelines based on the design principles and NetApp recommendations for storage infrastructure in Microsoft Exchange Server deployments. End-to-end implementation is out of the scope of this report. This guide assumes that you understand Exchange storage architecture and administration and the data protection concepts of backup and restore. This guide also assumes that you have a working knowledge of the following topics:

- NetApp ONTAP software
- NetApp SnapDrive® for Windows
- NetApp SnapManager® for Microsoft Exchange Server
- NetApp SnapCenter

To determine configuration compatibility across the NetApp stack, see the NetApp Interoperability Matrix Tool (IMT) .

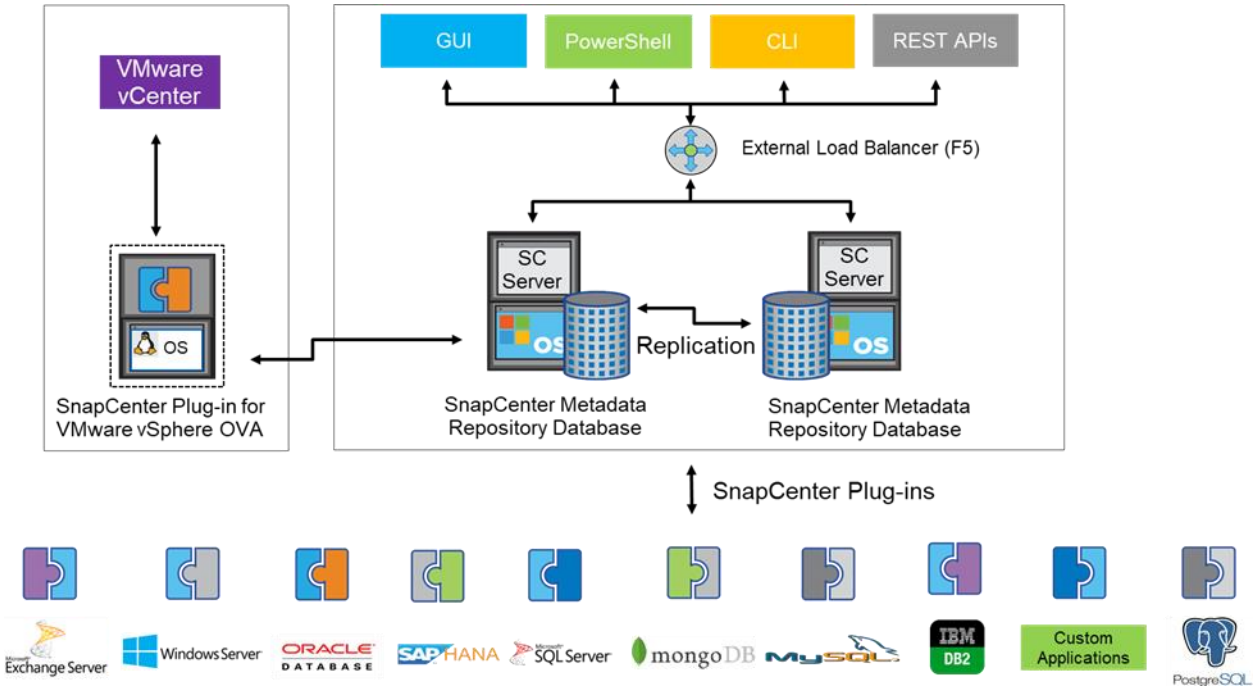
Prerequisites

The best practices for NetApp SnapCenter data protection presented in this document focus exclusively on Microsoft Exchange Server 2013, 2016, and 2019 on Microsoft Windows Server 2012 and later, with Exchange data stored on the latest NetApp storage operating system, ONTAP 9.x.

SnapCenter: The NetApp data protection solution for Microsoft Exchange Server

NetApp SnapCenter is a scalable storage platform that provides centralized control and oversight, while allowing users to manage application-specific backup and restore operations. SnapCenter also provides operational simplicity and lowers TCO by using policy-based management that enables backup automation at scale.

Figure 1) SnapCenter architecture.



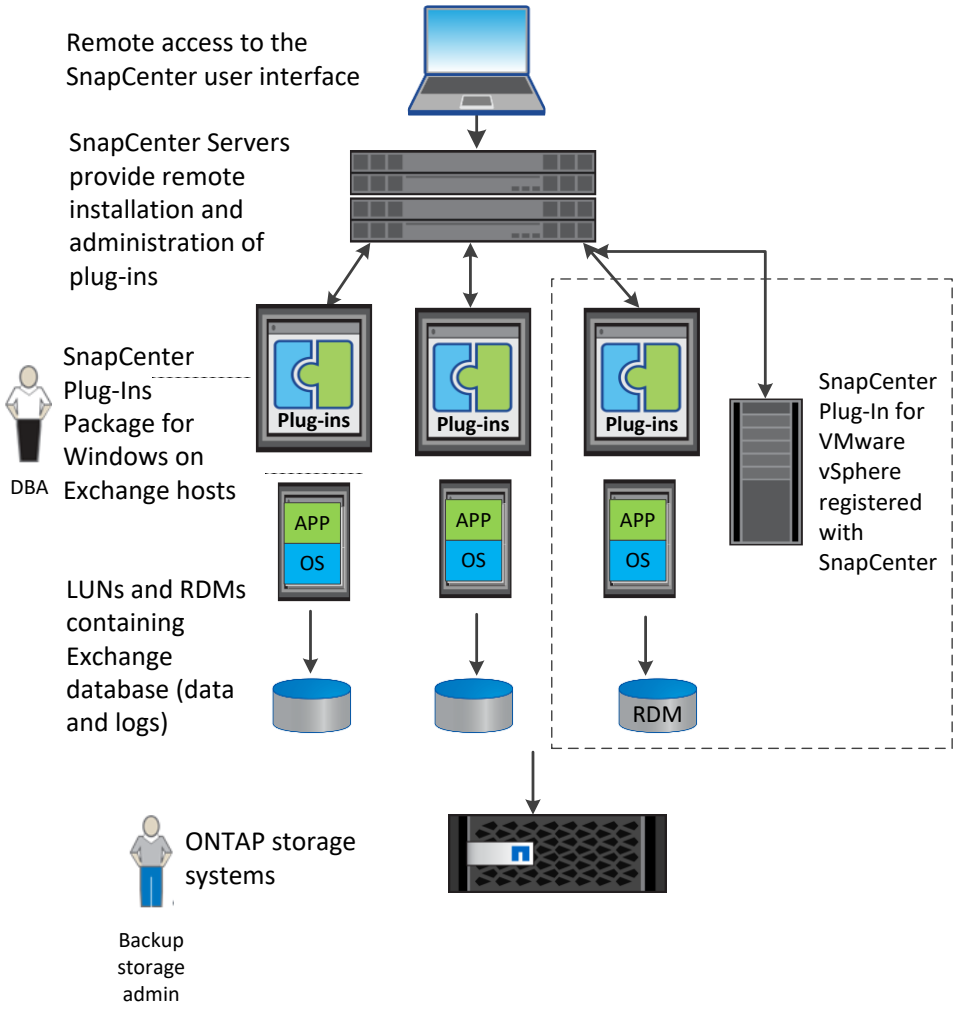
With SnapCenter, you can meet your data-protection SLAs by taking advantage of NetApp ONTAP data management capabilities, including the following technologies:

- **NetApp Snapshot™ technology.** Creates frequent application-consistent, space-efficient backups in minutes without affecting Microsoft Exchange. SnapCenter tightly integrates with the Microsoft Windows VSS framework for the creation of application-consistent Snapshot copies of Exchange databases, with no downtime for the production database.
- **NetApp SnapRestore® technology.** Enables rapid granular restores and application-consistent, PiT recovery. Therefore, it is not necessary to keep a lagged copy of the database availability group (DAG) database, saving additional storage.

SnapCenter components

SnapCenter consists of the SnapCenter Server, and SnapCenter Plug-Ins Package for Windows as follows:

Figure 2) SnapCenter components.



SnapCenter Server

The SnapCenter Server includes a web server, a centralized HTML5-based UI, PowerShell cmdlets, APIs, and the SnapCenter repository.

High availability can be set up by leveraging an external load balancer such as an F5 load balancer. High availability should be set up within same data center. If one SnapCenter host is ever unavailable for any reason, then the second SnapCenter Server can seamlessly take over with minimal impact on operations.

The SnapCenter platform is based on a multitiered architecture that includes a centralized management server (the SnapCenter Server) and a SnapCenter host agent (SMCore) that runs on the SnapCenter Server. HTTPS and the SnapCenter Plug-Ins Package for Windows are installed on the Exchange hosts to permit communication between the SnapCenter Server and the Exchange hosts.

SnapCenter enables centralized application resource management and easy data protection job execution through policy management, including scheduling and retention settings. SnapCenter provides unified reporting with the use of a dashboard, multiple reporting options, job monitoring, and log and event viewers. Information about SnapCenter operations is stored in the SnapCenter repository.

SnapCenter provides the following key capabilities:

- A scalable platform across various Exchange environments, both virtual and nonvirtual

- Role-based access control (RBAC)–supported security and centralized role delegation to improve productivity
- Application-consistent Snapshot copy management and restore
- Centralized scheduling and policy management for backup and restore operations
- Centralized reporting, monitoring, and dashboard views

Keep the following prerequisites in mind regarding the SnapCenter Server:

- Although the SnapCenter Server can function with a minimum of 8GB of RAM, NetApp recommends using 32GB of RAM.
- Make sure that the Windows OS on the host system on which SnapCenter Server is installed is up-to-date with no pending system restarts.
- The SnapCenter Server host should be part of a domain or workgroup and not a domain controller.
- Log in to the SnapCenter GUI with user credentials in the format of domain\user.
- Each storage virtual machine (SVM, previously called Vserver) supported by SnapCenter must have a unique name because SnapCenter does not support multiple SVMs with the same name on different clusters.
- Verify that a SnapManager Suite license or a SnapCenter Standard license is installed on the ONTAP storage system.
- Do not change the domain in which the SnapCenter Server is installed. Otherwise, the uninstall operation for SnapCenter Server fails.
- Do not rename the Exchange hosts protected by SnapCenter.
- SnapCenter does not currently support data protection for IPless DAGs in cross domains.
- Before you can perform data protection operations using SnapCenter, you must set up the following configurations:
  - Add a connection to the SVM in Storage Systems > Settings. This step gives the SnapCenter Server and the SnapCenter plug-ins access to ONTAP storage. This step also requires the configuration of the NetApp AutoSupport® and event management system (EMS) features.

Note: Make sure that host plug-in installation is not in progress when adding a storage system connection. The host cache might not be updated, and databases might produce the warnings “Not Available for Backup” or “Not on NetApp Storage” in SnapCenter.

  - To install the SnapCenter Plug-Ins Package for Windows, use Run As credentials with the Active Directory account that is a domain administrator. You can also use a domain user account that has local administrative privileges on the remote Exchange hosts. For an Exchange DAG, this domain user must have administrative privileges on all the nodes in the cluster. Run As credentials allow you to perform tasks such as adding hosts, installing plug-in packages, and scheduling data protection jobs.

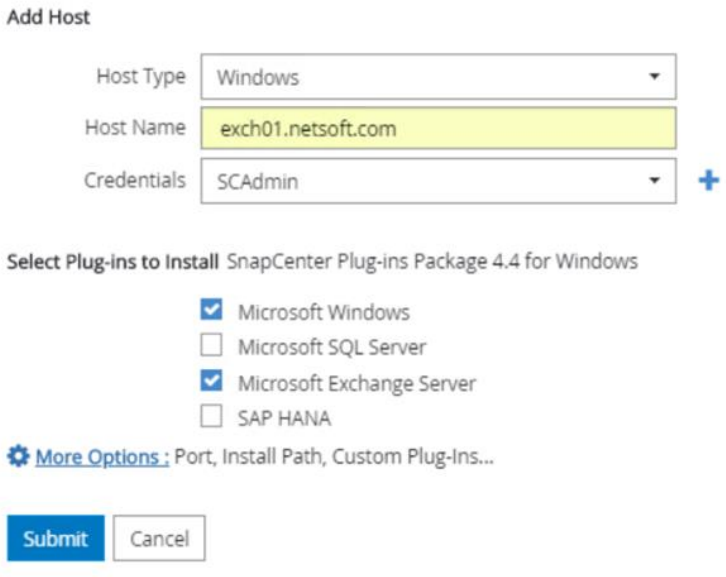
Best practices

- Add the SnapCenter URL to the trusted sites in Internet Explorer (IE), or disable IE enhanced security.
- For security reasons, do not allow your browser to save your SnapCenter password.
- Make sure that you have DNS configured to correctly resolve the SVM name to the SVM management LIF IP address.
- Make sure that you log out of SnapCenter either by clicking Sign Out or by shutting down the web browser to end your connection with SnapCenter.

SnapCenter Plug-Ins Package for Windows

Use the SnapCenter Add Host wizard to install the SnapCenter Plug-Ins Package for Windows on the remote stand-alone Exchange host or all the nodes in the DAG. You must be assigned to a role that has plug-in install and uninstall permissions, such as the SnapCenter administrator.

Figure 3) Adding SnapCenter Plug-Ins Package for Windows and Exchange to Exchange Server.



SnapCenter Plug-In for Microsoft Exchange Server

The NetApp SnapCenter Plug-in for Microsoft Exchange Server is a host-side component of the NetApp storage solution that offers application-aware online backup management for Microsoft Exchange Server databases. With the plug-in installed on your Exchange Server host, SnapCenter automates Microsoft Exchange Server database backup and restore operations. Note the following key features of the plug-in:

- Application-consistent backup of Exchange databases and transaction logs hosted on NetApp LUNs
- Support for the full and log, full, and log and copy backup types
- Retention of full and log backup copies
- Updates to NetApp SnapVault® and NetApp SnapMirror® relationships to provide a fast, centralized, and cost-effective disk-to-disk backup by replicating Snapshot copies to the secondary storage system
- Up-to-the-minute and PiT restore of Exchange databases that use transaction logs
- Reseeding of passive replicas
- Granular recovery of individual mailbox and public folder items with Single Mailbox Recovery (SMBR)

SnapCenter Plug-In for Microsoft Windows

The NetApp SnapCenter Plug-In for Microsoft Windows (SCW) is a host-side component that integrates with NetApp Snapshot technology. It manages disks in both physical and virtual environments, making LUNs available as local disks on Exchange hosts. SCW provisions disks, enables Snapshot copy consistency and space reclamation, initiates iSCSI sessions, manages initiator groups (igroups), and performs backup and restore operations on Exchange hosts. Note the following key features of SCW:

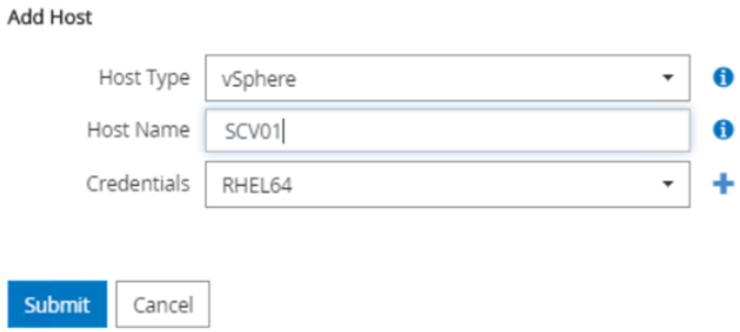
- Creates space-efficient backups of Exchange environments
- Runs multiple backups at the same time across multiple servers

- Provides PowerShell cmdlets for scripting of backup and restore operations
- Enables enhanced online storage configuration, LUN resizing, and streamlined management

SnapCenter Plug-In for VMware vSphere

SnapCenter Plug-in for VMware is another SnapCenter Virtualization plug-in that manages virtual servers running on VMware and helps to discover host file systems, resources on Virtual Machine Disk (VMDK), and raw device mappings (RDMs.) SnapCenter Plugin for VMware is a separate installation with an Open Virtualization Appliance (OVA) based setup on Linux-based Debian OS. SnapCenter interacts with the SnapCenter Plug-In for VMware vSphere to support backup and restoration of Exchange databases residing only on RDMs. To use SnapCenter Plug-in for VMware, you must register the VMware vSphere server in the SnapCenter Add Host wizard, as shown in Figure 4.

Figure 4) Register VMware vSphere in SnapCenter.



Best practices

- To enable data protection for Microsoft Exchange, make sure that SnapManager Suite or a SnapCenter Standard controller-based license is available on the ONTAP storage system through a Premium or Flash bundle or a data protection bundle.
- Make sure that the SnapCenter Plug-Ins Package for Windows is installed on an Exchange server that has at least 1GB of RAM, although 8GB is recommended. Also, see the Exchange system requirements.
- To protect the Exchange databases, verify that the SnapCenter Plug-Ins Package for Windows is installed on a stand-alone Exchange Server or members of the DAG.
- The SnapCenter Plug-Ins Package for Windows and the SnapCenter Plug-In for Microsoft Exchange Server must be the same version, because SnapCenter Plug-in for Microsoft Exchange Server uses the VSS Hardware Provider in SCW.

Role-based access control in SnapCenter

SnapCenter uses RBAC to delegate functionality to application and database owners while retaining oversight and control by a central storage infrastructure administrator. This level of control and security frees storage administrators from performing tedious tasks that application and database owners can do for themselves. At the same time, it protects the overall infrastructure from bullying applications and from accidental infrastructure abuse by users. SnapCenter provides application-specific or database-specific workflows tailored to meet the needs of application, database, and virtualization infrastructure administrators.

What you see depends upon your settings in the SnapCenter RBAC. You can assign your Exchange database administrators (DBAs) to see only hosts, storage systems, and policies related to Exchange,

whereas your SQL DBAs can see only assets and information related to SQL Server. Configuring RBAC for users is a two-step process in the settings. This process enables users to perform the actions for which they have permissions on the assets that are assigned to them. You can create and modify roles and add resource access to users at any time.

- **Roles.** SnapCenter has predefined roles with specific permissions assigned to the role to which you can add users or groups. You also can create roles.
- **User access.** Assign the user access to SnapCenter assets, such as hosts, policy, and resource groups.

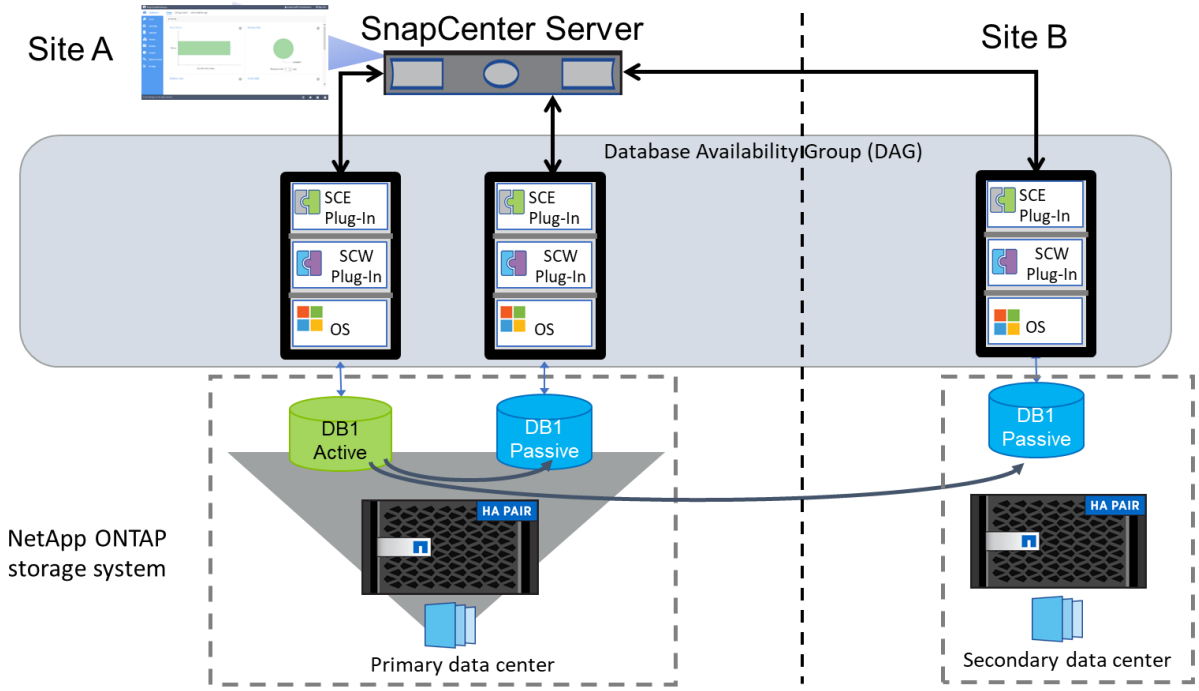
Best practices

- RBAC users should have plug-in install and uninstall permission, such as the SnapCenter administrator role, so that they can deploy the plug-in successfully on Exchange hosts.
- When logged in as an RBAC user, click Refresh Resources in the Resources window so that Exchange resources display correctly.

SnapCenter Plug-In for Microsoft Exchange Server architecture

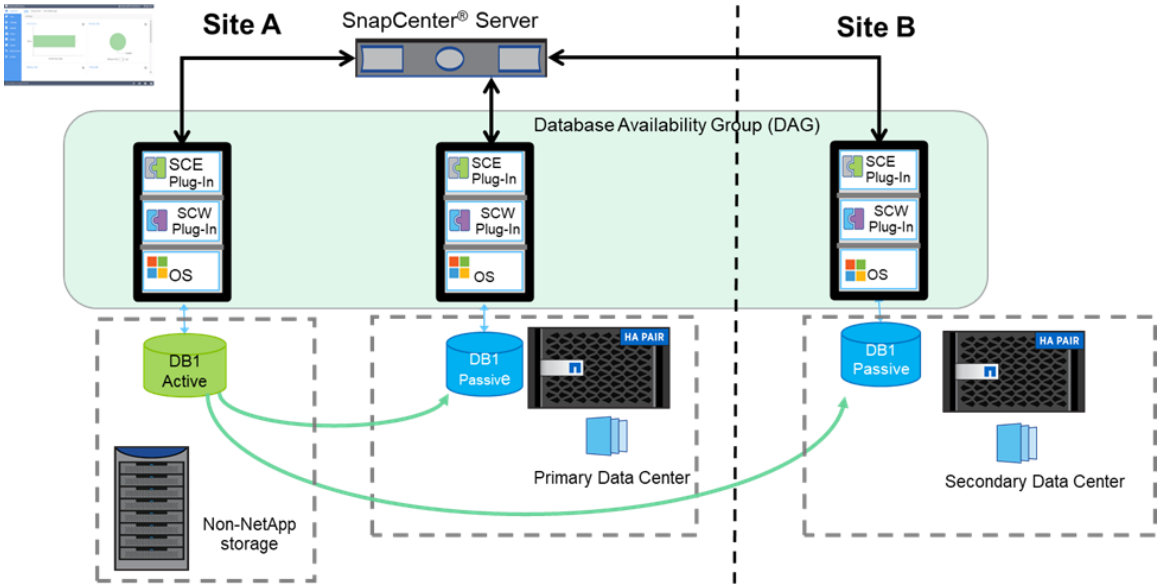
SnapCenter coordinates interactions among the SnapCenter Server, Exchange hosts, and ONTAP systems to create and manage application-consistent Snapshot copies of Exchange databases. SnapCenter uses the VSS feature of Windows Server for PiT or up-to-the-minute restore.

Figure 5) SnapCenter data protection of a Microsoft Exchange Database availability group.



SnapCenter supports a hybrid storage environment. If one of the nodes has all the active databases hosted on non-NetApp storage, then SnapCenter can still discover and back up the passive databases running on NetApp storage. SnapCenter cannot back up databases running on non-NetApp storage.

Figure 6) SnapCenter data protection of a Microsoft Exchange database availability group setup across hybrid storage.



To understand how to back up Exchange databases running on DAG in hybrid storage environment, see the Backup workflow.

SnapCenter Plug-In for Microsoft Exchange Server installation and upgrade considerations

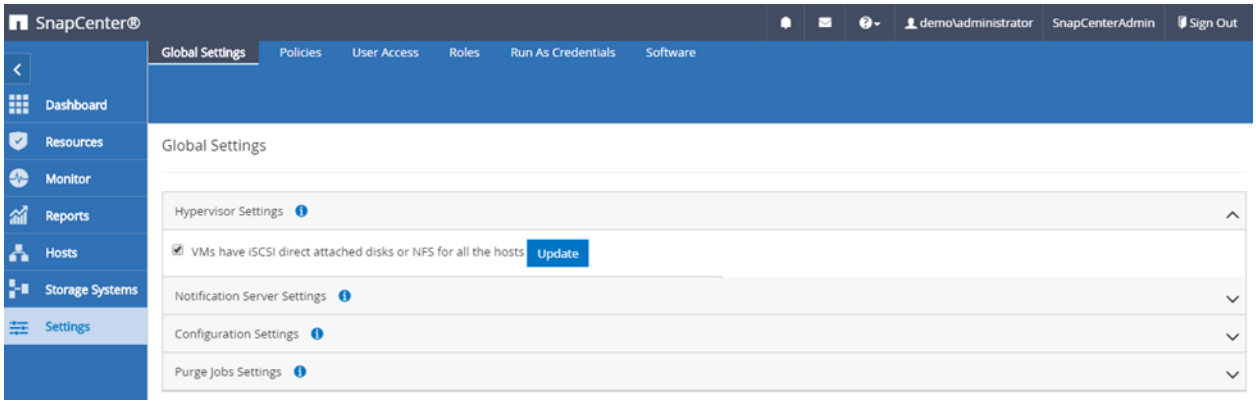
An upgrade or migration from earlier versions of NetApp SnapManager for Microsoft Exchange Server to SnapCenter is not available. Although they can coexist in a side-by-side installation, you cannot use SnapCenter to restore databases from Snapshot copies created by NetApp SnapManager for Microsoft Exchange Server.

Before upgrading to SnapCenter, you must complete the following steps:

- Back up the operating system installation on Exchange Server, including all the server system-state information—the registry, the boot files, and the COM+ class registry.
- Back up the data on local drives on Exchange Server.
- Back up the boot and system drives.
- Use your backup utility to create and maintain a current emergency repair disk.

Note: In VMware environments, you must update your hypervisor settings so that SnapCenter no longer displays a Configure Hypervisor message for overall status on the Add Host page. This message occurs when your Exchange Server environment is using an iSCSI initiator.

Figure 7) SnapCenter hypervisor settings.



Best Practices

- Before you install the SnapCenter Plug-Ins Package for Windows, make sure that all Exchange host system prerequisites are met, and the Exchange host is restarted so that the Validate in Preinstall function checks the prerequisites correctly.
- If you are using a DAG, select Add All Hosts in the cluster or DAG.
- Refer to the NetApp Interoperability Matrix Tool (IMT) for version compatibility between SnapCenter Server and any plug-ins.
- When SnapCenter Plug-in for Microsoft Exchange Server coexists with NetApp SnapManager for Microsoft Exchange Server, SnapDrive for Windows and SCW both contain VSS Hardware Providers that cannot be used simultaneously, because they both claim disks on the Exchange server. This conflict can cause issues in data protection. Verify that Data ONTAP VSS Hardware Provider for SnapCenter (version 7.0.0.5561) is registered.
- For Exchange databases in a VMware environment, verify that SnapCenter Plugin for VMware is also upgraded. After a successful upgrade, clear the browser cache before running any plug-in for VMware vSphere operations, because some operations might hang.

SnapCenter Plug-In uninstall considerations

If you no longer need a particular SnapCenter plug-in, you can uninstall it using the SnapCenter interface. Uninstalling the SnapCenter Plug-Ins Package for Windows from the Exchange host automatically removes the resources or resource groups, policies, and backups associated with the resource groups. If you uninstall the plug-ins individually, uninstalling the SnapCenter Plug-in for Microsoft Exchange Server plug-in automatically uninstalls the SCW plug-in as well.

Note: Before you reinstall the plug-in on a host, wait 5 minutes so that the SnapCenter GUI refreshes the status of the managed host.

Best practices

NetApp recommends uninstalling SnapCenter plug-ins from the SnapCenter GUI. Otherwise, the data associated with the Exchange host is not deleted.

Storage layout planning

Planning and designing the storage layout is the most critical step for Exchange environments. This step has a direct impact on the availability of Microsoft Exchange and reduces the administrative overhead associated with managing the volumes hosting Exchange data.

Aggregate

Creating separate aggregates for Exchange database and transaction log volumes can meet the performance requirements while providing the data availability required by typical SLAs.

Consider the following issues:

- Place Microsoft Exchange Server workloads on an individual aggregate to allow isolation from other I/O-intensive applications and workloads.
- For optimal storage performance, NetApp recommends thin provisioning and having at least 10% free space available in an aggregate hosting Exchange data.
- NetApp strongly recommends setting the autodelete trigger to volume.
- Place flexible volumes for active and passive copies of each database in a DAG onto separate aggregates. If a single aggregate is lost, only the database copy on that aggregate is affected.

Volumes

The number of volumes you provision depends on your backup strategy. If your recovery time objective (RTO) is very small, it is best to place each database on its own database and transaction log volumes. In high-availability architectures, there are two possibilities for volume layout:

- A single database per volume (database and corresponding log files are placed on the same volume)
- Multiple databases per volume

Also, the restore mechanism depends on the volume layout containing the Exchange databases.

Note: NetApp SnapCenter does not support active and passive replicas on the same volume.

Best practices

- Isolate Windows Server files and Exchange application files onto separate volumes to improve performance.
- NetApp recommends separating database (random I/O) and transaction logs (sequential I/O) into separate volumes or physical disks. Doing so maximizes hard disk I/O performance and increases fault tolerance. If the disk that contains the database files is damaged, you can use the latest backup and all the transaction log files. The backup can be used to recover all of the Exchange data.
- Move write-intensive non-Exchange workloads onto volumes separate from those containing Exchange databases.
- Design identical storage in terms of capacity and performance for active and passive copies of the mailboxes.
- Isolate each DAG replica onto separate volumes on separate disks to avoid a single point of failure.
- For FAS systems, NetApp recommends enabling read reallocation (`read_realloc`) on NetApp FlexVol® volumes hosting Exchange databases. Doing so improves read performance for Exchange workloads with a mixture of large sequential reads and random writes.
- Do not create mount points for LUNs that hold an Exchange database or create any files or folders in the root folder where the mount points are created. The restore operation removes any mount points that were created after the backup, disrupting access to the data on the mounted volumes referenced by these volume mount points.
- Do not place databases or transaction logs on a mount point root volume.

LUNs

Optimizing disk I/O is one of the largest performance-enhancing considerations for Microsoft Exchange. Database LUNs can be optimized for random reads and writes, and transaction log LUNs can be

optimized for sequential writes because logs are always written to and read from sequentially. Also, the number of LUNs you provision depends on your SLA requirements and recoverability defined by the recovery point objective (RPO) and the RTO.

One LUN per database

Both the database (.edb) and its corresponding log files (.log) are placed on the same LUN. Although this configuration simplifies storage administration because there are fewer LUNs to manage, this configuration creates a single point of failure. Therefore, the mailbox database must be configured as a part of a DAG with two or more copies to make sure that you can recover your database if a failure occurs.

Two LUNs per database

The mailbox database (.edb) and transaction log (.log) are placed on separate LUNs (each on a separate volume) to provide the best RPO and RTO. Although this approach increases the total number of LUNs required, volume mount points can be used because there are a finite number of drive letters available. NetApp recommends limiting the number of log streams per LUN to between 5 and 10.

Best practices

- Provision the active and passive LUNs so that they are identical in path, capacity, and performance.
- In a DAG, each database path must be the same on every DAG node that has a copy of that database. Therefore, use volume mount points when creating LUNs.
- Use larger databases. Microsoft supports databases up to 16TB in size, with a best practice size of 2TB.

Capacity planning

A properly sized Exchange environment meets both Microsoft requirements for Exchange storage and any requirements indicated in customer SLAs. For an environment to be properly sized, information from the customer environment is collected and tools are used to convert that information into a physical storage recommendation.

When planning an Exchange environment for a customer, use the Exchange Server 2019 Capacity Calculator:

Best practice

Consult a local NetApp Exchange expert or your NetApp partner to help size Exchange Server accurately.

Data protection

SnapCenter enables data protection for your Exchange environments, and you must invest significant time for planning so that you understand how data is protected according to your organization's needs.

Backup

It is important to understand business drivers like the SLA, RTO, and RPO before you determine your backup strategy. The RTO indicates how long you can afford to go without access to Exchange if an outage occurs, whereas the RPO is a measure of how much data you can afford to lose.

Planning the backup strategy for Exchange databases can minimize the chances of losing data if a restore operation is necessary while still controlling the resources needed to create and maintain the backups.

Use the following points to guide your backup strategy:

- Determine the number of Exchange Servers, DAGs, databases, the size of the database, network links, and so on.
- Understand SLAs, RPOs, and RTOs.
- Decide the type of backup you require.
- Determine when you should back up your databases.
- Decide how many backup jobs you require.
- Decide how to name your backups.
- Determine how long you want to retain backup copies on the source and destination storage systems.
- Determine how long you want to retain transaction log backups on the source and destination storage systems.

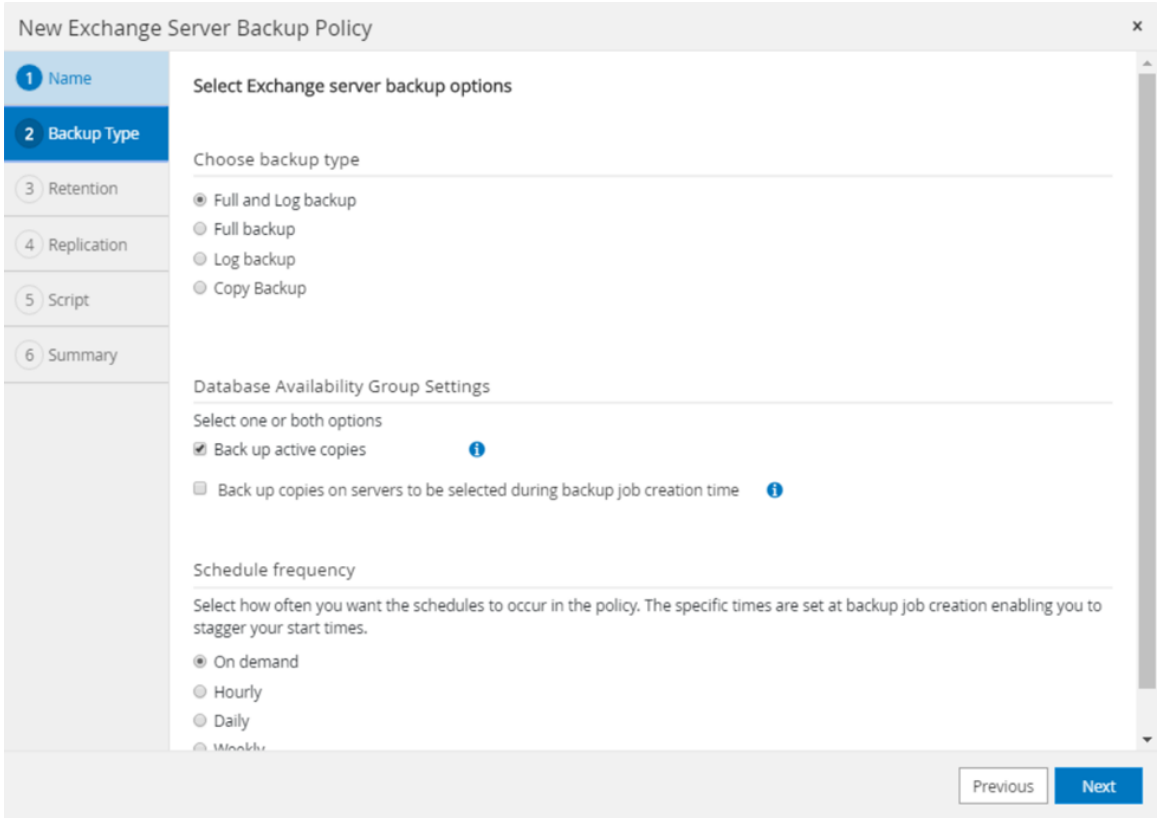
SnapCenter introduces portable backup of Microsoft Exchange resources to replace the NetApp SnapManager for Microsoft Exchange Server gapless backup feature. For this feature, the backup of a mailbox database can be offloaded to one or more replica copies instead of backing up all replicas (active and passive). This portable backup of the replica copy can be used to perform PiT or up-to-the-minute restore of the active copy on any failed DAG node in the same organization. This mechanism helps conserve storage space and reduces the backup Snapshot management overhead. SnapCenter backups provide a recovery mechanism in the rare event of systemwide, catastrophic logical corruption or administrative error, so you don’t need to keep a lagged copy in the DAG.

Note the following:

- A backup of a DAG database from a physical server through iSCSI cannot be used to restore a VMware virtual machine with RDM disks and conversely.
- SnapCenter data protection of Exchange databases through the Resilient File System (ReFS) is not supported.
- SnapCenter data protection of an Exchange database on Bitlocker encryption-enabled drives is currently not supported.

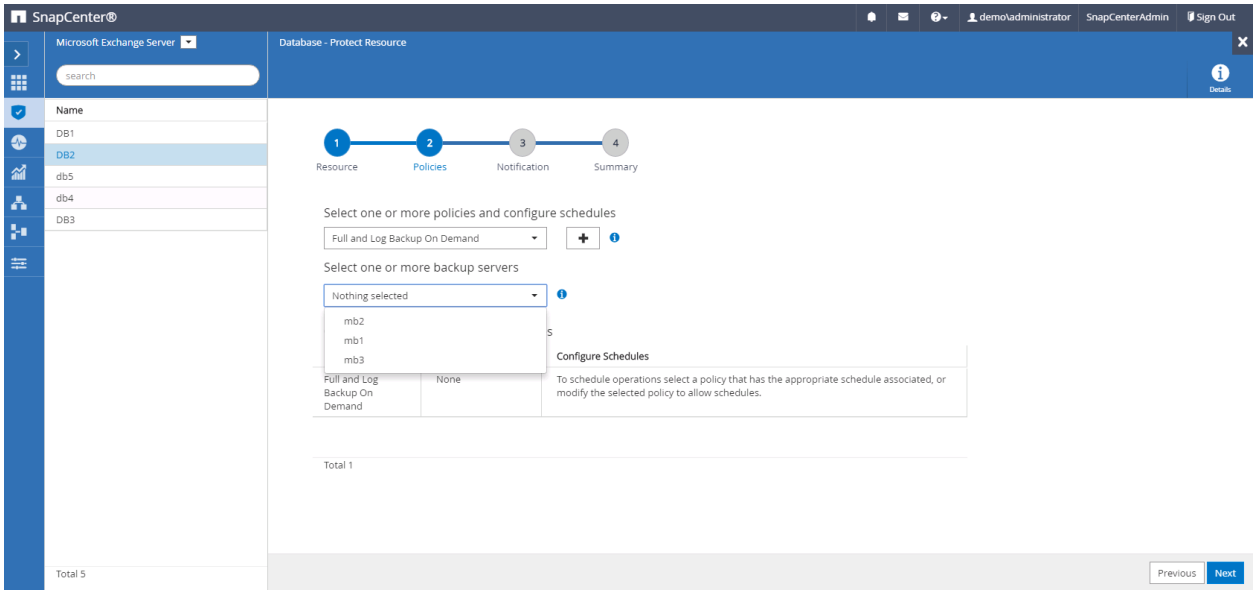
In the DAG settings of a new Exchange Server backup policy, you can choose either to back up active copies or to back up copies on servers that you’ll select when you create a backup job.

Figure 8) Option to select back up active copies or to backup copies on the server.



If you select the Back Up Copies on Servers to Be Selected During Backup Job Creation Time option, you can select the server on which the backup should run.

Figure 9) Option to select Exchange Servers for backup.



SnapCenter offers a copy backup feature, which backs up all selected databases and their logs without log truncation.

Note: Copy backups provide an image of data for use in testing and problem diagnosis or for seeding a replica. They are not intended for data recovery.

In previous versions of NetApp SnapManager for Microsoft Exchange Server, the latest Snapshot copy ended with `_recent`, which made it easy to write scripts to locate the latest Snapshot copies and move them to tape if necessary. To get the latest backup in SnapCenter, use the `Get-SmBackup` cmdlet as shown in Figure 10.

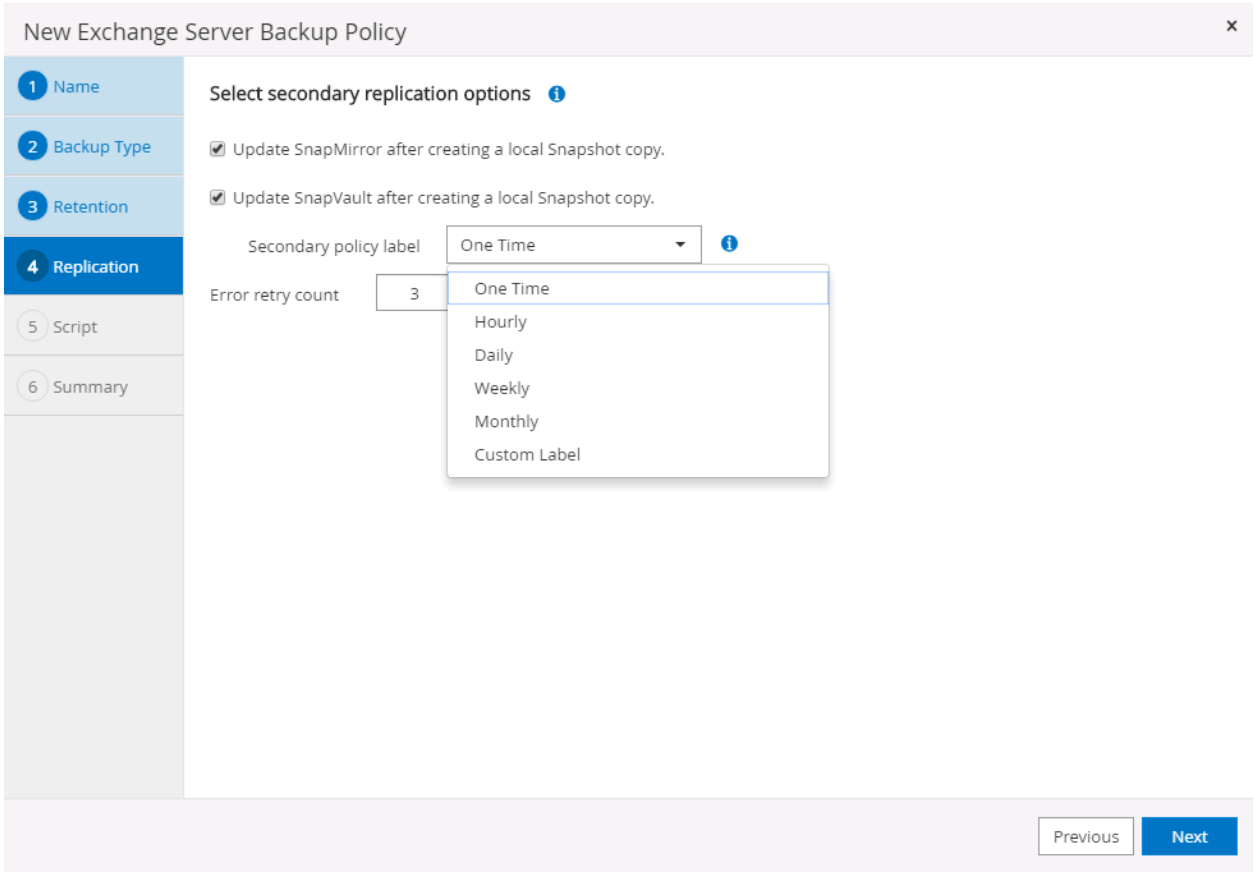
Figure 10) Get-SmBackup cmdlet to view backup details.

```
PS C:\Users\Administrator.DEMO> Get-SmResources -HostName dag1.demo.netapp.com

cmdlet Get-SmResources at command pipeline position 1
Supply values for the following parameters:
(Type !? for Help.)
PluginCode: sce

Completed Discovering Resouces: Job Id [297]


DBName          : DB3
ExchangeServer  : MB3.demo.netapp.com
DAGName         : DAG1
DBId            : MB3.demo.netapp.com\DB3
Protected       :
ReplicaServers  : MB1,MB2

DBName          : db4
ExchangeServer  : MB2.demo.netapp.com
DAGName         : DAG1
DBId            : mb2.demo.netapp.com\db4
Protected       :
ReplicaServers  : MB1,MB3

DBName          : db5
ExchangeServer  : MB2.demo.netapp.com
DAGName         : DAG1
DBId            : mb2.demo.netapp.com\db5
Protected       :
ReplicaServers  : MB3,MB1

DBName          : DB1
ExchangeServer  : MB2.demo.netapp.com
DAGName         : DAG1
DBId            : mb2.demo.netapp.com\DB1
Protected       :
ReplicaServers  : MB1,MB3

DBName          : DB2
ExchangeServer  : MB2.demo.netapp.com
DAGName         : DAG1
DBId            : mb2.demo.netapp.com\DB2
Protected       :
ReplicaServers  : MB3,MB1


PS C:\Users\Administrator.DEMO> Get-SmBackup -AppObjectName DB1

BackupId                BackupName                  BackupTime                BackupType
--------                ----------                  ----------                ----------
1                       SCE_Resource Group for Exc... 2/22/2018 11:01:32 PM   Full Backup
228                     SCE_Resource Group for Exc... 3/4/2018 9:56:18 AM     Full Backup
229                     SCE_Resource Group for Exc... 3/4/2018 10:56:19 AM    Full Backup
230                     SCE_Resource Group for Exc... 3/4/2018 11:56:18 AM    Full Backup
231                     SCE_Resource Group for Exc... 3/4/2018 12:56:20 PM    Full Backup
232                     SCE_Resource Group for Exc... 3/4/2018 1:56:20 PM     Full Backup
233                     SCE_Resource Group for Exc... 3/4/2018 2:56:27 PM     Full Backup
234                     SCE_Resource Group for Exc... 3/4/2018 3:56:43 PM     Full Backup


PS C:\Users\Administrator.DEMO> Get-SmBackup -AppObjectName DB1 | select -Last 1

BackupId                BackupName                  BackupTime                BackupType
--------                ----------                  ----------                ----------
234                     SCE_Resource Group for Exc... 3/4/2018 3:56:43 PM     Full Backup
```

SnapCenter supports the replication of backup Snapshot copies to a secondary storage system by using NetApp SnapMirror and NetApp SnapVault. This process can be defined in the Exchange Server backup policy.

Note: Cascade relationships are not supported.

Figure 11) Replication option from the SnapCenter Exchange Backup Policy wizard.



Best practices

- Verify that Microsoft VSS and VSS Writer are enabled on the Exchange Server so that you can protect the Exchange environments by using SnapCenter.
- Back up Exchange data regularly depending on the backup strategy that best meets your recovery objectives. This approach reduces the amount of space required to restore your Exchange databases, because full backups delete the transaction log files up to the time that you perform the backup. With this strategy, you do not have to restore more than one day's worth of log files.
- Verify that all copies in the DAG are in a healthy state.
- Keep the active and passive databases on separate volumes so that the SnapCenter backup does not fail, indicating that a Snapshot copy with a name already exists on the layout.
- Verify that circular logging is disabled for each database being protected by SnapCenter so that you can recover data up to the minute using the available transaction log.
- Keep Exchange databases at a manageable size according to Microsoft Exchange best practices; if databases are too large, backup and recovery times increase.
- Use ONTAP System Manager to configure SnapMirror relationships. Otherwise, SnapCenter backups fail with a warning. You cannot create relationships by using SnapCenter.

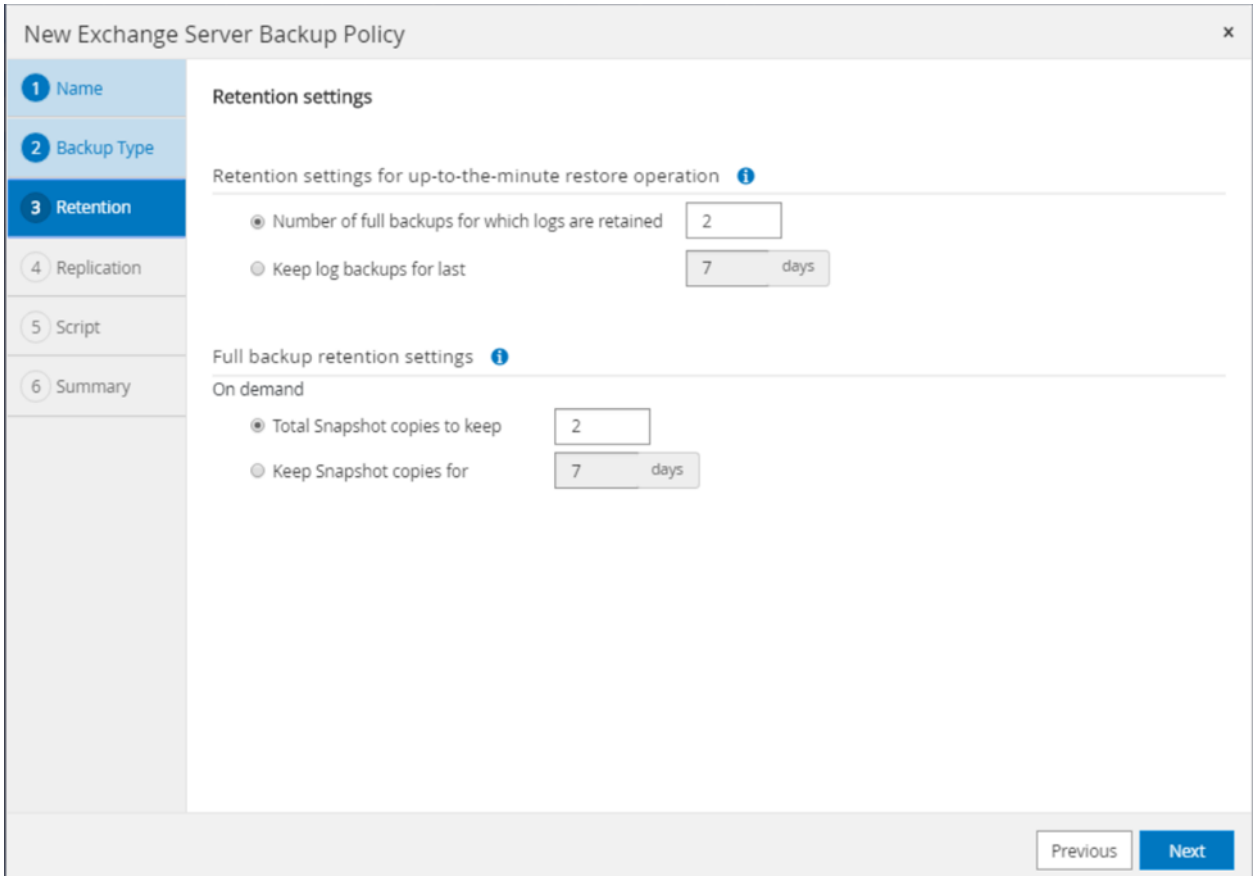
- Make sure the primary and secondary SVMs or the ONTAP cluster name are registered with SnapCenter Server. Exchange hosts should have the necessary connectivity to the primary and secondary storage systems.

Snapshot retention guidelines

SnapCenter backup operations work as follows:

1. SnapCenter creates a VSS backup of the Exchange database, which gets deleted according to the full backup retention settings.
2. To enable up-to-the-minute restore, SnapCenter archives transaction logs to the `SceBackupInfo` directory by creating NTFS hard links to the live transaction log files without physically copying the log file. This archived transaction log is deleted as a part of log backup retention.

Figure 12) Log and full backup retention settings.



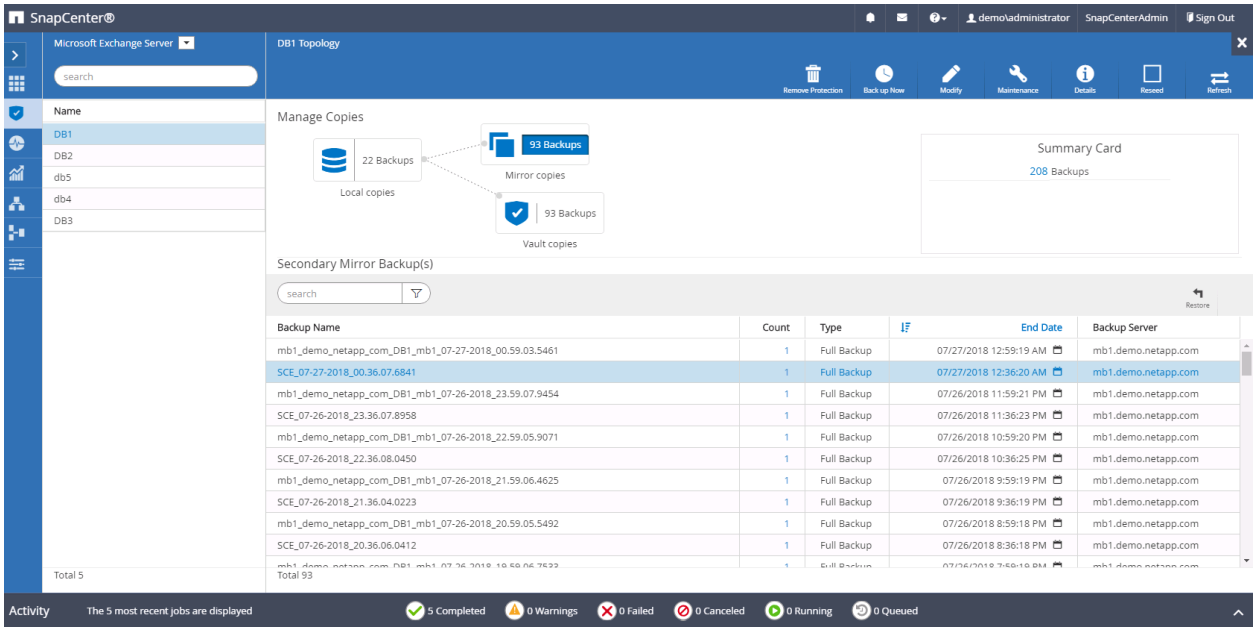
NetApp flexible volumes running NetApp ONTAP software can store a maximum of 255 Snapshot copies per flexible volume and 1,024 Snapshot copies with ONTAP 9.4 and later. The amount of storage needed for NetApp Snapshot copies depends on the change rate. To provide accurate volume sizing and layout for Exchange environments, consult a NetApp Exchange expert or your NetApp partner.

Best practice

A database and its corresponding transaction log must be placed on separate LUNs if you want to use separate backup and retention schedules.

Restore guidelines

Figure 13) Local, mirror, and vault copies from which you can perform the restore operation.

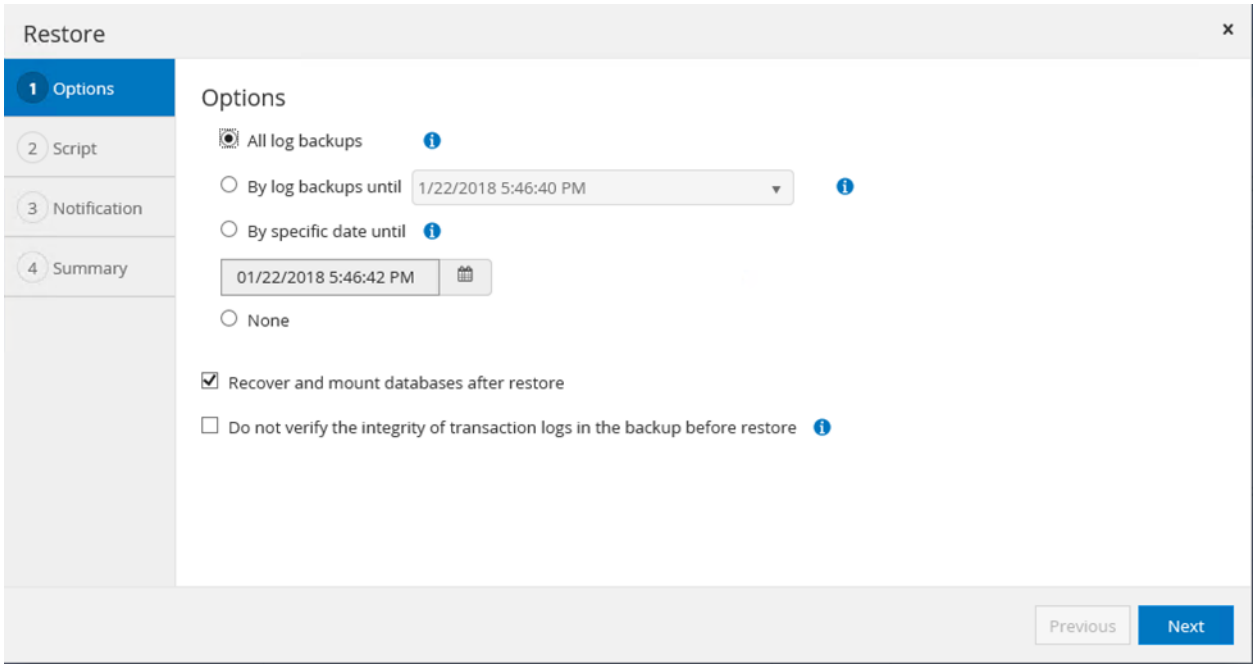


There are two types of restore operations:

- **Up to the minute.** An up-to-the-minute restore mounts the database, and Exchange replays the transaction logs from the backup and applies them to the database. The complete transaction log chain is required for an up-to-the-minute restore to succeed. To restore all the available log backups after the full backup, choose All Log Backups.
- **PiT.** This option allows you to restore your Exchange data to a chosen Pit. Any Exchange data past that point is not restored. This option is particularly useful when you want to restore to a point before an event such as data corruption occurred. A PiT restore replays and applies to the database only those transaction logs that existed in the active file system when the backup was created up to the specified PiT. All transaction logs beyond that PiT are discarded.

  Choose By Log Backups Until to restore the database based on the backup log with the selected date. Choose By Specific Date Until to specify the date and time after which transaction logs are not applied to the restored database. The PiT restore operation halts the restoration of transaction log entries that were recorded after the specified date and time. Choose None when you need to restore only the full backup without any log backups.

Figure 14) SnapCenter restore options.



The technology that you use for a restore depends on the storage layout of the database in the volumes, as shown in Table 1.

Table 1) Restore options.

Storage configuration	Primary	Secondary
Single database scenario: • Eg: DB1 • E: db1.edb • T: db1.log	Perform a single-file SnapRestore (SFSR) restore of the LUN.	Perform a SnapMirror restore (SFR). This restore is most efficient because the storage network, not the host network, is used, with only the incremental delta of the LUN restored from secondary storage.
Multiple databases: • Eg: DB1, DB2 • E: db1.edb, db2.edb • T: db1.log, db2.log	By default, perform a sub-LUN restore. If restore fails, perform a mount and copy restore.	Perform a mount and copy restore.

After a successful backup, you might need to transition database ownership or the active node to another node. For example, during backup at time t1, node 1 owned the active copy, and later, because of a virus infection, a copy on node 2 was instantiated. Therefore, node 2 then owned the active copy. At this point, if you restore backup-t1, the restore must be performed for node 2. This requires mounting the database and log disks from the Snapshot copy on node 2 to perform the restore. Node 2 in this situation should have access to the controllers hosting the database and the log LUNs mounted on node 1. However, for a geographically separated cluster, this might not always be possible. Therefore, NetApp recommends that you back up the active or passive database copy in the remote data center to allow a successful restore.

Best practices

- Verify that there is adequate hard disk capacity to restore both the database and the log files.

- Perform a test restore to an alternate Exchange Server regularly to verify the backup consistency and success of the restore.
- For an up-to-the-minute restore, restore from your most recent full backup to minimize the number of transaction logs that must be replayed.
- Make sure that the storage from which the backup was taken is accessible to the target host where the restore is performed. Otherwise, the restore might fail.
- To verify the log's integrity, make sure to deselect Do Not Verify the Integrity of Transaction Logs in the Backup Before Restore. By default, the option is unselected.

Reseed guidelines

When Microsoft Exchange Server runs in the DAG configuration, one of the replicas might go into a failed state, possibly because of corruption. If this occurs, you must recover the failed database copy by using the Microsoft Exchange Server reseed operation. Reseeding replicates data from the active database copy to the failed replica and brings this failed copy back to a healthy state. The time required for a reseed operation depends on the size of the database and on network performance. SnapCenter makes DAG reseeding go many times faster, because a SnapCenter reseed operation uses NetApp Snapshot technology to restore from a backup Snapshot copy. This process has no effect on the active replica.

After SnapCenter reseeding restores the failed database copy to a healthy state, the latest content is available across all DAG copies because of replication from the active replica. Reseeding can be performed from backup Snapshot copies on the same node (default) or a different node. The storage network is used rather than host network resources.

The technology used for reseeding also depends on the storage layout of the database in the volumes, as shown in Table 2.

Table 2) Reseed options.

Storage configuration	Reseed of FC/iSCSI/RDM (same node)	Reseed from different node
Single database scenario: • Eg: DB1 • E: db1.edb • T: db1.log	SFSR	Mount and copy restore
Multiple databases: • Eg: DB1, DB2 • E: db1.edb, db2.edb • T: db1.log, db2.log	SFSR. If SFSR fails, then mount and copy restore.	Mount and copy restore

Best practices

- Create a backup or select the most recent backup Snapshot copy across the nodes, because the lag between the active copy and passive copy to be recovered is minimal. This process also affects the time taken for the reseed operation.
- Verify that there is connectivity between the reseed target node and the storage containing the backup Snapshot copy.

Single mailbox and item-level recovery

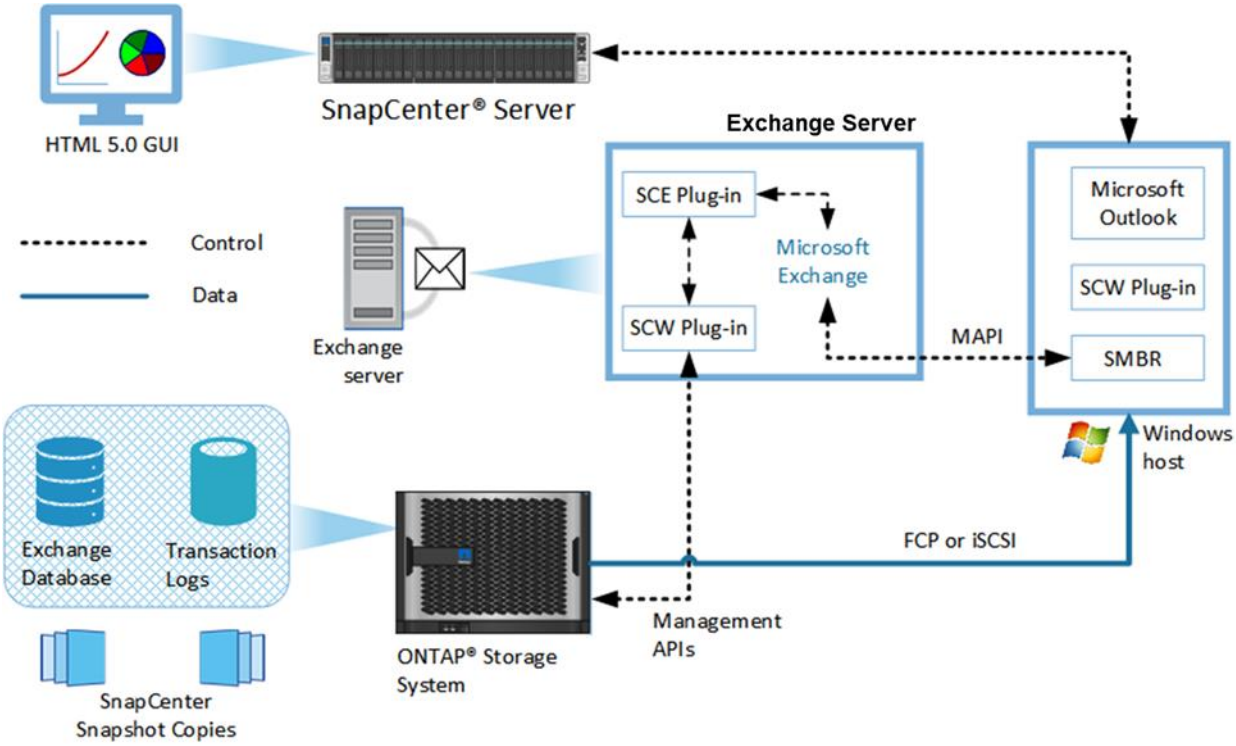
NetApp SMBR software can be used for the following functions:

- Repairing accidental or malicious deletion of items.

- Rapidly recovering Exchange data directly to your production Microsoft Exchange Server or any PST file at any level of granularity, including individual mailboxes, public folders, messages, attachments, calendars, notes, and tasks.
- Using near-instantaneous online backups of Exchange databases created with SnapCenter. This eliminates time-consuming and expensive single mailbox (brick-level) backups and the need for a recovery server.
- Searching for and creating a copy of all archived emails that match a given keyword or other criteria.

SMBR can be set up on different Windows hosts that Microsoft Outlook is running, and the SnapCenter Plug-Ins Package for Windows is installed. SMBR uses the native Microsoft Messaging Application Program Interface (MAPI) protocol to communicate with the Exchange Server that is running on a separate machine.

Figure 15) Single Mailbox Recovery architecture installed on separate hosts.



The prerequisites for using SMBR include:

- Add the SMBR host to SnapCenter Server and install the NetApp SnapCenter Plug-In for Microsoft Windows (4.3.1 P2 or later).
- Install Microsoft Outlook on the SMBR host.
- Create an igroup of the SMBR host in the SVM.
- Establish a session between the SMBR host and the controller.

NetApp storage efficiency

Storage efficiency is the ability to store and manage Exchange Server data in a way that consumes the least amount of storage space, with little or no impact on the overall performance of the system. To design an efficient storage solution, you must understand the I/O and bandwidth characteristics of Microsoft Exchange. Typically, Exchange databases encounter 32KB random reads to the database and

sequential writes for the transaction log, which typically vary from 4KB pages (the native I/O size) to a log buffer size of 1MB. Storage efficiency goes beyond data deduplication; it is a combination of provisioning (overall layout and utilization) and data protection technologies.

Table 3)

Storage efficiency	Best practice
NetApp Snapshot technology	This feature provides zero-cost, fast-backup, PiT copies of the volumes hosting Exchange databases.
Thin provisioning	Use thin-provisioned volumes for the Exchange databases and logs.
Space reclamation	Space reclamation should be run during periods of low activity because it initially consumes cycles on the host.
Fractional reserve	The default value for the fractional reserve is 100%. However, by using the autodelete feature, the fractional reserve can be set to 0.
Autodelete	NetApp recommends setting the autodelete trigger to volume.
Autogrow	There must be enough space available in the aggregate for the autosize option to function. NetApp recommends planning for additional buffer space when you use thin provisioning for Microsoft Exchange Server environments.
Deduplication	NetApp recommends deduplication for database volumes, but not for transaction log volumes. Turn on scheduled deduplication and schedule it for nonpeak hours (typically late at night).

Performance

Providing good performance to meet Exchange service levels depends on the proper sizing of NetApp storage for Exchange workloads. Consult a local NetApp Exchange expert to provide accurate performance sizing and layout for Exchange environments.

SATA performance considerations

If you have a SATA-based deployment of Exchange, consider that SATA drives have a lower I/O profile than SAS and FC drives. NetApp Flash Cache intelligent caching can be used to help improve the I/O performance and reduce latency of SATA-based deployments. NetApp recommends NetApp Flash Cache and SATA if deployments exceeding 1,000 mailboxes or if SATA-based designs are bounded by performance instead of capacity.

Best practice
Have fewer, large databases to help reduce the complexity of the storage design and amount of background maintenance I/O, which can exceed the transactional I/O generated by users.

Virtualization

Virtualizing Exchange environments can deliver significant benefits, including reduced server hardware costs, reduced power usage, greater space savings, improved server utilization, and rapid server provisioning.

Best practices

- NetApp recommends separating Exchange roles onto different servers so that no particular role fails if a host server fails.
- Separate Exchange data storage from the storage that hosts the guest virtual machine's operating system.
- Make sure that a similar storage configuration is used on every node in the DAG.

High availability

A DAG is used for data resiliency by deploying multiple copies of mailbox databases across the two data centers. This configuration protects mailbox data from software, hardware, and even data center failures. The overall design of the DAG, the number of DAG members, and the number of mailbox database copies depend on your recovery SLAs for RTO and RPO. A larger DAG provides more redundancy and resources. NetApp SnapCenter enables PiT or up-to-the-minute restores, without the added capacity requirements and complexity of a lagged copy.

Best practices

- Place the database replicas in a consistent, distributed configuration to make sure that they are evenly distributed after a failure.
- To avoid a single point of failure, verify that the replicas of a specific mailbox database are not placed in the same server rack or storage array.

Disaster recovery

A DAG that relies on transaction log shipping for data replication can be extended to multiple sites to provide resiliency against disk, server, network, and data center failures. When a single server or database is lost, the DAG automatically performs switchover to activate the database copies on the other DAG nodes to keep Exchange services online.

Recover Microsoft Exchange Server and use NetApp SnapCenter to set up the network connections to the NetApp ONTAP storage system. In addition, connect to the database and transaction log LUNs for the Exchange database to recover from the most recent backup.

Conclusion

Microsoft Exchange Server is not a one-size-fits-all application. Multiple configuration options are available to suit most of a customer’s needs. NetApp storage and data management software is built in a similar fashion, so that users can manage Exchange data to meet their business requirements. With high-performance, easy-to-manage storage systems and robust software offerings, NetApp offers the flexible storage and data management solutions to support Exchange Server 2013, 2016, and 2019 enterprise messaging systems.

Where to find additional information

To learn more about the information described in this document, refer to the following documents:

- SnapCenter Concepts
  https://docs.netapp.com/us-en/snapcenter/concept/concept_snapcenter_overview.html
- SnapCenter Plug-in for Microsoft Exchange Server Concepts
  https://docs.netapp.com/us-en/snapcenter/protect-sce/concept_snapcenter_plug_in_for_exchange_server_overview.html
- SnapCenter Installation Workflow
  https://docs.netapp.com/us-en/snapcenter/install/install_workflow.html

Version history

Version	Date	Document version history
3.0	September 2022	Document updated for SnapCenter 4.7
2.0	April 2021	Document updated for SnapCenter 4.4.
1.0	April 2018	Initial release.

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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