Technical Report

NetApp Guide:
Archive SnapManager Backup Sets to Tape

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The goal of this document is to provide guidance on how to implement tape archive of backup sets created by NetApp® SnapManager® for Microsoft® Exchange and SnapManager for Microsoft SQL Server®. This guide supplements archive procedures listed in the SnapManager for Exchange and SnapManager for SQL Server Installation and Administration Guides.

The scope of this guide is limited to technical procedures and guidelines to support the tape archive of backup sets created by NetApp SnapManager for Exchange and SnapManager for Microsoft SQL Server. This document does not cover end-to-end implementation of Exchange and SQL Server. Nor does the document cover the integration and configuration of SnapDrive® or SnapManager or the configuration of third-party backup software or tape libraries to support the archive process.

1.2 INTENDED AUDIENCE

This document offers guidance in planning and deploying tape archives of backup sets created by NetApp SnapManager for Exchange and SnapManager for Microsoft SQL Server. The procedures and guidance described enable Microsoft Exchange and Microsoft SQL Server administrators to work with backup administrators to successfully archive SnapManager backup sets to tape. It is assumed that the audience for this document has working knowledge of the following:

- NetApp Data ONTAP® operating system
- NDMP enablement
- NetApp SnapDrive for Windows® (SDW) LUN management software
- NetApp Data ONTAP Windows PowerShell™ Toolkit 1.6 or higher
- Windows PowerShell 2.0 or higher
- NetApp SnapProtect™ or third-party backup software

For tape archive and restore of SnapManager for Exchange backup sets:

- NetApp SnapManager for Exchange (SME)
- NetApp Single Mailbox Recovery (SMBR)
- Microsoft Exchange Server 2003 or higher

For tape archive restore of SnapManager for Microsoft SQL Server backup sets:

- NetApp SnapManager for SQL Server (SMSQL)
- Microsoft SQL Server 2005 or higher

1.3 ARCHIVAL AND DISASTER RECOVERY

Many organizations have a requirement to keep SnapManager backups for a long period of time due to compliance reasons. One way of satisfying this requirement is to archive the SnapManager backups to tape. Storage capacity constraints are another reason that organizations might archive SnapManager backups to tape.

SnapManager backups archived to tape can also be used in certain disaster recovery scenarios where the RTO or RPO requirements are greater. Restoring archived SnapManager backups from tape takes significantly more time than using SnapMirror® and Snapshot™ copies with SnapManager in a disaster recovery scenario. For disaster recovery, it is recommended to use SnapMirror and SnapManager wherever possible.

2 UNDERSTANDING SNAPMANAGER FOR EXCHANGE BACKUP SET ARCHIVAL

2.1 IMPORTANCE OF ARCHIVING A COMPLETE BACKUP SET

Archiving a complete backup set facilitates the restore of the backup data that was archived. In the case of Exchange, the archived data can be used to restore to a recovery mailbox database or for mailbox recovery using Single Mailbox Recovery (SMBR).

A SnapManager for Exchange backup set consists of the following components that are created as part of the backup operation:

- Exchange Server mailbox database Snapshot copies
- Exchange Server transaction log Snapshot copies
- SnapInfo directory

All of the preceding components must be archived for you to successfully recover and implement a recovery mailbox database restore using SnapManager for Exchange.

The Exchange Server mailbox database and the Exchange server transaction log Snapshot copies must be archived for you to successfully recover mailbox data using Single Mailbox Recovery.

2.2 GUIDELINES FOR ARCHIVING A BACKUP SET

Before you start archiving your data, consider the guidelines for choosing the type of data to be archived, naming, and using the appropriate protocols:

- Archive verified backups:
  - If you are not sure whether a backup copy is verified, use the SnapManager Restore window to check.
  - An unverified backup can be archived to tape. However, archiving an unverified backup can result in archiving an invalid backup set.
  - Exchange 2010 DAG backups do not require verification of database backups, if there are two or more copies of a database.
- Archive a complete backup set.
- Archive the most recent backup copy.
- If you use the SnapManager for Exchange unique naming convention for backup sets, archive the Snapshot copy with the most recent date and time.
- If you did not use the unique name option when you created the backup, look for the most recent Snapshot copy in the storage system's LUN drive volume named:

  /exchsnap_servername_recent

  or

/exchsnap_servername_recent_backupmgmtgroup.

- Do not use the CIFS or NFS protocols to archive LUNs.
- Use the storage system's dump command or an NDMP backup application to archive LUNs.

In addition, when archiving SnapManager for Exchange backups to tape, consider the following operational factors:

- The archive method you use
- Service-level agreements for recovery
- The number of SnapManager backups performed per day
- Exchange client activity schedules
- Backup verification time

3 SNAPMANAGER FOR EXCHANGE ARCHIVE TO TAPE PROCESS

You can use different methods for selecting the components of your backup to archive:

- Use NetApp SnapProtect NAS NDMP iDataAgent, a third-party NDMP backup application (such as Veritas™ NetBackup™), or the storage controller's dump command to archive SnapManager backup sets to the archive medium using NDMP.
- Mount the LUNs in a SnapManager backup Snapshot copy and share it, then use NetApp SnapProtect Windows iDataAgent, NTBackup, Windows Backup, or another Windows backup utility to copy the LUN content to the archive medium. This document will cover the process using the Windows Backup utility archive to tape process.

3.1.1 AUTOMATIC BACKUP ARCHIVING USING RUN AFTER COMMAND OPERATION FEATURE

SnapManager allows you to automatically run your own program or script after a backup or database verification operation, but only after the operation finishes successfully. This feature, called Run Command After Operation, is typically used to automatically archive a backup copy.

Make sure that you archive all components of a backup set together. If any one of the mailbox databases is offline and you a initiate a backup process using the Run Command After Operation, the backup operation fails for that particular job.

3.1.2 COMMAND ARGUMENTS SUPPORTED BY RUN COMMAND AFTER OPERATION FEATURE

The Run Command After Operation feature supports some predefined variables that can pass operation-specific information to your program or script.

$ExchSnapshot

Expands to the name of an Exchange database Snapshot copy, as shown in the following examples:

```
exchsnap__exchange-mb1__01-31-2012_15.03.09
```

```
exchsnap__exchange-mb1__recent
```

The number of database Snapshot copies in a SnapManager backup set depends on the number of volumes used to store the storage groups included in the backup operation.

$InfoSnapshot

Expands to the name of a SnapInfo directory Snapshot copy, as shown in the following examples:

```
eloginfo__exchange-mb1__01-31-2012_15.03.09
```

```
eloginfo__exchange-mb1__recent
```

$SnapInfoName

Expands to the name of the SnapInfo directory, as shown in the following examples:

```
exchange-mb1__01-23-2012_16.21.07__Daily
```

```
exchange-mb1__recent
```

If you use this variable, you must also provide the correct path to the directory.

$SnapInfoPath

Expands to the name of the SnapInfo subdirectory, as shown in the following example:

```
I:\SME_SnapInfo\EXCH_exchange-mb1\SG_First Storage Group\exchange-mb1_01-06-
2012_11.52.36
```

The $SnapInfoPath variable is automatically enclosed within double quotes so that the actual path name can contain spaces without affecting the script invocation on the Windows command line.

If you do not want the double quotes to appear in your command line, remove them from the Command Arguments field in the **Run Command After Operation** dialog box.

3.2 SPECIFYING COMMAND TO BE RUN BY RUN COMMAND AFTER OPERATION FEATURE

While specifying a backup or verification operation, you can use Run Command After Operation to specify the details of the command that you want to run after the operation finishes. Using default values for the command arguments frees you from entering the command information each time you initiate a backup or verification operation.

Before You Begin

- You must install SnapManager on a computer that you specify, but you do not need to configure it.
- If your script is stored on a network share, use the UNC path rather than the network drive letter to specify the script's location.
- Add the network location to Internet Explorer's list of trusted sites; otherwise, your command might fail.

About This Task If more than one Snapshot copy of the same type exists for your command, include that Snapshot copy's variable name once for every Snapshot copy. If you do not, you cannot create a complete archive. For example, if you enter myscript $exchSnap $exchSnap, the command that is generated is myscript snap1 snap2.

Steps

1. Use the Backup wizard or the Backup and Verify window to specify a full database backup, a transaction log–only backup, or a database verification.
2. Select Yes, Run a command after this operation in the Backup wizard or Run Command After Operation in the Backup and Verify window.
3. Under Specify a computer where..., select the host on which your program or script resides.
4. Under Specify the full path..., select your program or script.
5. Type the command input string in Command Arguments.

   You can directly enter text or select the variable you want to enter from the SnapManager Variables list.
6. Repeat steps 4 and 5 as needed until the Command Arguments box contains all of the arguments that you want to pass to your program or script.
7. Click OK and return to the backup or verification setup process.

After the backup or verification finishes successfully, the command that you specified, with the Snapshot copy and SnapInfo information for this backup operation inserted, runs automatically.

Example: Script and Required Parameters

Suppose that you want to run the following script:

C:\SnapManager Scripts\scriptname.bat

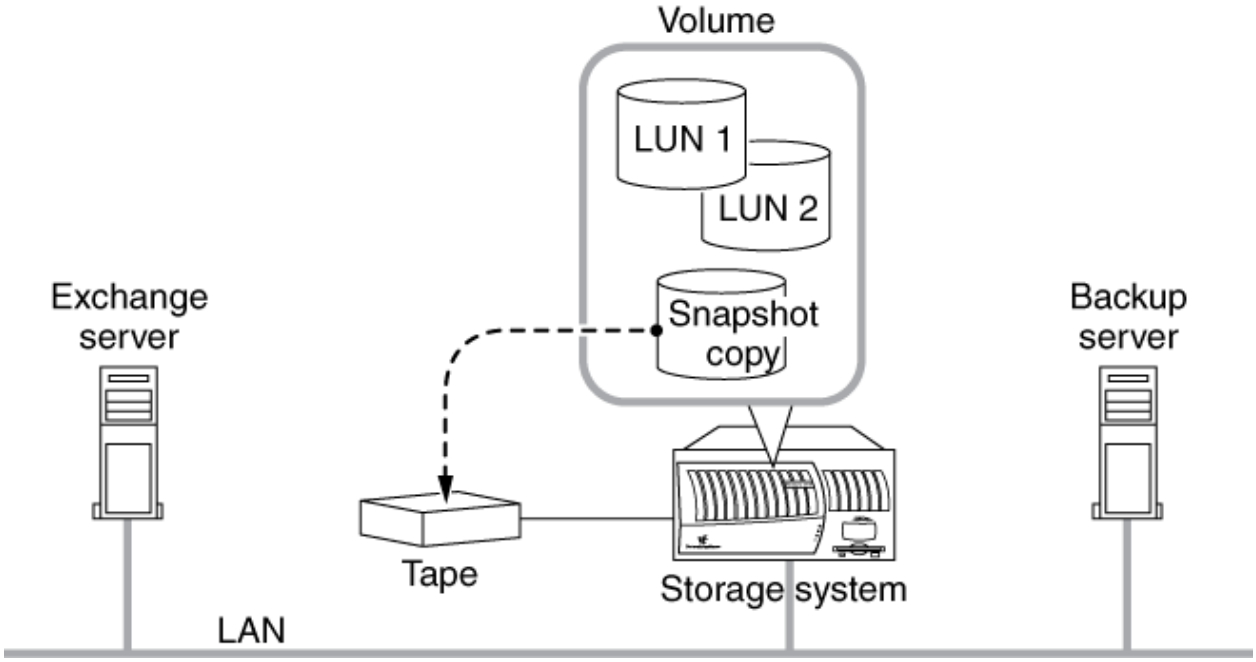
You need the following parameters:
- Name of the database Snapshot copy
- Name of the specific SnapInfo directory
- NTFS path to the SnapInfo directory

3.3 TAPE ARCHIVE USING NDMP BACKUP OVERVIEW

You can use NetApp SnapProtect NAS NDMP iDataAgent, a third-party NDMP backup application using Network Data Management Protocol (NDMP), or the Data ONTAP dump command to archive each of the LUNs that contain data for the backup set that you want to archive directly from the storage system to the archive medium, without involving Exchange or the Exchange server at all.

NDMP and dump command are the most efficient methods for creating archives of the LUN drive files.

Figure 1



For more information about backing up storage system data to tape, see the Data ONTAP System Administration Guide for your version of Data ONTAP.

Path Name for LUN to Be Archived

When using NDMP or the dump command to archive your SnapManager backups, specify the database LUN by using its absolute path name, `/vol/volume_name/.snapshot/snapshot_name/LUN_name`, in which the three variables represent the following text strings:

- volume_name Name of the volume containing the data to be archived
- snapshot_name Name of the Snapshot copy containing the LUNs to be archived
- LUN_name Name of the LUN containing the data to be archived

For example, the absolute path name of the LUN exch1db.lun in the Snapshot copy `exchsnap__exchange-mb1_01-20-2012_12.05.58_Daily` on the volume ExchVol is represented as follows:

```
/vol/ExchVol/.snapshot/exchsnap__exchange-mb1_01-20-
2012_12.05.58__Daily/exch1db.lun
```

EVALUATION OF NDMP AND DUMP COMMAND METHOD OF ARCHIVING

The NDMP and the dump command are the most efficient methods of creating archives of the LUN drive files.

Advantages

- Because the NDMP and the dump command methods do not rely on mounting a Snapshot copy, you do not risk creating of busy Snapshot copies.
- Because the NDMP and the dump command methods archive the entire raw LUN, restoring involves restoring the entire LUN.

- If your archive procedure does not send the data over the network, the NDMP and the dump command methods can be significantly faster than other methods.

Disadvantages

- Because you are archiving raw LUNs, the entire LUN containing the Exchange data is archived, so you archive more data than you need.

  If archiving extra data is undesirable, you can use Windows Backup, NTBackup, or another Windows backup utility to back up the corresponding SnapInfo directory. Coordinate this so that the two pieces of the archive are kept together for later retrieval.

  If you archive the SnapInfo directory separately, you must make sure that you get the SnapInfo directory backed up directly from the Exchange server and the Exchange data extracted from the LUN backed by Snapshot copy from different locations into the same archive.

3.3.1 EXAMPLE: USING NETAPP SNAPPROTECT TO ARCHIVE SNAPMANAGER FOR EXCHANGE BACKUP SET TO TAPE

You can run a script to archive your SnapManager backups to tape either by using the Run Command After Operation feature or by hardcoding the Snapshot copy names into the script if you are using the generic backup naming convention for SnapManager for Exchange backup sets.

Assume you want to run a script in the following environment:

- The script is run on the computer running Exchange and SnapManager.
- The name of the storage system is fas01.
- The name of the LUN containing the Exchange databases is exch_db.lun.
- The name of the LUN containing the Exchange transaction logs and the SnapInfo directory is exch_log.lun.
- The name of the volume that contains the Exchange databases is exch_db.
- The name of the volume that contains the Exchange transaction logs is exch_logs.
- NDMP is enabled and a local account is created (that is, ndmpuser) on the storage system that is a member of the Backup Operators group on the storage system.
- An ndmp password for the local account (that is, ndmpuser) has been created.
- NetApp SnapProtect CommCell must be installed and configured in the environment.
- NetApp SnapProtect NAS NDMP iDataAgent client is installed on the Exchange server and configured in the CommCell.

Procedure Configure SnapProtect NDMP Backup to Be Called from SnapManager

1. Add the storage controller, fas01, as a NAS client computer in the SnapProtect CommCell.
2. On the Exchange server where the SnapProtect NAS NDMP iDataAgent client is installed, add the registry key `HKEY_LOCAL_MACHINE\SOFTWARE\CommVault Systems\Galaxy\Instance<xxx>\NAS.`
3. Under the NAS key, add the value `OnDemandLocalFilePath` as a String type.
4. Set the value of `OnDemandLocalFilePath` to the path of the Content file, `c:\snappath.txt`
5. In the CommCell browser, double-click the storage system, fas01, and right-click the NetApp NAS NDMP agent, select Tasks and then select New On Demand Backup Set.

6. From the New On Demand Backup Set dialog box, enter in SME Tape Archive for the on-demand backup set you want to create.
7. Associate a storage policy with the new on-demand backup set and click OK to continue.
8. In the Backup Schedule dialog box, select Do Not Schedule and click OK to continue.
9. In the CommCell browser, double-click the SME Tape Archive on-demand backup set that was created in the previous step.
10. Right-click the default subclient name and select Properties.
11. Click the SnapProtect Operations tab and deselect the SnapProtect checkbox. Click OK on the warning message and then click OK once again to complete the configuration of the subclient.
12. Right-click the default subclient for the SME Tape Archive on-demand backup set and select Backup.
13. In the Backup Options dialog box, make sure that the Immediate radio button is checked under Job Initiation and then click the Save as Script button.
14. Select the name of the Exchange Server (that is, exchange-mb1) from the client drop-down list.
15. Enter in the path where the script file will be saved (that is, C:\sme_tape_archive.bat).
16. Select the CommCell user account that will run the script (that is, ndmpuser). This script will contain qcommands that will initiate the tape archive actions in SnapProtect. Click OK to complete the action.
17. A Windows .bat file and an XML file will be created in the location where you saved the script.
18. In SnapManager for Exchange, set up a backup job to run the script with the following options in the Run After Command Operation in the SME Backup wizard:
    - Computer where script is run: host name of Exchange server where SME backups are created (that is, exchange-mb1)
    - Full path to script to be run (that is, C:\sme_tape_archive.bat)
    - SnapManager variables: $ExchSnapshot $InfoSnapShot

      The command-line parameters %1 and %2 might provide values similar to the following, respectively:

      ```
      exchsnap_exchange-mb1_01-20-2012_12.05.58
      ```

      ```
      eloginfo__exchange-mb1_01-20-2012_12.05.58
      ```
19. Modify the script created by SnapProtect to update the SnapProtect Demand file with the correct Snapshot paths and to make sure that no Unicode characters are passed into the script by SME.

    Add the following commands to the batch file:

    ```
    echo /vol/exch_db/.snapshot/%1>C:\snappathtemp.txt
    ```

    ```
    echo /vol/exch_logs/.snapshot/%2>>C:\snappathtemp.txt
    ```

    ```
    cvconvertunicode.exe C:\snappathtemp.txt C:\snappath.txt
    ```

    The first line writes the Snapshot path for the database LUN to a temporary copy of the SnapProtect Demand file on the Exchange server where the backups were created with SME (that is, exchange-mb1).

    The second line writes the Snapshot path for the transaction log LUN to a temporary copy of the SnapProtect Demand file on the Exchange server where the backups were created with SME (that is, exchange-mb1).

    If there are additional database and transaction log volumes, make sure that you add an additional line for each separate volume.

The third line calls a SnapProtect utility that reads a temporary copy of the SnapProtect Demand file, converts any Unicode characters, and writes the output to the SnapProtect Demand file the SnapProtect OnDemand backup job will use.

The following sample script uses the NetApp SnapProtect qcommands to archive the database transaction log LUNs in the Snapshot copy created by SnapManager for Exchange to the tape.

```
@echo off

setlocal

if not defined GALAXY_BASE set GALAXY_BASE=C:\Program
Files\NetApp\SnapProtect\Base

set PATH=%PATH%;%GALAXY_BASE%
set response="sme_tape_archive.bat_13271820.tmp"

REM ***** Begin customization section here *****
echo /vol/exch_db/.snapshot/%1>C:\snappathtemp.txt
echo /vol/exch_logs/.snapshot/%2>>C:\snappathtemp.txt
cvconvertunicode.exe C:\snappathtemp.txt c:\snappath.txt
REM ***** End customization section here *****
REM ***** Change ndmpuser password to match password set on controller *****
qlogin -u "ndmpuser"  -ps "3e362baac942d14eb5366e047a83d7995"  -cs "snapprotect-
svr.demo.netapp.com"
if %errorlevel% NEQ 0 (
                            echo Login failed.
                            goto endOfScript )
:loopx
if "%1"=="" ( goto loopz )
set input=%input% %1
shift
goto loopx
:loopz
REM ***** Update the qoperation line to specify the correct XML command file *****
qoperation execute -af "sme_tape_archive.bat_1327182005.xml"  %input% > %response%
if %errorlevel% NEQ 0 (
                       echo Failed to get job details.
                       goto end_1327182005 )
for /F "tokens=1* usebackq" %%i in (%response%) do echo %%i %%j
:loopInitial
REM ****** Make sure you update the qlist line to specify the correct XML command
file ******
    for /l %%X in (1,1,6) do (cvsleep 20
    qlist job -co is -af %response% > C:\output_1327182005.result
if %errorlevel% NEQ 0 (
                       echo Failed to get job details.
                       goto end_1327182005 )
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (if not %%a == No
(goto loopEnd) echo %%a %%b))
```

```
echo Failed to start job for long time.
goto end_1327182005

:loopEnd
for /F "tokens=1,2" %%a in (C:\output_1327182005.result) do (echo %%a %%b)

echo Processing...
:loop_1327182005
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (if %%b == Running
(goto loop1)
if %%b == Waiting (goto loop1))
goto loop2
:loop1
cvsleep 20

qlist job -co is -af %response% > c:\output_1327182005.result
goto loop_1327182005
:loop2
echo Final Job Status:
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (echo %%a %%b)
   del output_1327182005.result
:end_1327182005

set OrigErrLevel=%errorlevel%
qlogout

if %errorlevel% NEQ 0 (echo Logout failed. )
del %response%
if %OrigErrLevel% NEQ 0 exit /b %OrigErrLevel%
:endOfScript
```

WINDOWS POWERSHELL METHOD

If you want to use Windows PowerShell instead of Windows command shell scripting, You can use the following sample scripts.

The first sample script is a Windows batch file that SnapManager for Exchange will be called using the Run After Command Operation function in a SnapManager for Exchange backup job. The batch file calls a Windows PowerShell script and passes the $ExchSnapShot and $InfoSnapShot parameters into the Windows PowerShell script.

```
powershell.exe c:\sme_tape_archive.ps1 %1 %2
```

The second sample script is a Windows PowerShell script that updates the SnapProtect Demand file and runs the SnapProtect qcommands copied from the script file that SnapProtect created.

The following script uses the NetApp SnapProtect qcommands to archive the database transaction log LUNs in the Snapshot created by SnapManager for Exchange to the tape.

```
$db snapname = $args[0]
```

```
$db_snapname = $db_snapname.Trim()
$log_snapname = $args[1]
$log_snapname = $log_snapname.Trim()

#Make sure you update these values specific to your environment
$tempsnappathfile = 'c:\snappathtemp.txt'
$snappathfile = c:\snappath.txt'
$logfile = 'C:\sme_tape_archive.log'
$commandfile = 'C:\sme_tape_archive.bat_1327182005.xml'


$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Construct backup paths" | out-file -filepath $logfile

$db_snappath = "/vol/exch_db/.snapshot/" + $db_snapname | out-file -filepath
$tempsnappathfile

$log_snappath = "/vol/exch_logs/.snapshot/" + $log_snapname | out-file -
filepath $tempsnappathfile -append

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Use CVconvertunicode utility to remove any unicode
characters" | out-file -filepath $logfile -append

& "C:\Program Files\NetApp\SnapProtect\Base\cvconvertunicode.exe"
$tempsnappathfile $snappathfile | out-file -filepath $logfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qlogin to snapprotect server" | out-file -filepath
$logfile –append


#Change ndmpuser password to match password set on controller
& "C:\Program Files\NetApp\SnapProtect\Base\qlogin.exe" -u "ndmpuser" -ps
"3e362baac942d14eb5366e047a83d7995" -cs "snapprotect-svr.demo.netapp.com" |
out-file -filepath $logfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qoperation to begin ndmp backup of SME snapshots" | out-
file -filepath $logfile –append

& "C:\Program Files\NetApp\SnapProtect\Base\qoperation.exe" execute -af
$commandfile | out-file -filepath $jobstatusfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qlogout of snapprotect server" | out-file -filepath
$logfile -append

& "C:\Program Files\NetApp\SnapProtect\Base\qlogout.exe" | out-file -filepath
$logfile –append
```

3.3.2 EXAMPLE: USING NDMP DUMP COMMAND TO ARCHIVE SNAPMANAGER FOR EXCHANGE BACKUP SET TO TAPE

You can run a script to archive your SnapManager backups to tape by using the Run Command After Operation feature.

Assume you want to run a script in the following environment:

- The script is run on the computer running Exchange and SnapManager.
- The name of the storage system is fas01.
- The name of the LUN containing the Exchange databases is exch_db.lun.
- The name of the LUN containing the Exchange transaction logs and the SnapInfo directory is exch_log.lun.
- The name of the volume that contains the Exchange database is exch_db.
- The name of the volume that contains the Exchange transaction log and the SnapInfo data is exch_logs.
- An rsh client is installed on the Exchange server.

To run a script using the SnapManager Run Command After Operation feature, use the following command:

C:\SnapManager Scripts\scriptname.txt $ExchSnapshot $InfoSnapshot

The command-line parameters %1 and %2 might provide values similar to the following, respectively:

```
exchsnap__exchange-mb1_01-20-2012_12.05.58__Daily
eloginfo__exchange-mb1_01-20-2012_12.05.58__Daily
```

The following script uses the storage system dump command to dump the database, transaction logs, and SnapInfo LUNs to the tape. This script relies on rsh functioning on the Exchange server using the SnapManager user account.

```
REM Back up the LUN containing the Exchange database.
REM For this example, a level 0 backup is performed
REM to the tape device named nrst0a.
rsh fas01 dump 0f nrst0a /vol/exch_db/.snapshot/%1/exch_db.lun
REM Before appending the next backup to the tape,
REM reposition to the end of the tape so the next
REM write will not overwrite the existing data.
rsh fas01 mt -f nrst0a eom
REM Back up the LUN containing the Exchange
REM transaction log files and the SnapManager SnapInfo
REM directory.
rsh fas01 dump 0f nrst0a /vol/exch_logs/.snapshot/%2/exch_log.lun
```

Note: If you do not use the Run Command After Operation feature and you do not use the unique naming convention for your backups, you can hard code the Snapshot copy names into the script.

For example, the dump command for the database might look like this for an Exchange server named exchange-mb1:

rsh fas01 dump 0f nrst0a /vol/exch_db/.snapshot/exchsnap__exchange-mb1__recent__Daily/exch_db.lun

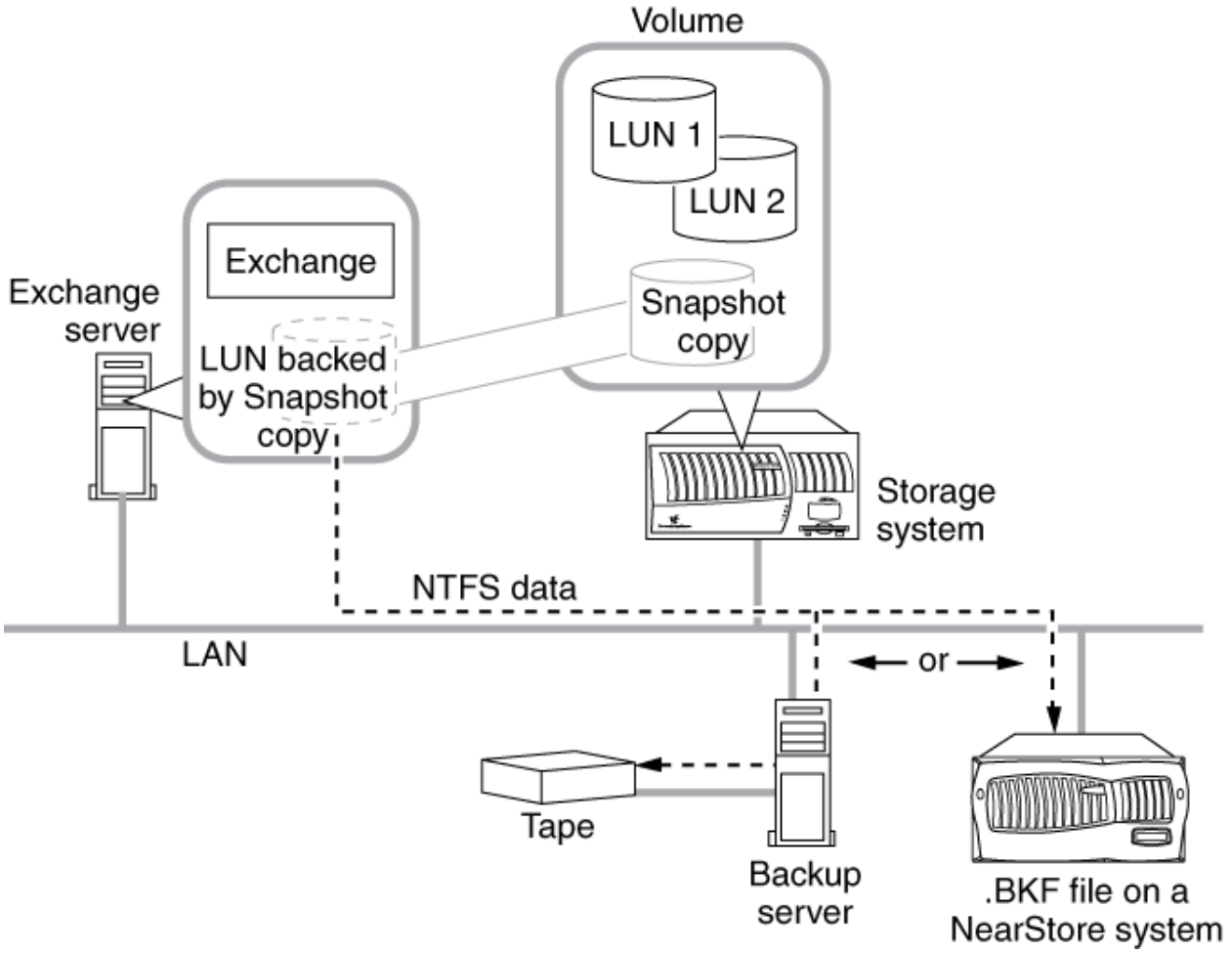
rsh fas01 dump 0f nrst0a /vol/exch_logs/.snapshot/exchsnap__exchange-mb1__recent__Daily/exch_log.lun

3.4 ARCHIVES CREATED USING WINDOWS BACKUP UTILITY OR WINDOWS THIRD-PARTY BACKUP UTILITY

You can use the built-in Windows backup utility or a third-party Windows file backup utility to archive your SnapManager backups to tape. To do so, you mount the LUNs backed up by the Snapshot copy that you want to archive and then use the Windows backup utility or a third-party backup utility to archive the backup set to your archive medium.

In this case, the NTFS data is backed up, rather than the raw LUNs, as shown in the following diagram:

Figure 2



Note: You do not need to mount the LUN on the Exchange server; you can use another computer for archiving.

Your archive must include the following two components:

- The SnapInfo directory backed up directly from the Exchange server
- The Exchange data extracted from the LUN backed up by a Snapshot copy

EVALUATION OF WINDOWS BACKUP UTILITY/THIRD-PARTY WINDOWS BACKUP UTILITY METHOD OF ARCHIVING

Using the Windows backup utility to archive your SnapManager backups enables you to select exactly which data you archive; however, you must be careful to avoid scheduling any backups while the archiving is performed.

Advantages

- Because you are archiving NTFS data rather than raw LUNs, you can archive exactly the data that you need, and no more.
- The procedures and tools used for this method are familiar and available to you.

Disadvantages

- This method requires a FlexClone® license activated on the storage system or requires that you avoid scheduling any backups during the archive process, because creating a Snapshot copy of a mounted Snapshot copy results in a Snapshot copy that cannot be deleted.
- You must make sure that you get the SnapInfo directory backed up directly from the Exchange server and the Exchange data extracted from the LUN backed by a Snapshot copy from different locations into the same archive.
- Windows backup utility on Windows 2008 and Windows 2008R2 does not support backup to tape devices.

3.4.1 EXAMPLE: USING WINDOWS BACKUP UTILITY OR THIRD-PARTY WINDOWS BACKUP UTILITY TO CREATE FILE-LEVEL TAPE ARCHIVE OF SNAPMANAGER BACKUPS

You can use a script to mount a Snapshot copy of the LUNs that contain the Exchange databases, then back up the databases using Windows Backup, unmount the LUNs, and back up the SnapInfo directory.

Assume that you use a script in the following environment:

- The script is run on the computer running Exchange and SnapManager.
- The drive letter for the Exchange database is S:.
- The Snapshot copy is mounted as drive V:.
- The drive letter used for the LUN mount must be available when you run the script.
- The command-line parameters %1 and %2 might provide values similar to the following, respectively:

```
exchsnap__exchange-mb1_01-20-2012_12.05.58__Daily
eloginfo__exchange-mb1_01-20-2012_12.05.58__Daily
```

To run this script using the SnapManager Run Command After Operation feature, use the following command:

C:\SnapManager Scripts\scriptname.bat $ExchSnapshot $InfoSnapshot

The following script mounts a Snapshot copy of the LUNs that contain the Exchange databases, and it backs them up using Windows Backup. It then unmounts the LUNs and backs up the SnapInfo directory.

```
REM Mount a LUN backed by the Snapshot copy of the Exchange
REM database as drive letter V:\ and mount a LUN backed by
REM the Exchange transaction logs as drive letter W:\.

sdcli snap mount -k s -s %1 -d v
```

```
sdcli snap mount –k s –s %2 –d w

REM Use Windows backup to back up the database files. The path
REM to the databases in your environment might be different.

wbadmin start backup –backuptarget “fas01\backuptarget” –include "V:\Program
Files\Exchsrvr\mdbdata”,”W:\Program Files\Exchsrvr\mdbdata”

REM Dismount the Snapshot copies mounted as drive letter V:\ and W:\.
REM The below example is shown with an optional parameter (-f)
REM to forcefully disconnect the drive letter.

sdcli snap unmount -d v –f
sdcli snap unmount –d w –f
```

4 SNAPMANAGER FOR EXCHANGE RESTORE FROM TAPE ARCHIVE PROCESS

The restore process will differ depending on the method that was used to archive the SnapManager backup set to tape.

- Restore Exchange data from tape archive of LUNs in the SnapManager backup set created by NetApp SnapProtect NAS iDataAgent, by a third-party NDMP backup application, or by the storage controller’s dump command.
- Restore Exchange data from tape archive of the Exchange data in the LUNs in the SnapManager backup set created by NetApp SnapProtect Windows iDataAgent, Windows Backup, NTBackup, or another Windows backup utility. This document will cover this process using the Windows Backup utility.
- Restore Exchange data from Exchange copy-type backup using the SnapProtect Exchange iDataAgent or a third-party Exchange-aware backup application.

4.1 RESTORE LUNS FROM SNAPPROTECT TAPE ARCHIVE

The restore process involves the restore of the LUNs and mounting them to a host running NetApp Single Mailbox Recovery so that the mailbox data can be recovered.

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUN that was backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.

2. Log into the SnapProtect CommServe server (that is, snapprotect-svr).
3. In the CommCell browser, expand the Client Computers object and then double-click the storage system (that is, fas01).
4. Double-click the NetApp NAS NDMP agent and then right-click the SME Tape Archive backup set and select All Tasks and then the Browse Backup Data task.
5. In the Browse Backup Data dialog box, define the Specify Browse Time if you are interested in restoring from tape archive for a particular date. To restore from the latest backup sets, make sure that the Browse the Latest Data radio button is selected and click OK.

6. The CommCell browser then displays a list of backup sets. Expand the SME Tape Archive backup set and then expand the path of the data down to the Snapshot copy (that is, SME Tape Archive:/vol/exch_db/.snapshot/<snapshot name>).
7. Check the checkbox next to the Snapshot name and then click the Recover All Selected… button.
8. In the Restore Options for All Selected Items dialog box, make sure that the storage system you want to restore to is listed in the Destination Client field. Make sure that you uncheck the checkbox next to Restore to Same Folder and then click the Browse button.
9. In the Browsing for destination folder dialog box, select the volume you want to restore the LUN (that is, /vol/restore_db) and click OK to start the restore.
10. Repeat step 9 for the transaction log LUN.
11. After the restores are complete, use the storage system CLI to move the restored LUNs to the root of the volume using the lun move command, if desired.
12. Set the restored LUNs to online using the lun online command.
13. Connect the Single Mailbox Recovery host to the restored LUNs with SnapDrive.
14. Use Single Mailbox Recovery to recover data from the mailbox database with the restored database LUN.
15. After the data has been recovered using Single Mailbox Recovery, you can use SnapDrive to disconnect or delete the restored LUNs from the Exchange server.

4.2 RESTORE LUNS FROM NDMP DUMP/THIRD-PARTY NDMP TAPE ARCHIVE

The restore process involves the restore of the LUNs and mounting them to a host running NetApp Single Mailbox Recovery so that the mailbox data can be recovered.

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUN that was backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.
2. After creating the restore volumes on the storage system, restore the LUNs using the Restore functions in the third-party tape backup software or using the NetApp CLI restore command if you used the NetApp CLI dump command to back up the LUNs in the Snapshot copy to tape.
3. Set the restored LUNs to online using the lun online command.
4. Connect the Single Mailbox Recovery host to the restored LUNs with SnapDrive.
5. Use Single Mailbox Recovery to recover data from the mailbox database with the restored database LUN.
6. After the data has been recovered using Single Mailbox Recovery, you can use SnapDrive to disconnect or delete the restored LUNs from the Exchange server.

4.3 RESTORE EXCHANGE DATA FROM TAPE ARCHIVE CREATED BY WINDOWS FILE-LEVEL BACKUP OR THIRD-PARTY WINDOWS FILE-LEVEL BACKUP

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUNs that were backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.

2. After creating the restore volumes on the storage system, create LUNs using SnapDrive as restore targets for the files that were backed up in the LUN in the SnapManager for Exchange Snapshot copy. These LUNs will be connected to the Single Mailbox Recovery host.
3. Use the Windows backup utility or the third-party Windows backup utility to restore the database file and transaction log files to the restore LUNs.
4. Use Single Mailbox Recovery to recover data from the mailbox database with the restored database LUN.
5. After the data has been recovered using Single Mailbox Recovery, you can use SnapDrive to disconnect or delete the restored LUNs from the Exchange server.

5 UNDERSTANDING SNAPMANAGER FOR SQL BACKUP SET ARCHIVAL

5.1 IMPORTANCE OF ARCHIVING COMPLETE BACKUP SET

A SnapManager for SQL Server backup set consists of the following components that are created as part of the SnapManager backup operation:

- SQL Server database Snapshot copies
- SQL Server transaction log Snapshot copies
- SnapInfo directory

All of the preceding components must be archived for you to successfully recover and implement a point-in-time restore.

When you use an NDMP backup application, such as NetApp SnapProtect, or the storage system's dump command to archive your SnapManager backups, you archive each LUN that contains data for that backup set. This method enables you to archive your SnapManager backup sets without involving SQL Server at all. Snapshot copies are created of the LUNs, then copied to the archive medium and deleted.

5.2 GUIDELINES FOR ARCHIVING BACKUP SET

Before you start archiving your data, consider the guidelines for choosing the type of data to be archived, naming, and using the appropriate protocols:

- Dedicate storage volumes to specific database hosts.
- Archive verified backups:
  - If you are not sure whether a backup copy is verified, use the SnapManager Restore window to check.
  - An unverified backup can be archived to tape. However, archiving an unverified backup can result in archiving an invalid backup set.
- Archive a complete backup set.
- Archive the most recent backup copy.
- If you use the SnapManager for SQL Server unique naming convention for backup sets, archive the Snapshot copy with the most recent date and time.
- If you did not use the unique name option when you created the backup, look for the most recent Snapshot copy in the storage system's LUN drive volume named:

  /sqlsnap_servername_recent

or

/sqlsnap_servername_recent_backupmgmtgroup.

- Do not use the CIFS or NFS protocols to archive LUNs.
- Use the storage system's dump command or an NDMP backup application, such as NetApp SnapProtect, to archive LUNs to tape.

In addition, when archiving SnapManager for SQL Server backups to tape, consider the following operational factors:

- The archive method you use
- Service-level agreements for recovery
- The number of SnapManager backups performed per day
- SQL Server database activity times
- Backup verification time

6 SNAPMANAGER FOR SQL SERVER ARCHIVE TO TAPE PROCESS

You can use different methods for selecting the components of your backup to archive.

- Use NetApp SnapProtect NAS iDataAgent, a third-party NDMP backup application (such as NetBackup), or the storage controller's dump command to archive SnapManager backup sets to the archive medium using NDMP.
- Mount the LUNs in a SnapManager backup Snapshot copy and share it, then use NetApp SnapProtect Windows iDataAgent, Windows backup, or another third-party Windows backup utility to copy the LUNs' contents to the archive medium. This document will cover the process using the Windows Backup utility.

6.1.1 AUTOMATIC BACKUP ARCHIVING USING RUN AFTER COMMAND OPERATION FEATURE

SnapManager allows you to automatically run your own program or script after a backup or database verification operation, but only after the operation finishes successfully. This feature, called Run Command After Operation, is typically used to automatically archive a backup copy.

Make sure that you archive all components of a backup set together. If any one of the SQL Server databases is offline and you a initiate a backup process using the Run Command After Operation, the backup operation fails for that particular job.

6.1.2 COMMAND ARGUMENTS SUPPORTED BY RUN COMMAND AFTER OPERATION FEATURE

The Run Command After Operation feature supports some predefined variables that can pass operation-specific information to your program or script.

$SqlSnapshot

Expands to the name of a SQL Server database Snapshot copy, as shown in the following examples:

```
sqlsnap__sql1__01-31-2012_15.03.09
sqlsnap__sql1__recent
```

$InfoSnapshot

Expands to the name of a SnapInfo directory Snapshot copy, as shown in the following examples:

```
sqlinfo__sql1__01-31-2012_15.03.09
sqlinfo__sql1__recent
```

$SnapInfoName

Expands to the name of the SnapInfo directory, as shown in the following examples:

```
sql1__01-23-2012_16.21.07__Daily
sql1__recent
```

If you use this variable, you must also provide the correct path to the directory.

$SnapInfoPath

Expands to the name of the SnapInfo subdirectory, as shown in the following example:

```
I:\SMSQL_SnapInfo\SQL_sql1\DB__northwind
```

6.2 SPECIFYING COMMAND TO BE RUN BY RUN COMMAND AFTER OPERATION FEATURE

While specifying a backup or verification operation, you can use Run Command After Operation to specify the details of the command that you want to run after the operation finishes. Using default values for the command arguments frees you from entering the command information each time you initiate a backup or verification operation.

Before You Begin

- You must install SnapManager on a computer that you specify, but you do not need to configure it.
- If your script is stored on a network share, use the UNC path rather than the network drive letter to specify the script's location.
- Add the network location to Internet Explorer's list of trusted sites; otherwise, your command might fail.

About This Task

If more than one Snapshot copy of the same type exists for your command, include that Snapshot copy's variable name once for every Snapshot copy. If you do not, you cannot create a complete archive. For example, if you enter myscript $SqlSnap $InfoSnap, the command that is generated is myscript snap1 snap2.

Steps

1. Use the Backup wizard or the Backup and Verify window to specify a full database backup, a transaction log–only backup, or a database verification.
2. Select Yes, Run a command after this operation in the Backup wizard or Run Command After Operation in the Backup and Verify window.
3. Under Specify a computer where..., select the host on which your program or script resides.
4. Under Specify the full path..., select your program or script.

5. Type the command input string in Command Arguments.

   You can directly enter text or select the variable you want to enter from the SnapManager Variables list.

6. Repeat steps 4 and 5 as needed until the Command Arguments box contains all of the arguments that you want to pass to your program or script.

7. Click OK and return to the backup or verification setup process.

After the backup or verification finishes successfully, the command that you specified, with the Snapshot copy and SnapInfo information for this backup operation inserted, runs automatically.

Example: Script and Required Parameters

Suppose that you want to run the following script:

C:\SnapManager Scripts\scriptname.bat

You need the following parameters:

- Name of the database Snapshot copy
- Name of the specific SnapInfo directory
- NTFS path to the SnapInfo directory

6.3 TAPE ARCHIVE USING NDMP BACKUP OVERVIEW

You can use NetApp SnapProtect NAS iDataAgent, a third-party NDMP backup application using Network Data Management Protocol (NDMP), or the Data ONTAP dump command to archive each of the LUNs that contain data for the backup set that you want to archive directly from the storage system to the archive medium, without involving SQL Server at all.

NDMP and dump command are the most efficient methods for creating archives of the LUN drive files.

For more information about backing up storage system data to tape, see the Data ONTAP System Administration Guide for your version of Data ONTAP.

Path Name for LUN to Be Archived

When using NDMP or the dump command to archive your SnapManager backups, specify the database LUN by using its absolute path name, `/vol/volume_name/.snapshot/snapshot_name/LUN_name`, in which the three variables represent the following text strings:

- volume_name Name of the volume containing the data to be archived
- snapshot_name Name of the Snapshot copy containing the LUNs to be archived
- LUN_name Name of the LUN containing the data to be archived

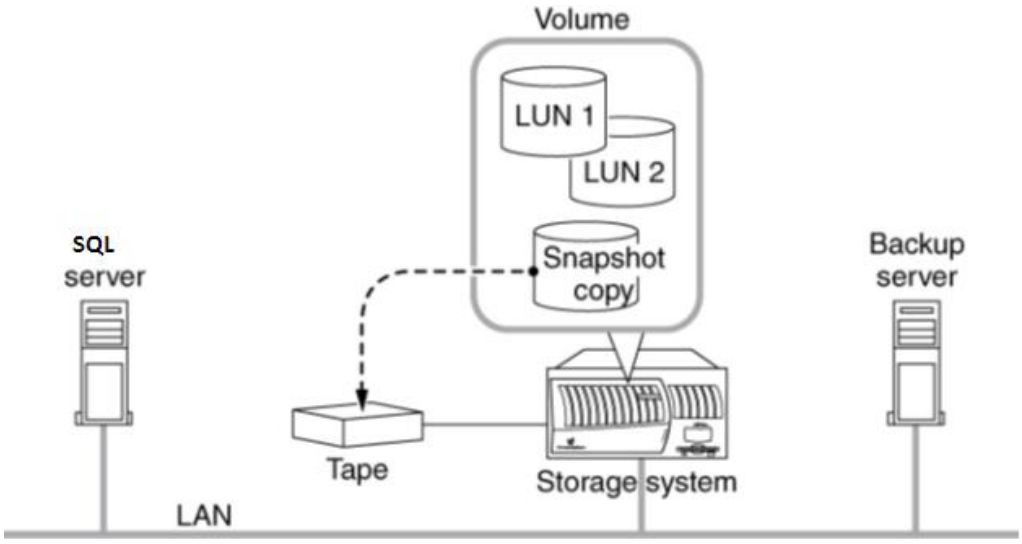
For example, the absolute path name of the LUN sql_db.lun in the Snapshot copy `sqlsnap__esql11_01-20-2012_12.05.58_Daily` on the volume sql_db is represented as follows:

`/vol/sql_db/.snapshot/sqlsnap__sql1_01-20-2012_12.05.58__Daily/sql_db.lun`

EVALUATION OF NDMP AND DUMP COMMAND METHOD OF ARCHIVING

The NDMP and the dump command are the most efficient methods of creating archives of the LUN drive files. LUN Snapshot copies are made, copied to the archive medium, and deleted as shown in the following diagram.

Figure 3



Advantages

- Because the NDMP and the dump command methods do not rely on mounting a Snapshot copy, you do not risk creating of busy Snapshot copies.
- Because the NDMP and the dump command methods archive the entire raw LUN, restoring involves restoring the entire LUN.
- If your archive procedure does not send the data over the network, the NDMP and the dump command methods can be significantly faster than other methods.

Disadvantages

- Because you are archiving raw LUNs, the entire LUN containing the SQL Server data is archived, so you archive more data than you need.

  If archiving extra data is undesirable, you can use Windows backup or another Windows backup utility to back up the corresponding SnapInfo directory. Coordinate this so that the two pieces of the archive are kept together for later retrieval.

  If you archive the SnapInfo directory separately, you must make sure that you get the SnapInfo directory backed up directly from SQL Server and the SQL Server data extracted from the LUN backed by Snapshot copy from different locations into the same archive.

6.3.1 EXAMPLE: USING NETAPP SNAPPROTECT TO ARCHIVE SNAPMANAGER FOR SQL SERVER BACKUP SET TO TAPE

You can run a script to archive your SnapManager backups to tape either by using the Run Command After Operation feature or by hardcoding the Snapshot copy names into the script if you are using the generic backup naming convention for SnapManager for SQL Server backup sets.

Assume you want to run a script in the following environment:

- The script is run on the computer running SQL Server and SnapManager.
- The name of the storage system is fas01.
- The name of the LUN containing the SQL Server databases is sql_db.lun.
- The name of the LUN containing the SQL Server transaction logs is sql_log.lun.
- The name of the LUN containing the SnapInfo LUN is sql_snapinfo.lun.
- The name of the volume that contains the SQL Server databases is sql_db.
- The name of the volume that contains the SQL Server transaction logs is sql_logs.
- The name of the volume that contains the SnapInfo LUN is sql1_snapinfo.lun.
- NDMP is enabled and a local account is created (that is, ndmpuser) on the storage system that is a member of the Backup Operators group on the storage system.
- An ndmp password for the local account (that is, ndmpuser) has been created.
- NetApp SnapProtect CommCell must be installed and configured in the environment.
- NetApp SnapProtect iDataAgent client is installed on SQL Server and configured in the CommCell.

Procedure Configure SnapProtect NDMP Backup to Be Called from SnapManager

1. Add the storage controller, fas01, as a NAS client computer in the SnapProtect CommCell.
2. On SQL Server where the SnapProtect iDataAgent client is installed, add the registry key `HKEY_LOCAL_MACHINE\SOFTWARE\CommVault Systems\Galaxy\Instance<xxx>\NAS`.
3. Under the NAS key, add the value `OnDemandLocalFilePath` as a string type.
4. Set the value of `OnDemandLocalFilePath` to the path of the content file, `c:\snappath.txt`.
5. In the CommCell browser, double-click the storage system, fas01, and right-click the NetApp NAS NDMP agent, select Tasks, and then select New On Demand Backup Set.
6. From the New On Demand Backup Set dialog box, enter in SME Tape Archive for the on-demand backup set you want to create.
7. Associate a storage policy with the new on-demand backup set and click OK to continue.
8. In the Backup Schedule dialog box, select Do Not Schedule and click OK to continue.
9. In the CommCell browser, double-click the SMSQL Tape Archive on-demand backup set that was created in the previous step.
10. Right-click the default subclient name and select Properties.
11. Click the SnapProtect Operations tab and deselect the SnapProtect checkbox. Click OK on the warning message and then click OK once again to complete the configuration of the subclient.
12. Right-click the default subclient for the SMSQL Tape Archive on-demand backup set and select Backup.
13. In the Backup Options dialog box, make sure that the Immediate radio button is checked under Job Initiation and then click the Save as Script button.
14. Select the name of SQL Server (that is, sql1) from the client drop-down list.
15. Enter in the path where the script file will be saved (that is, C:\smsql_tape_archive.bat).

16. Select the CommCell user account that will run the script (that is, ndmpuser). This script will contain qcommands that will initiate the tape archive actions in SnapProtect. Click OK to complete the action.
17. A Windows .bat file and an XML file will be created in the location where you saved the script.
18. In SnapManager for SQL Server, set up a backup job to run the script with the following options in the Run After Command Operation in the SMSQL Backup wizard:
    - Computer where script is run: host name of SQL Server where SMSQL backups are created (that is, sql1)
    - Full path to script to be run (that is, C:\smsql_tape_archive.bat)
    - SnapManager variables: $SqlSnapshot $InfoSnapShot

      The command-line parameters %1 and %2 might provide values similar to the following, respectively:

      ```
      sqlsnap__sql1_01-20-2012_12.05.58
      ```

      ```
      sqlinfo__sql1_01-20-2012_12.05.58
      ```
19. Modify the script created by SnapProtect to update the SnapProtect Demand file with the correct Snapshot paths and to make sure that no Unicode characters are passed into the script by SMSQL.

    Add the following commands to the batch file:

    ```
    echo /vol/sql_db/.snapshot/%1>C:\snappathtemp.txt
    ```

    ```
    echo /vol/sql_logs/.snapshot/%1>>C:\snappathtemp.txt
    ```

    ```
    echo /vol/sql_snapinfo/.snapshot/%2>>C:\snappathtemp.txt
    ```

    ```
    cvconvertunicode.exe C:\snappathtemp.txt c:\snappath.txt
    ```

    The first line writes the Snapshot path for the database LUN to a temporary SnapProtect Demand file on SQL Server where the backups were created with SMSQL (that is, sql1).

    The second line writes the Snapshot path for the transaction log LUN to a temporary SnapProtect Demand file on SQL Server where the backups were created with SMSQL (that is, sql1).

    The third line writes the Snapshot path for the SnapInfo LUN to a temporary SnapProtect Demand file on SQL Server where the backups were created with SMSQL (that is, sql1).

    If there are additional database and transaction log volumes, make sure that you add an additional line for each separate volume.

    The fourth line calls a SnapProtect utility that reads the temporary copy of the SnapProtect Demand file, converts any Unicode characters, and writes the output to a SnapProtect Demand file the SnapProtect OnDemand backup job will use.

The following sample script uses the NetApp SnapProtect qcommands to archive the database transaction log LUNs in the Snapshot copy created by SnapManager for SQL Server to the tape.

```
@echo off

setlocal

if not defined GALAXY_BASE set GALAXY_BASE=C:\Program
Files\NetApp\SnapProtect\Base
```

```
set PATH=%PATH%;%GALAXY_BASE%
set response="sme_tape_archive.bat_13271820.tmp"

REM ***** Begin customization section here *****
echo /vol/sql_db/.snapshot/%1>C:\snappathorig.txt
echo /vol/sql_logs/.snapshot/%1>>C:\snappathorig.txt
echo /vol/sql1_snapinfo/.snapshot/%2>>C:\snappathorig.txt
cvconvertunicode.exe C:\snappathorig.txt c:\snappath.txt
REM ***** End customization section here *****
REM ***** Change ndmpuser password to match password set on controller *****
qlogin -u "ndmpuser"  -ps "3e362baac942d14eb5366e047a83d7995"  -cs "snapprotect-
svr.demo.netapp.com"
if %errorlevel% NEQ 0 (
                            echo Login failed.
                            goto endOfScript )
:loopx
if "%1"=="" ( goto loopz )
set input=%input% %1
shift
goto loopx
:loopz
REM ***** Update the qoperation line to specify the correct XML command file *****
qoperation execute -af "sme_tape_archive.bat_1327182005.xml"  %input% > %response%
if %errorlevel% NEQ 0 (
                       echo Failed to get job details.
                       goto end_1327182005 )
for /F "tokens=1* usebackq" %%i in (%response%) do echo %%i %%j
:loopInitial
REM ****** Update the qlist line to specify the correct XML command file ******
    for /l %%X in (1,1,6) do (cvsleep 20
    qlist job -co is -af %response% > C:\output_1327182005.result
if %errorlevel% NEQ 0 (
                       echo Failed to get job details.
                       goto end_1327182005 )
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (if not %%a == No
(goto loopEnd) echo %%a %%b))
echo Failed to start job for long time.
goto end_1327182005

:loopEnd
for /F "tokens=1,2" %%a in (C:\output_1327182005.result) do (echo %%a %%b)

echo Processing...
:loop_1327182005
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (if %%b == Running
(goto loop1)
if %%b == Waiting (goto loop1))
goto loop2
:loop1
cvsleep 20
```

```
qlist job -co is -af %response% > c:\output_1327182005.result
goto loop_1327182005
:loop2
echo Final Job Status:
for /F "tokens=1,2" %%a in (c:\output_1327182005.result) do (echo %%a %%b)
   del output_1327182005.result
:end_1327182005

set OrigErrLevel=%errorlevel%
qlogout

if %errorlevel% NEQ 0 (echo Logout failed. )
del %response%
if %OrigErrLevel% NEQ 0 exit /b %OrigErrLevel%
:endOfScript
```

WINDOWS POWERSHELL

If you want to use Windows PowerShell instead of Windows command shell scripting, you can use the following sample scripts.

The first sample script is a Windows batch file that is called by the SnapManager for Exchange Run Command After Operation functionality and then calls a Windows PowerShell script and passes the $SqlSnapShot and $InfoSnapShot parameters into the Windows PowerShell script.

```
powershell.exe c:\sme_tape_archive.ps1 %1 %2
```

The second sample script is a Windows PowerShell script that updates the SnapProtect Demand file on SQL Server and runs the SnapProtect qcommands copied from the script file that SnapProtect created.

The following sample script uses the NetApp SnapProtect qcommands to archive the database transaction log LUNs in the Snapshot copy created by SnapManager for SQL Server to the tape.

```
$sql_snapname = $args[0]
$sql_snapname = $db_snapname.Trim()
$snapinfo_snapname = $args[1]
$snapinfo_snapname = $log_snapname.Trim()

#Make sure you update these values specific to your environment
$tempsnappathfile = 'c:\snappathtemp.txt'
$snappathfile = 'c:\snappath.txt'
$logfile = 'C:\sme_tape_archive.log'
$commandfile = 'C:\sme_tape_archive.bat_1327182005.xml'


$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Construct backup paths" | out-file -filepath $logfile

$db_snappath = "/vol/sql_db/.snapshot/" + $sql_snapname | out-file -filepath
$tempsnappathfile

$log_snappath = "/vol/sql_logs/.snapshot/" + $sql_snapname | out-file -
filepath $tempsnappathfile –append

$snapinfo_snappath = "/vol/sql_snapinfo/.snapshot/" + $snapinfo_snapname |
```

```
out-file –filepath $tempsnappathfile -append

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Use CVconvertunicode utility to remove any unicode
characters" | out-file -filepath $logfile -append

& "C:\Program Files\NetApp\SnapProtect\Base\cvconvertunicode.exe"
$tempsnappathfile $snappathfile | out-file -filepath $logfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qlogin to snapprotect server" | out-file -filepath
$logfile –append


#Change ndmpuser password to match password set on controller
& "C:\Program Files\NetApp\SnapProtect\Base\qlogin.exe" -u "ndmpuser" -ps
"3e362baac942d14eb5366e047a83d7995" -cs "snapprotect-svr.demo.netapp.com" |
out-file -filepath $logfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qoperation to begin ndmp backup of SME snapshots" | out-
file -filepath $logfile –append

& "C:\Program Files\NetApp\SnapProtect\Base\qoperation.exe" execute -af
$commandfile | out-file -filepath $jobstatusfile

$timestamp = get-date -format "[HH.mm.ss]"
$timestamp + "     Qlogout of snapprotect server" | out-file -filepath
$logfile -append

& "C:\Program Files\NetApp\SnapProtect\Base\qlogout.exe" | out-file -filepath
$logfile –append
```

6.3.2 EXAMPLE: USING NDMP DUMP COMMAND TO ARCHIVE SNAPMANAGER FOR SQL SERVER BACKUP SET TO TAPE

You can run a script to archive your SnapManager backups to tape by using the Run Command After Operation feature.

Assume you want to run a script in the following environment:

- The script is run on the computer running SQL Server and SnapManager.
- The name of the storage system is fas01.
- The name of the LUN containing the SQL Server databases is sql_db.lun.
- The name of the LUN containing the SQL Server transaction logs is sql_log.lun.
- The name of the LUN containing the SnapInfo data is sql1_snapinfo.lun.
- The name of the volume that contains the SQL Server database is sql_db.
- The name of the volume that contains the SQL Server transaction logs is sql_logs.
- The name of the volume that contains the SnapInfo data is sql1_snapinfo.
- An rsh client is installed on SQL Server.

To run a script using the SnapManager Run Command After Operation feature, use the following command:

C:\SnapManager Scripts\scriptname.bat $SqlSnapshot $InfoSnapshot

The command-line parameters %1 and %2 might provide values similar to the following, respectively:

```
sqlsnap__sql1_01-20-2012_12.05.58__Daily
sqlinfo__sql1_01-20-2012_12.05.58__Daily
```

The following sample script uses the storage system dump command to dump the database, transaction logs, and SnapInfo LUNs to the tape. This script relies on rsh functioning on the SnapInfo server using the SnapManager user account.

```
REM Back up the LUN containing the SQL database.
REM For this example, a level 0 backup is performed
REM to the tape device named nrst0a.
rsh fas01 dump 0f nrst0a /vol/sql_db/.snapshot/%1/sql_db.lun
REM Before appending the next backup to the tape,
REM reposition to the end of the tape so the next
REM write will not overwrite the existing data.
rsh fas01 mt -f nrst0a eom
REM Back up the LUN containing the SQL Server
REM transaction log files.
rsh fas01 dump 0f nrst0a /vol/sql_logs/.snapshot/%1/sql_log.lun
REM Back up the LUN containing the SnapInfo data
rsh fas01 dump 0f nrst0a /vol/sql1_snapinfo/.snapshot/%2/sql1_snapinfo.lun
```

Note: If you do not use the Run Command After Operation feature and you do not use the unique naming convention for your backups, you can hard code the Snapshot copy names into the script.

For example, the dump command for the database might look like this, for a SQL Server instance named sql1:

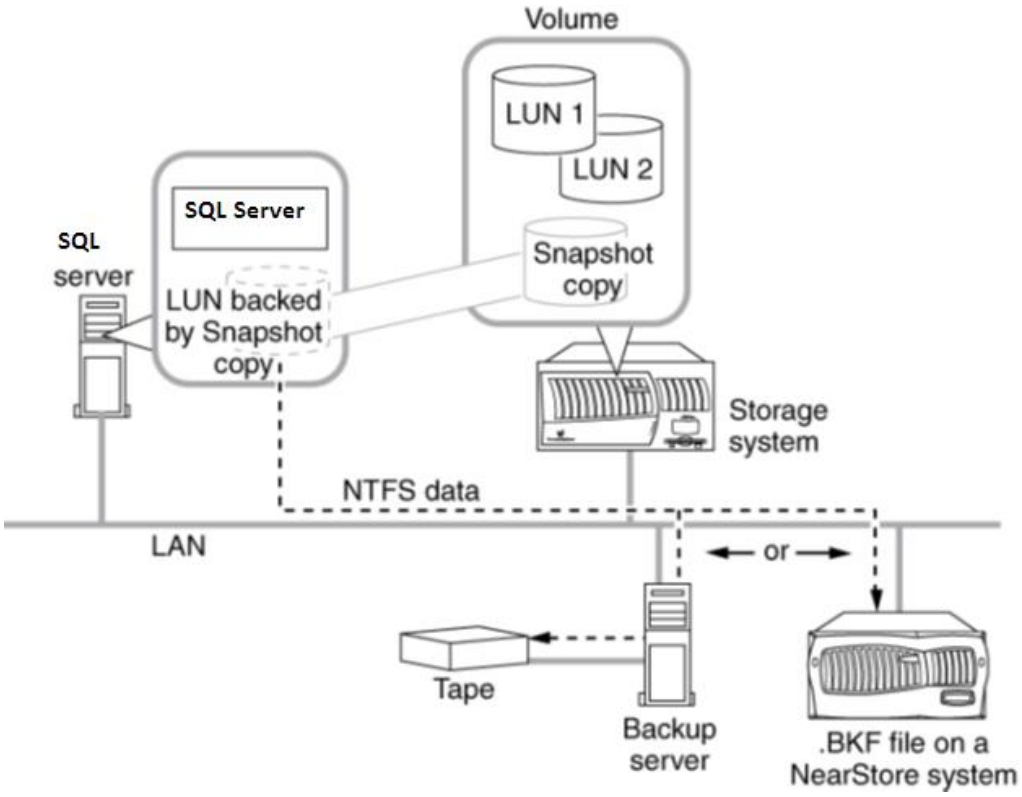
```
rsh fas01 dump 0f nrst0a
/vol/sql_db/.snapshot/sqlsnap__sql1__recent__Daily/sql_db.lun

rsh fas01 dump 0f nrst0a
/vol/sql_logs/.snapshot/sqlsnap__sql1__recent__Daily/sql_log.lun

rsh fas01 dump 0f nrst0a
/vol/sql1_snapinfo/.snapshot/sqlinfo__sql1__recent__Daily/sql1_snapinfo.lun
```

6.4 ARCHIVES CREATED USING WINDOWS BACKUP UTILITY OR THIRD-PARTY WINDOWS BACKUP UTILITY

You can use the built-in Windows backup utility or a third-party Windows file backup utility to archive your SnapManager backups to tape. To do so, you mount the LUNs backed up by the Snapshot copy that you want to archive and then use the Windows backup utility or a third-party backup utility to archive the backup set to your archive medium.

In this case, the NTFS data is backed up, rather than the raw LUNs, as shown in the following diagram:

Figure 4



Note: You do not need to mount the LUN on SQL Server; you can use another computer for archiving.

Your archive must include the following two components:

- The SnapInfo directory backed up directly from SQL Server
- The SQL Server data extracted from the LUN backed up by a Snapshot copy

EVALUATION OF WINDOWS BACKUP UTILITY/THIRD-PARTY WINDOWS BACKUP UTILITY METHOD OF ARCHIVING

Using the Windows backup utility to archive your SnapManager backups enables you to select exactly which data you archive; however, you must be careful to avoid scheduling any backups while the archiving is performed.

Advantages

- Because you are archiving NTFS data rather than raw LUNs, you can archive exactly the data that you need, and no more.
- The procedures and tools used for this method are familiar and available to you.

Disadvantages

- This method requires a FlexClone license activated on the storage system or requires that you avoid scheduling any backups during the archive process, because creating a Snapshot copy of a mounted Snapshot copy results in a Snapshot copy that cannot be deleted.
- You must make sure that you get the SnapInfo directory backed up directly from SQL Server and the SQL Server data extracted from the LUN backed by a Snapshot copy from different locations into the same archive.

- Windows backup utility on Windows 2008 and Windows 2008R2 does not support backup to tape devices.

6.4.1 EXAMPLE: USING WINDOWS BACKUP UTILITY OR THIRD-PARTY WINDOWS BACKUP UTILITY TO CREATE FILE-LEVEL TAPE ARCHIVE OF SNAPMANAGER BACKUPS

You can use a script to mount a Snapshot copy of the LUNs that contain the SQL Server databases, then back up the databases using Windows Backup, unmount the LUNs, and back up the SnapInfo directory.

Assume that you use a script in the following environment:

- The script is run on the computer running SQL Server and SnapManager.
- The drive letter for the SQL Server database is S:.
- The Snapshot copy is mounted as drive V:.
- The drive letter for the SQL Server transaction logs is T:.
- The Snapshot copy is mounted as drive W:.
- The drive letter used for the LUN mount must be available when you run the script.
- The command-line parameters %1, %2, and %3 might provide values similar to the following, respectively:

```
sqlsnap__sql1_01-20-2012_12.05.58__Daily
sqlinfo__sql1_01-20-2012_12.05.58__Daily
```

To run this script using the SnapManager Run Command After Operation feature, use the following command:

C:\SnapManager Scripts\scriptname.bat $SqlSnapshot $SnapInfoPath $LogBackupFile

The following sample script mounts a Snapshot copy of the LUNs that contain the SQL Server databases, and it backs them up using Windows Backup. It then unmounts the LUNs and backs up the SnapInfo directory.

```
REM Mount a LUN backed by the Snapshot copy of the SQL server
REM database as drive letter V:\ and mount a LUN backed by
REM the SQL server transaction logs as drive letter W:\.

sdcli snap mount -k s -s %1 -d v
sdcli snap mount –k t –s %1 –d w

REM Use Windows backup to back up the database files. The path
REM to the databases in your environment might be different.

wbadmin start backup –backuptarget “fas01\backuptarget” –include "V:\Program
Files\Microsoft SQL Server”,”W:\Program Files\Microsoft SQL Server”,%2,%3

REM Dismount the Snapshot copies mounted as drive letter V:\ and W:\.
REM The below example is shown with an optional parameter (-f)
REM to forcefully disconnect the drive letter.

sdcli snap unmount -d v –f
sdcli snap unmount –d w -f
```

7 SNAPMANAGER FOR SQL SERVER RESTORE FROM TAPE ARCHIVE PROCESS

The restore process will differ depending on the method that was used to archive the SnapManager backup set to tape.

- Restore SQL Server data from tape archive of LUNs in the SnapManager backup set created by NetApp SnapProtect NAS iDataAgent, by a third-party NDMP backup application (such as NetBackup), or by the storage controller's dump command.
- Restore SQL Server data from tape archive of the SQL Server data in the LUNs in the SnapManager backup set created by NetApp SnapProtect Windows iDataAgent, Windows Backup, NTBackup, or another Windows third-party backup utility.

7.1 RESTORE LUNS FROM SNAPPROTECT TAPE ARCHIVE

The restore process involves the restore of the LUNs and mounting them to SQL Server with SnapDrive and SnapManager for SQL Server.

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUN that was backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.

2. Log into the SnapProtect CommServe server (that is, snapprotect-svr).
3. In the CommCell browser, expand the client computers object and then double-click the storage system (that is, fas01).
4. Double-click the NetApp NAS NDMP agent and then right-click the SMSQL Tape Archive backup set and select All Tasks and then the Browse Backup Data task.
5. In the Browse Backup Data dialog box, define the Specify Browse Time if you are interested in restoring from tape archive for a particular date. To restore from the latest backup sets, make sure that Browse the Latest Data radio button is selected and click OK.
6. The CommCell browser then displays a list of backup sets. Expand the SMSQL Tape Archive backup set and then expand the path of the data down to the Snapshot copy (that is, SMSQL Tape Archive:/vol/sql_db/.snapshot/<snapshot name>).
7. Check the checkbox next to the Snapshot name and then click the Recover All Selected… button.
8. In the Restore Options for All Selected Items dialog box, make sure that the storage system to which you want to restore is listed in the Destination Client field. Make sure that you uncheck the checkbox next to Restore to Same Folder and then click the Browse button.
9. In the Browsing for destination folder dialog box, select the volume you want to restore the LUN (that is, /vol/restore_db) and click OK to start the restore.
10. Repeat step 9 for the transaction log LUN.
11. After the restores are complete, use the storage system CLI to move the restored LUNs to the root of the volume using the lun move command. The Snapshot names are restored as qtrees.
12. Set the restored LUNs to online using the lun online command.
13. Connect the restored LUNs to SQL Server with SnapDrive.
14. Open SQL Server management studio and attach the databases you want to recover.

7.2 RESTORE LUNS FROM NDMP DUMP/THIRD-PARTY NDMP TAPE ARCHIVE

The restore process involves the restore of the LUNs and mounting them to SQL Server with SnapDrive and SnapManager for SQL Server:

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUN that was backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.

2. After creating the restore volumes on the storage system, restore the LUNs using the Restore functions in the third-party tape backup software or using the NetApp CLI restore command if you used the NetApp CLI dump command to back up the LUNs in the Snapshot copy to tape.
3. Set the restored LUNs to online using the lun online command.
4. Connect the restored LUNs to SQL Server with SnapDrive.
5. Open SQL Server management studio and attach the databases you want to recover.

7.3 RESTORE SQL SERVER DATA FROM TAPE ARCHIVE CREATED BY WINDOWS FILE-LEVEL BACKUP OR THIRD-PARTY WINDOWS FILE-LEVEL BACKUP

1. Create restore volumes on the storage system with the same volume options as the original volumes and with enough capacity to accommodate the size of the LUNs that were backed up.

   In this example, we will be creating two volumes, /vol/restore_db and /vol/restore_logs.

2. After creating the restore volumes on the storage system, create LUNs using SnapDrive as restore targets for the files that were backed up in the LUN in the SnapManager for SQL Server Snapshot copy. These LUNs will be connected to SQL Server.
3. Use the Windows backup utility or the third-party Windows backup utility to restore the database file and transaction log files to the restore LUNs.
4. After restoring the data, open SQL Server management studio and attach the databases you want to recover.

7.4 POINT-IN-TIME RESTORE OF SQL SERVER DATA FROM TAPE ARCHIVE

If you are looking to restore to a point in time between archived backups using SnapManager for SQL Server, perform the following steps:

Assuming that you have two backup sets, day 1 and day 2.

1. Restore the database and transaction log LUNs from day 1 backup set using SnapProtect.
2. Restore the SnapInfo LUN from day 2 backup set using SnapProtect.
3. Connect the LUNs to their original drive letters or mountpoints.
4. Open SQL Server management studio and connect the databases you want to restore.
5. If the recovery SQL Server instance is different than the original SQL Server instance, open SnapManager for SQL Server and select the restore option of “Restore backups created on a different server”:
   a. Specify the directory path of the SnapInfo data.
   b. Specify the transaction logs to apply and the time period for the transactions to be applied.

6. If the recovery SQL Server instance is the original SQL Server instance, open SnapManager for SQL Server and select the restore option of “Restore SnapManager backups that were created on the same SQL Server":
   a. Specify the transaction logs to apply and the time period for the transactions to be applied.

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