Restoring database backups

SnapManager for SAP

NetApp
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Table of Contents

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SnapManager for SAP enables you to restore a database to the state it was when a Snapshot copy was taken. Because backups are created more frequently, the number of logs that need to be applied is reduced, thus reducing the mean-time-to-recovery (MTTR) for a database.

The following are some of the tasks that you can perform related to restoring and recovering data in databases:

- Perform a file-based restore.

- Restore the entire backup or a portion of it.

  If you restore a portion of it, you specify a group of tablespaces or a group of data files. You can also restore the control files along with the data or just the control files themselves.

- Recover the data based on either a point in time or on all of the available logs, which stores the last transaction committed to the database.

  The point in time can be an Oracle System Change Number (SCN) or a date and time (yyyy-mm-dd:hh:mm:ss). SnapManager uses the 24-hour clock.

- Restore from backups on primary storage (local backups).

- Restore and recover the backup by using SnapManager, or use SnapManager to restore the backup and use another tool, such as Recovery Manager (RMAN), to recover the data.

- Restore backups from alternate locations.

For more information, see the .

You can restore a backup made by a previous version of SnapManager by using SnapManager 3.0 and later versions.

Administrators can perform restore or recovery operations by using the SnapManager graphical user interface (GUI) or by using the command-line interface (CLI).

What database restore is

SnapManager enables you to perform file-based backup and restore operations.

The following table describes the restore methods:

Restore process	Details
File-based restores	Storage-side full file system restore (from primary or secondary): SnapManager performs a full logical unit number (LUN) restore.

Storage-side full file system restore

A storage-side full file system restore is performed when a volume restore cannot be performed, but the entire

files system can be restored on the storage system.

When a storage-side file system restore is performed, the following occurs:

- In a SAN environment, all the LUNs used by the file system (and underlying volume group if any) are restored on the storage system.

When a storage-side file system restore is performed, the following occurs, depending on the storage location:

- When SnapManager restores from primary storage systems, the LUNs (SAN) are restored in place via SFSR.
- When SnapManager restores from secondary storage systems, the LUNs (SAN) are copied from secondary storage systems back to the primary storage system over the network.

Because the file system is fully restored, files that are not part of the backup are reverted as well. An override is required if files, which are not part of the restore, exist in the file system that is being restored.

Host-side file restore

A host-side file copy restore is used as a last resort in SAN environments when storage-side file system restore and storage-side file restore cannot be performed.

A host-side file copy restore involves the following tasks:

- Cloning the storage
- Connecting the cloned storage to the host
- Copying files out of the clone file systems back into the active file systems
- Disconnecting the clone storage from the host
- Deleting the clone storage

Backup recovery

In SnapManager, you must perform the restore and recover operations at the same time. You cannot perform a restore operation and then perform a SnapManager recover operation later.

In SnapManager 3.2 or earlier, you can either use SnapManager to restore and recover the backup or use SnapManager to restore the backup and use another tool, such as Oracle Recovery Manager (RMAN), to recover the data. Because SnapManager can register its backups with RMAN, you can use RMAN to restore and recover the database at finer granularities such as blocks. This integration combines the benefits of speed and space efficiency of Snapshot copies with the fine level of control for restoring using RMAN.

> (i) You must recover a database before you can use it. You can use any tool or script to recover a database.

Starting from SnapManager 3.2 for SAP, SnapManager enables the restore of database backups automatically by using the archive log backups. Even when the archive log backups are available in the external location, SnapManager uses the archive log backups from the external location to restore the database backups.

If new data files are added to the database, Oracle recommends that you take a new backup immediately. Also, if you restore a backup taken before the new data files were added and attempt to recover to a point after

the new data files were added, the automatic Oracle recovery process might fail, because it is unable to create data files. See the Oracle documentation for the process for recovering data files added after a backup.

Database state needed for the restore process

The state of the database that is to be restored depends on the type of restore process that you want to perform and the type of files that are to be included.

The following table lists the state in which the database should be depending on the restore option selected and the type of files you want to include in the restore:

Type of restore	Files included	Database state for this instance
Restore only	Control files	Shutdown
	System files	Mount or Shutdown
	No system files	Any state
Restore and recovery	Control files	Shutdown
	System files	Mount
	No system files	Mount or Open

The database state required by SnapManager for a restore operation depends on the type of restore being performed (complete, partial, or control files). SnapManager does not transition the database to a lower state (for example, from Open to Mount) unless the `force` option is specified.

SnapManager for SAP does not verify whether SAP is running. SnapManager for SAP waits for a timeout to elapse and then shuts down the database, which can add an hour of additional restore time.

What restore preview plans are

SnapManager provides restore plans before and after a restore operation is completed. The restore plans are used to preview, review, and analyze regarding different restore methods.

Structure of the restore plan

The restore plan consists of the following two sections:

- Preview/Review: This section describes how SnapManager will restore (or has restored) each file.
- Analysis: This section describes why some restore mechanisms were not used during the restore operation.

The Preview/Review section

This section shows how each file will be or has been restored. When you view the restore plan before a restore operation, it is called a preview. When you view it after a restore operation is completed, it is called a review.

The following preview example shows that the files are restored by using storage-side file system restore and storage-side system restore methods. To determine why all the files would not be restored by using the same restore method, see the Analysis section.

```
Preview:
The following files will be restored completely via: storage side full
file system restore
E:\rac6\sysaux.dbf
E:\rac6\system.dbf
```

Each restore method has one subsection that contains information about the files that can be restored using that restore method. The subsections are ordered according to decreasing levels of storage method efficiency.

It is possible for one file to be restored by multiple restore methods. Multiple restore methods are used when the underlying logical unit numbers (LUNs) used for a file system are spread among different storage system volumes and some volumes are eligible for volume restore, while others are not. If multiple restore methods are used to restore the same file, the preview section will be similar to the following:

```
The following files will be restored via a combination of:
[storage side file system restore and storage side system restore]
```

The Analysis section

The Analysis section presents the reasons why some restore mechanisms will not be or were not used. You can use this information to determine what is required to enable more efficient restore mechanisms.

The following example shows an Analysis section:

```
Analysis:

The following reasons prevent certain files from being
restored completely via: storage side full file system restore
    * LUNs present in snapshot of volume fas960:
          \vol\disks may not be consistent when reverted:
          [fas960:\vol\disks\DG4D1.lun]
      Mapped LUNs in volume fas960:\vol\disks
          not part of the restore scope will be reverted: [DG4D1.lun]

Files to restore:
      E:\disks\sysaux.dbf
      E:\disks\system.dbf
      E:\disks\undotbs1.dbf
      E:\disks\undotbs2.dbf

 * Reasons denoted with an asterisk (*) are overridable.
```

In the example, you can override the first failure either from the command-line interface (CLI), or by selecting **Override** in the graphical user interface (GUI). The second failure about mapped LUNs in the volume is mandatory and not overridable.

You can resolve checks by doing the following:

- To resolve a mandatory check failure, change the environment so that the check will pass.
- To resolve an overridable check failure, you can change the environment, or override the check.

  However, you must be careful because overriding the check can result in undesired consequences.

Preview backup restore information

You can preview information about a backup restore process before it occurs to see information about restore eligibility that SnapManager for SAP found on your backup. SnapManager analyzes data on your backup to determine whether the restore process can be completed successfully.

About this task

The restore preview provides the following information:

- Which restore mechanism (storage-side file system restore, storage-side file restore, or host-side file copy restore) can be used to restore each file.
- Why more efficient mechanisms were not used to restore each file, when you specify the `-verbose` option.

If you specify the `-preview` option in the `backup restore` command, SnapManager does not restore anything, but lists the files to be restored and indicates how they will be restored.

> (i) You can preview all types of restore mechanisms. The preview shows information about up to 20 files.

Steps

1. Enter the following command:

   smsap backup restore -profile *profile_name* -label *label* -complete -preview -verbose

   Example

   For example, enter:

   ```
   smsap backup restore -profile targetdb1_prof1
         -label full_bkup_sales_nov_08  -complete -preview -verbose
   ```

   The following example shows the files ready to be restored and lists the different methods used for each:

```
The following files will be restored via storage side full file system
restore:
E:\disks\sysaux.dbf
E:\disks\system.dbf

The following files will be restored via host side file copy restore:
E:\disks\undotbs1.dbf
E:\disks\undotbs2.dbf
```

2. Review any reasons why other restore processes cannot be used.

3. Begin the restore operation without the `-preview` option, if only reasons that are overridable are displayed.

   You can still override non-mandatory checks.

Restore backups on primary storage

You can use the `backup restore` command to restore a database backup on primary storage.

About this task

You can use the `backup restore` command options to specify whether SnapManager should restore all or part of the backup. SnapManager also allows you to restore control files along with the data files or tablespaces from the backups in a single user operation. You can include `-controlfiles` with `-complete` to restore control files along with tablespaces and data files.

You can select one of the following options to restore the backup:

If you want to restore…	Use…
The entire backup with all tablespaces and data files	`-complete`
The list of specific tablespaces	`-tablespaces`
Specific data files	`-files`
The control files only	`-controlfiles`
Tablespaces, data files, and control files	`-complete -controlfiles`

You can also restore the backup from an alternate location by specifying `-restorespec`.

If you include `-recover`, you can recover the database to:

- The last transaction that occurred in the database (all logs)
- A specific date and time
- A specific Oracle System Change Number (SCN)
- The time of the backup (no logs)
- Restore only

> ⓘ Both date and time recovery and the SCN recovery are point-in-time recoveries.

SnapManager (3.2 or later) provides the ability to recover the restored database backups automatically by using the archive log files. Even if the archive log files are available in the external location, if you specify the `-recover-from-location` option, SnapManager uses the archive log files from the external location to recover the restored database backups.

When you specify the external archive log locations for the recovery of the restored backups, you must ensure that you include the external location names in uppercase. In the file system, all the folders and subfolders names must be in uppercase, because Oracle translates the destination path to uppercase and expects the external destination paths, folder names, and subfolder names to be in uppercase. If you specify the external archive log destination paths in lowercase, Oracle might not be able to identify the specified path, and fails to restore the database.

SnapManager provides the external location to Oracle. But, Oracle does not identify the files from the external destination. This behavior is noticed in flash recovery area destination. These are issues with Oracle and the workaround is to always have backup of archive log files in such database layouts.

If any inconsistent SCN or date is provided, then recovery will stop at the last consistent point recovered with the error message `Recovery succeeded, but insufficient.` You have to manually perform recovery to a consistent state.

For recovery when no logs are applied, SnapManager recovers until the last SCN of the last archive log file created during the backup. If the database is consistent until this SCN, then the database will be opened successfully. If the database is not consistent at this point, SnapManager still attempts to open the database, which will be opened successfully, if the database is already consistent.

> ⓘ SnapManager does not support recovering the archive log-only backups.

If the archive log destination is not a Snapshot-capable storage, SnapManager enables you to recover the restored database backups using the profile. Before performing SnapManager operations on non-Snapshot-capable storage, you should add the destinations for `archivedLogs.exclude` in `smsap.config`.

You must ensure that you set the exclude parameter before creating a profile. Only after setting the exclude parameter in the SnapManager configuration file, the profile creation is successful.

If the backup is already mounted, SnapManager does not mount the backup again and uses the already mounted backup. If the backup is mounted by a different user, and if the current user does not have access to the previously mounted backup, other users have to provide the permissions. All the archive log files have read permissions for the groups owners; the current user might not get the permissions, if the backup is mounted by a different user group. The users can give permissions to the mounted archive log files manually and then retry the restore or recovery.

You can specify the `-dump` option as an optional parameter to collect the dump files after the successful or failed restore operation.

Steps

1. Enter the following command:

   ```
   smsap backup restore -profile profile_name -label label -complete -recover
   -alllogs [-recover-from-location path [,path2]]-dump-verbose
   ```

   Example

   ```
   smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -
   complete -recover -alllogs -verbose
   ```

2. To restore data for different scenarios, complete one of the following:

If you want to restore…	Command Example
Complete database without control files and recover to a particular SCN number (3794392). In this case, the current control files exist, but all the data files are damaged or lost. Restore and recover the database from an existing full online backup to a point immediately before that SCN.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -complete -recover -until 3794392 -verbose`
Complete database without control files and recover up to a date and time.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -complete -recover -until 2008-09-15:15:29:23 -verbose`
Complete database without control files and recover up to a data and time. In this case, the current control files exist, but all of the data files are damaged or lost or a logical error occurred after a specific time. Restore and recover the database from an existing full online backup to a date and time immediately before the point of failure.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -complete -recover -until "2008-09-15:15:29:23" -verbose`
Partial database (one or more data files) without control files and recover using all available logs. In this case, the current control files exist, but one or more data files are damaged or lost. Restore those data files and recover the database from an existing full online backup using all available logs.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -files E:\disks\s02.dbf E:\disks\sales03.dbf E:\disks\sales04.dbf -recover -alllogs -verbose`
Partial database (one or more tablespaces) without control files and recover using all available logs. In this case, the current control files exist, but one or more tablespaces are dropped or one of more data files belonging to the tablespace are damaged or lost. Restore those tablespaces and recover the database from an existing full online backup using all available logs.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -tablespaces users -recover -alllogs -verbose`

If you want to restore…	Command Example
Only control files and recover using all available logs. In this case, the data files exist, but all control files are damaged or lost. Restore just the control files and recover the database from an existing full online backup using all available logs.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -controlfiles -recover -alllogs -verbose`
Complete database without control files and recover using the backup control files and all available logs. In this case, all data files are damaged or lost. Restore just the control files and recover the database from an existing full online backup using all available logs.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -complete -using-backup-controlfile -recover -alllogs -verbose`
Recover the restored database using the archive log files from the external archive log location.	`smsap backup restore -profile targetdb1_prof1 -label full_bkup_sales_nov_08 -complete -using-backup-controlfile -recover -alllogs -recover-from-location E:\\archive -verbose`

3. Specify external archive log locations by using the `-recover-from-location` option.

Restore files from an alternate location

SnapManager enables you to restore data files and control files from a location other than that of the Snapshot copies in the original volume.

The original location is the location of the file on the active file system at the time of the backup. The alternate location is the location from which a file will be restored.

You can restore from an alternate location to restore the data files from an intermediate file system to an active file system.

Recovery is automated by SnapManager. When recovering files from external locations, SnapManager uses the `recovery automatic from location` command.

SnapManager also uses Oracle Recovery Manager (RMAN) to recover files. The files to be recovered should be recognizable by Oracle. The file names should be in the default format. When recovering from flash recovery area, SnapManager provides the translated path to Oracle. Oracle though, does not recover from the flash recovery area because it cannot generate the correct file name. Ideally, flash recovery area is a destination that is intended to work with RMAN.

Restore backups from an alternate location overview

To restore a database backup from an alternate location, use the following major steps, each of which is further described in this section.

- Do one of the following, depending on your database layout and what needs to be restored:

- Restore the required data files from tape, SnapVault, SnapMirror, or any other media to any file system mounted on the database host.

- Restore the required file system and mount it on the database host.

- Connect to the required raw devices that exist in the local host.

- Create a restore specification Extensible Markup Language (XML) file that includes the mappings that SnapManager requires to restore from the alternate location to the original location. Save the file in a location that SnapManager can access.

- Use SnapManager to restore and recover the data using the restore specification XML file.

Restoration of the data from files

Before you restore from an alternate location, you need to restore the necessary files from any storage media and restore the files from applications like SnapVault or SnapMirror to a file system mounted on the local host.

You can use the restore from an alternate location operation to copy the files from an alternate file system to an active file system.

You need to specify the alternate locations from which to restore the original files by creating a restore specification.

Restoration of data from the file system

Before you restore data from an alternate location, you must restore the necessary file system and mount it on the local host.

You can invoke the restore operation from an alternate location to copy the files from alternate file systems to active file systems.

To perform this operation, you must specify the alternate mount points from which to restore the original mount points and the original Snapshot copy names by creating a restore specification file.

> ⓘ The Snapshot copy name is a necessary component because the same file system might be snapped multiple times in a single backup operation (for example, once for the data files and once for the log file).

Create restore specifications

The restore specification file is an XML file that contains the original and alternate locations from which the file can be restored. SnapManager uses this specification file to restore files from the specified location.

About this task

You can create the restore specification file by using any text editor. You must use a .xml extension for the file.

Steps

1. Open a text file.

2. Enter the following:

```
<restore-specification xmlns="http://www.netapp.com">
```

3. Enter any file mapping information using the format shown in the following example:

```
<file-mapping>
    <original-location>E:\disks\sysaux.dbf</original-location>
    <alternate-location>E:\disks\sysaux.dbf</alternate-location>
</file-mapping>
```

File mapping specifies where a file is restored from. The original location is the location of the file on the active file system at the time of backup. The alternate location is the location from where the file is restored.

4. Enter any mounted file system mapping information using the format shown in the example:

```
<mountpoint-mapping>
    <original-location>E:\disks\sysaux.dbf</original-location>
    <snapname>snapname</snapname>
    <alternate-location>E:\disks\sysaux.dbf</alternate-location>
</mountpoint-mapping>
```

Mountpoint refers to directory path `C:\myfs`. The mountpoint mapping specifies the mountpoint from which the files are restored. The original location is the location of the mountpoint in the active file system at the time of backup. The alternate location is the mountpoint from which the files in the original location are restored. The `snapname` is the name of the Snapshot copy in which the original files were backed up.

> (i) The Snapshot copy name is a necessary component because the same file system can be used multiple times in a single backup operation (for example, once for the data files and once for the logs).

5. Enter the following:

   `</restore-specification>`

6. Save the file as a .xml file and close the specification.

Restore backups from an alternate location

You can restore from an alternate location to restore the data files from an intermediate file system to an active file system.

What you'll need

- Create a restore specification XML file and specify the type of restore method you want to use.

About this task

You can use the `smsap backup restore` command and specify the restore specification XML file you

created to restore the backup from an alternate location.

Step

1. Enter the following command:

```
smsap backup restore -profile profile -label label -complete-alllogs
-restorespec restorespec
```