

WHITE PAPER

SAP HANA BACK UP AND RECOVERY

USING SNAP TO NFS

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SUMMARY

Backing up SAP HANA on Pure Storage® FlashArray™ is now extremely simple using the Snap-to-NFS feature. Previously, snapshots taken for an SAP HANA system were considered as recover points and not actual backups, since these snapshots resided in FlashArray only. Now, Snap-to-NFS includes a built-in ability to move snapshots off FlashArray to any NFS storage system. Examples of storage systems that can be used as NFS targets include the Pure Storage FlashBlade™ product; third-party NFS storage systems and disk-to-disk backup systems; and generic Linux servers with NFS exports.

This document will attempt to showcase this feature for a very common use case: backup and recovery of an SAP HANA instance. We will go over the necessary steps to take a snapshot of an SAP HANA instance for backup purposes and move that snapshot on to Pure Storage FlashBlade. We'll also show you how to restore the database via Snap-to- NFS.

AUDIENCE

The target audience for this document includes storage administrators, SAP system administrators, data center admins, etc., who are interested in deploying and maintaining an SAP environment with SAP HANA as the database layer on Pure FlashArray. A working knowledge of SAP HANA, server, storage, networks, and data center design is assumed but is not a prerequisite to read this document.

ENVIRONMENT

In order to test this concept, we set up an environment in our lab with the following entities:

COMPONENT	TYPE
DATABASE	SAP HANA 1.0 SPS12/SAP HANA 2.0
OPERATING SYSTEM	SUSE LINUX 12 SP 2
STORAGE	FLASHARRAY//X, FLASHBLADE

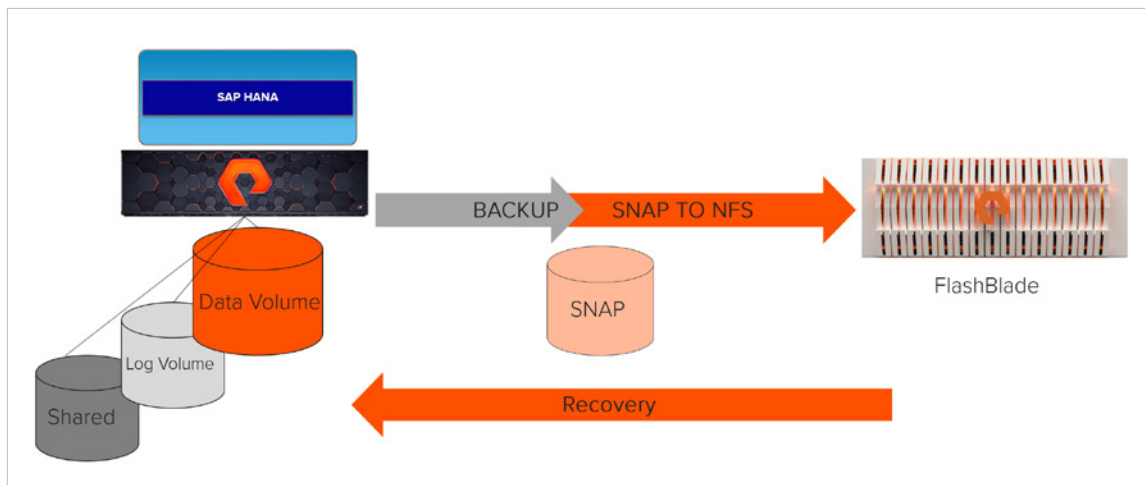


FIGURE 1. Test environment

SETTING UP SNAP-TO-NFS ON FLASHARRAY

The Pure Storage Support team has to enable Snap-to-NFS before it can be used. Enabling Snap to NFS is a one-time, non-disruptive, data-in-place process, and it involves the following steps:

- Ensure that the version of Purity on FlashArray supports Snap-to-NFS
- Enable Purity Run
- Install and configure Snap-to-NFS on FlashArray

After Snap to NFS is enabled by the Pure Support team, customers can start using it by connecting an NFS target to FlashArray and selecting it as a replication target in **Protection Groups**. Once it is configured, you will see **Offload Targets** enabled under the **Storage** pane → **Array** tab in the GUI, as shown below.

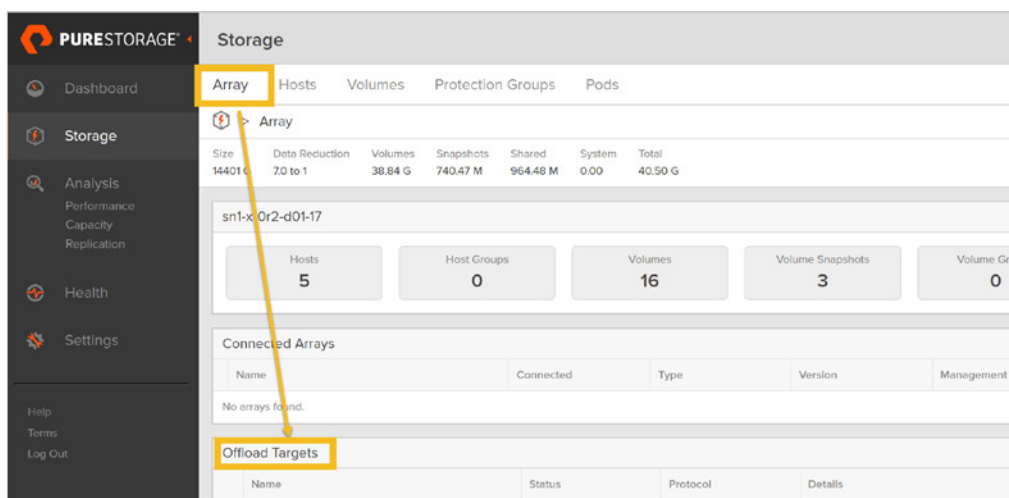


FIGURE 2. Array tab of the Storage pane

Then add a new **Offload Target**, in this case via the remote FlashBlade information and the File system credentials.

Connect NFS Target

Name

SAPSNAPTONFS

Address

XX.XXX.XX.XXX

Mount Point

/SAPNFS

Mount Options

port=num,rs= num,ws= num,nfsvers= num,tcp,udp

Cancel

Connect

FIGURE 3. Add a new Offload Target

Here is the File System information for FlashBlade.

PURESTORAGE

Dashboard

Storage

Analysis

Performance

Capacity

Health

Settings

Storage

File Systems

Object Store

> File Systems

File Systems

Name

SAP

SAP_HANA_BACKUP

SAPNFS

FIGURE 4. File System information for FlashBlade

Once the offload target is added for Snap-to-NFS, it will appear as shown below:

Offload Targets				
	Name	Status	Protocol	Details
✓	SAPSNAPTONFS	connected	nfs	Address: Mount Point: /SAPNFS

FIGURE 5. Offload Target added to Snap-to-NFS

The SAP HANA system has the following volumes. We need to add the data volume to the protection group.

Storage



Array

Hosts

Volumes

Protection Groups

Pods

 > Hosts >  sap-ch5-05-node4

Size

Data Reduction

Volumes

Snapshots

Shared

System

Total

4 T

1.9 to 1

34.66 G

2.68 M

-

-


34.67 G

Connected Volumes

1-4 of 4

<


>



Name ▲

Shared


LUN

 saphanadatavolume

False

1


X

 saphanalogvolume

False

2


X

 saphanasharedvolume

False

3

X

 SAPMEDIA1

False

6

X

Volumes for SAP HANA System

FIGURE 6. Add data volume to a protection group

Create a protection group and add the SAP HANA data volume to this protection group. Then select **Add** and choose **Offload Target** from the target options. This means the protection group is ready to replicate the data to the NFS target on the FlashBlade.

Array	Hosts	Volumes	Protection Groups	Pods
> Protection Groups > PG-SAPSNAPNFS				
Snapshots 0.00				
Members 1-1 of 1				
Name				
saphanadatavolume X				
Targets 1-1 of 1				
Name				
SAPSNAPNFS True				
Add... remove...				

FIGURE 7. Preparing the protection group for replication

HOW TO USE SNAP-TO-NFS BACKUP ON SAP HANA

SAP HANA best practice dictates using the **PREPARE** statement prior to taking a backup copy. This step creates a database internal snapshot based on a system wide **savepoint** executed during the PREPARE. During this period, no other backup should run, but log backup can continue as configured.

Step 1: PREPARE Statement

From SAP HANA Studio, perform the following steps:

In the Backup section → Context menu → **Manage Storage Snapshot** → select **Prepare**.

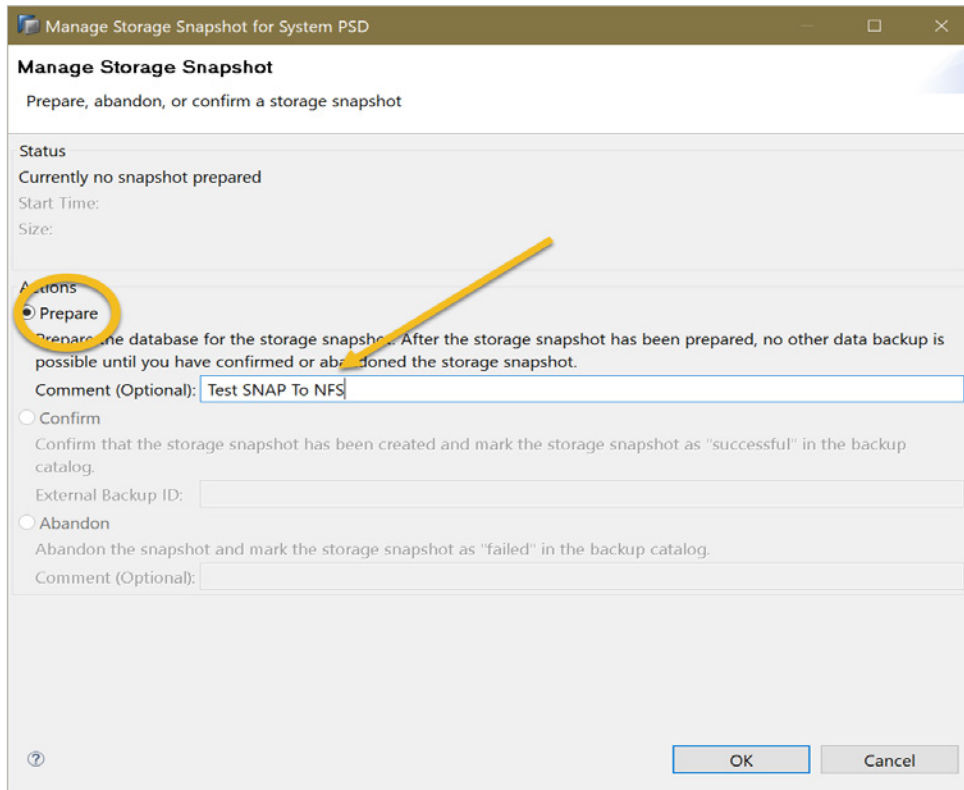


FIGURE 8. Manage Storage Snapshot pane

Alternatively, this step can also be performed with a SQL statement on the index server (the database user as BACKUP OPERATOR authorization):

```
BACKUP DATA CREATE SNAPSHOT BACKUP OPERATOR
```

In SAP HANA 2.0, however, you need to do the following to put SAP HANA in create snapshot mode:

```
BACKUP DATA FOR FULL SYSTEM CREATE SNAPSHOT
```

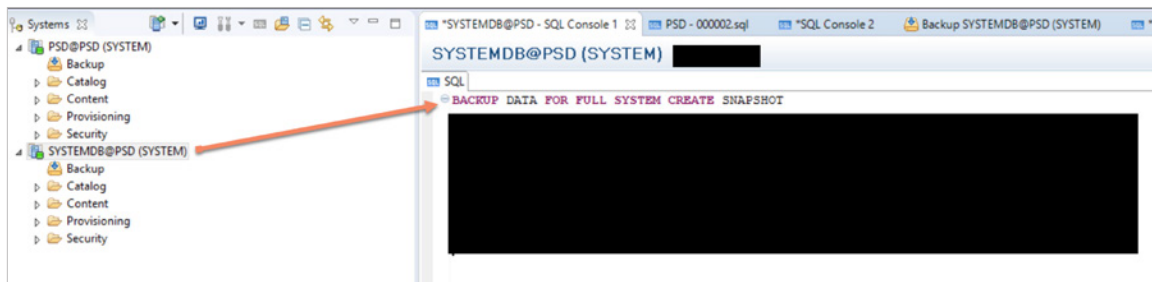


FIGURE 9. Putting SAP HANA in create snapshot mode

Now the database is prepared for the storage snapshot. Verify the backup details, either through the backup catalog tab in SAP HANA studio (make sure you capture important details, like ID), or by issuing the following SQL statement to get the backup details using the view **M_BACKUP_CATALOG**:

```
select * from M_BACKUP_CATALOG where "ENTRY_TYPE_NAME" ='data snapshot'
```

Check the data volumes' mount point and see if there is a file created that matches **snapshot_databackup_0_1**.

```
saphananode3:/hana/data/PSD/mnt00001/hdb00001 # ls
DO_NOT_TOUCH_FILES_IN_THIS_DIRECTORY__ datavolume_0000.dat landscape.id snapshot_databackup_0_1
saphananode3:/hana/data/PSD/mnt00001/hdb00001 #
```

FIGURE 10. Matching snapshot ID

After you perform the above operation, be sure to freeze your file system (XFS) using **xfs_freeze**:

```
xfs_freeze -f <Data Volume mount point>
```

And unfreeze it after taking the snapshot:

```
xfs_freeze -u <Data volume mount point>
```

Step 2: Create a Protection Group Snapshot

To take a snapshot using the Pure Storage GUI, go to the **Storage** tab and select a protection group

Click **Add** on the right and select the **+** sign to create a new snapshot. This creates a near instantaneous copy regardless of the size of the volume.

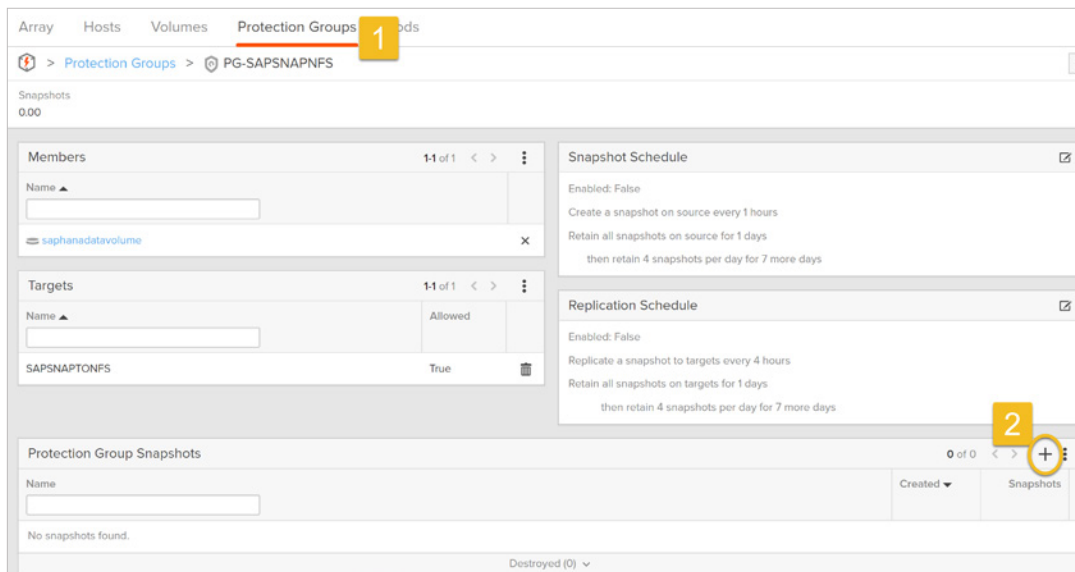


FIGURE 11. Taking a snapshot with the Pure GUI

Make sure you select **Replicate Now**, as this will replicate the snapshot to the NFS Target, which is FlashBlade.

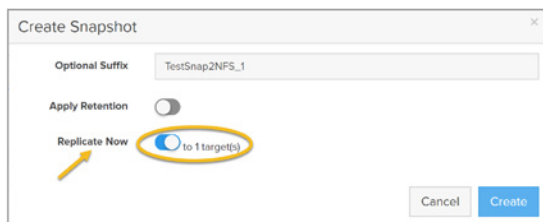


FIGURE 12. Replicate Now option replicates to NFS target

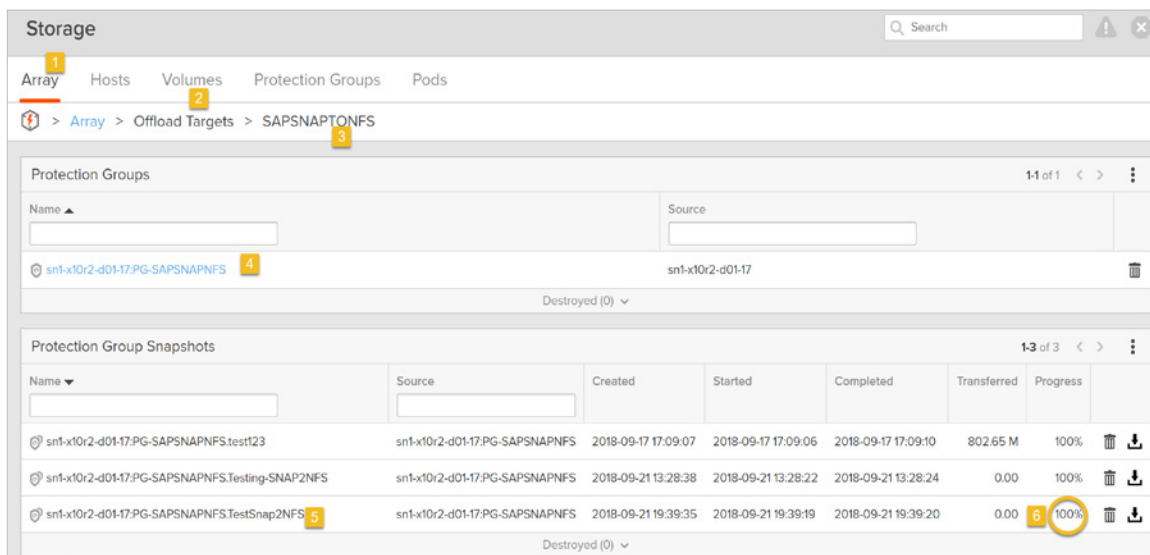


FIGURE 13. Snapshot replicated to the NFS target

Step 3: Confirm or Abandon the Snapshot in SAP HANA

After creating the snapshot, SAP HANA has to be made aware that it has been created in order to confirm or abandon the snapshot. All storage snapshots are recorded in SAP HANA in the backup Catalog, along with a status of successful or failed. This is very important, as SAP HANA has to clear its internal state once it is confirmed. This action can either be done in SAP HANA studio or via SQL statements.

USING SAP HANA STUDIO

Go to **Manage Storage Snapshot**. This time you will see only two options: **Confirm** or **Abandon**. Confirm the storage snapshot by using the **External Backup ID** generated. This is the same ID that was captured in Step 1.

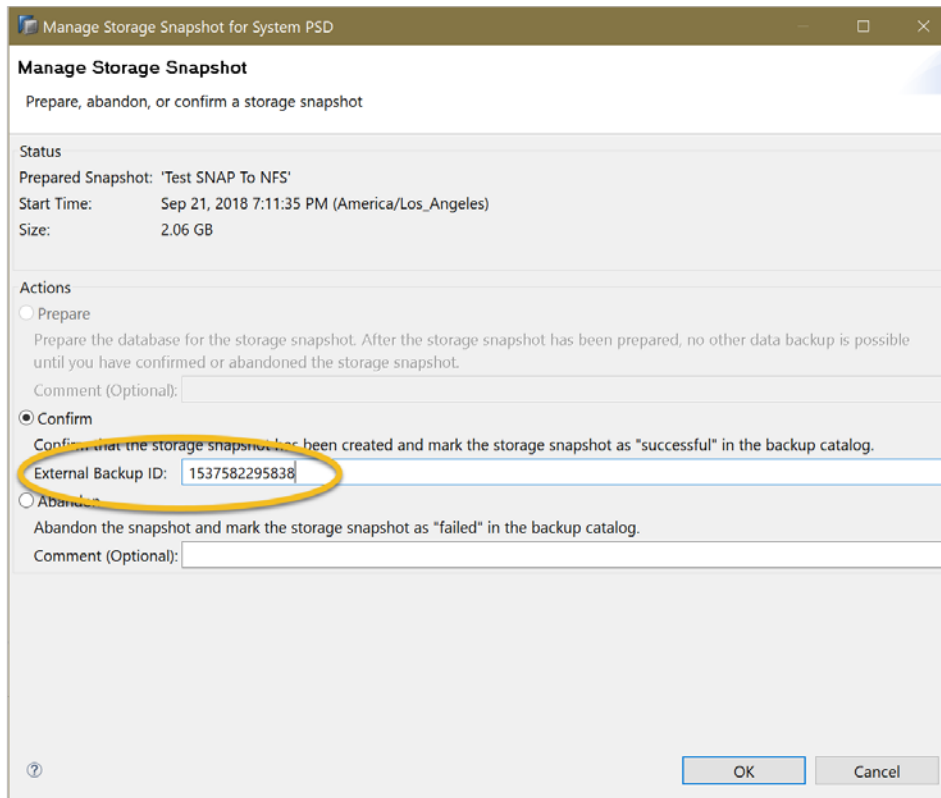


FIGURE 14. Manage Storage Snapshot pane

USING SQL STATEMENTS

You can use the following SQL statement to perform the same action as above:

```
BACKUP DATA CLOSE SNAPSHOT BACKUP_ID <BACKUP_ID> SUCCESSFUL
```

If you're using SAP HANA 2.0, you need to go to the SQL console for the system database and run the following statement. This will update the backup catalog with this successful backup id.

```
BACKUP DATA FOR FULL SYSTEM CLOSE SNAPSHOT BACKUP_ID 1516141675109 SUCCESSFUL 'use this'
```

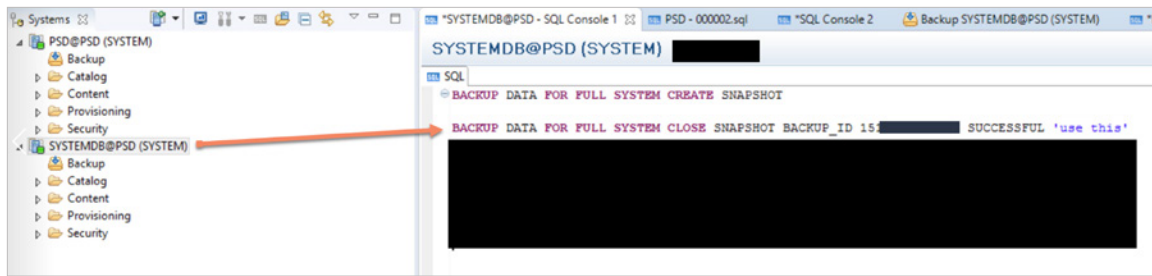


FIGURE 15. SQL console in SAP HANA 2.0

RECOVERING SAP HANA FROM A SNAPSHOT

After a storage snapshot is created, it can be used to recover the SAP HANA instance. There are multiple options for recovering an instance using a storage snapshot.

Recover the database to a specific storage snapshot:

- Use a specific storage snapshot for recovery
- All logs will be lost; it is like beginning a new database lifecycle

Start the recovery process in SAP HANA studio: **System → Backup and Recovery → Recover System...**

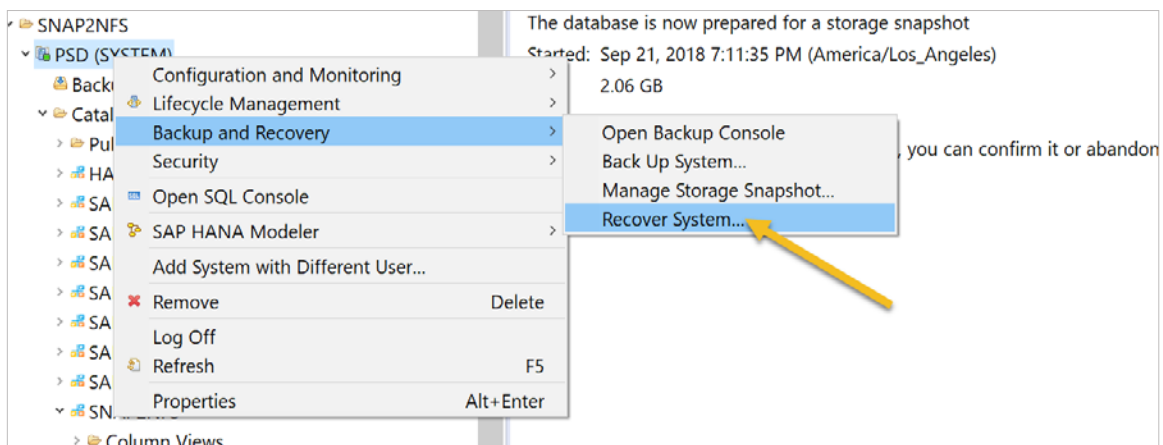


FIGURE 16. Recovery from SAP HANA studio

In SAP HANA 2.0, go to the system database of this SAP HANA system and, in the context menu, select **Backup and Recovery → Recover System Database**, which is **SYSTEMDB@PSD**. This will shut down the system.

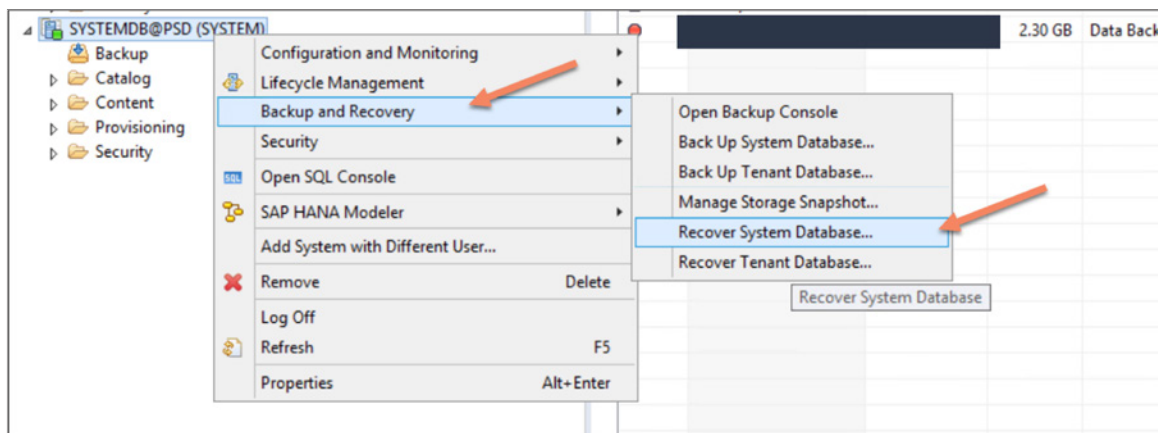


FIGURE 17. Recovery from SAP HANA 2.0 studio

Select the following option: **Recover the database to a specific data backup or storage snapshot.**

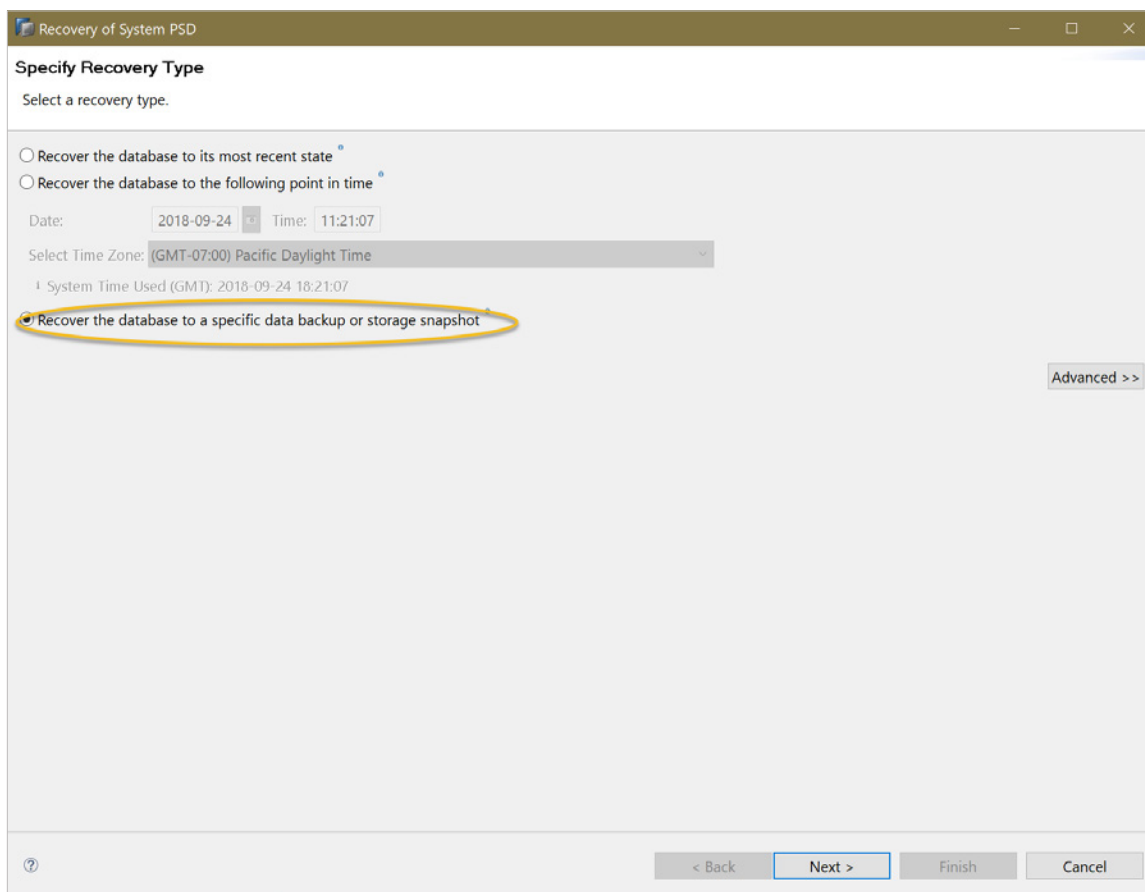


FIGURE 18. Choosing a specific recovery type

Then select **Specify backup without catalog**:

Recovery of System PSD

Specify Backup Location

Choose whether you want to select a backup from a backup catalog or enter the name and the path of a backup in the next step.

☐ Select backup from the backup catalog

☐ Search for the catalog in the file system in addition to the default locations

Specify one or more locations for the backup catalog. The backup catalog is stored in the same location as the log backups. If multiple backup catalogs are found, the most recent backup catalog is used.

Locations:

☒ **Specify backup without catalog**

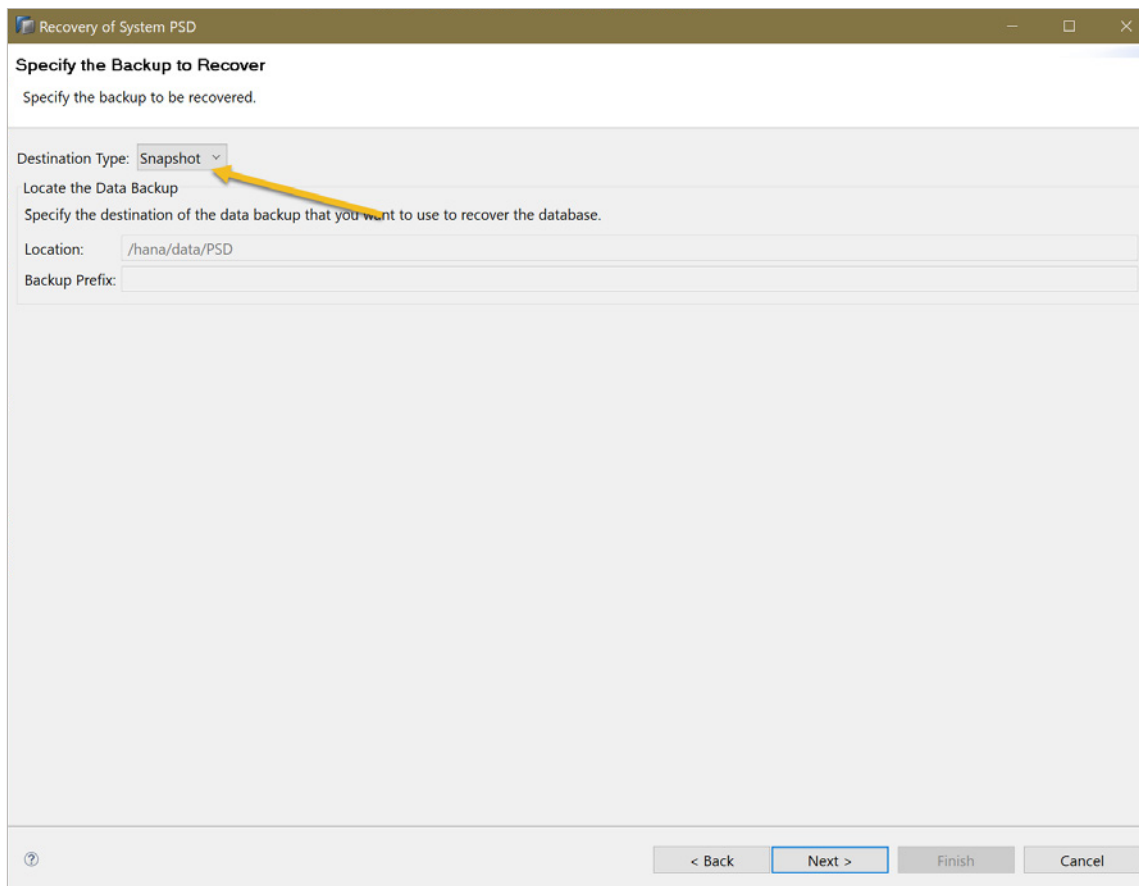
Backint System Copy

☐ Backint System Copy

Source System:

FIGURE 19. Specify Backup Location pane

For **Destination Type**, select **Snapshot**.



The screenshot shows a window titled "Recovery of System PSD". Inside, the section "Specify the Backup to Recover" has the instruction "Specify the backup to be recovered." Below this, the "Destination Type" is set to "Snapshot" in a dropdown menu, with a yellow arrow pointing to it. The "Locate the Data Backup" section has the instruction "Specify the destination of the data backup that you want to use to recover the database." Below this, the "Location" field contains "/hana/data/PSD" and the "Backup Prefix" field is empty. At the bottom, there are four buttons: "< Back", "Next >" (which is highlighted with a blue border), "Finish", and "Cancel".

FIGURE 20. Selecting a destination type

Initialize Log Area.

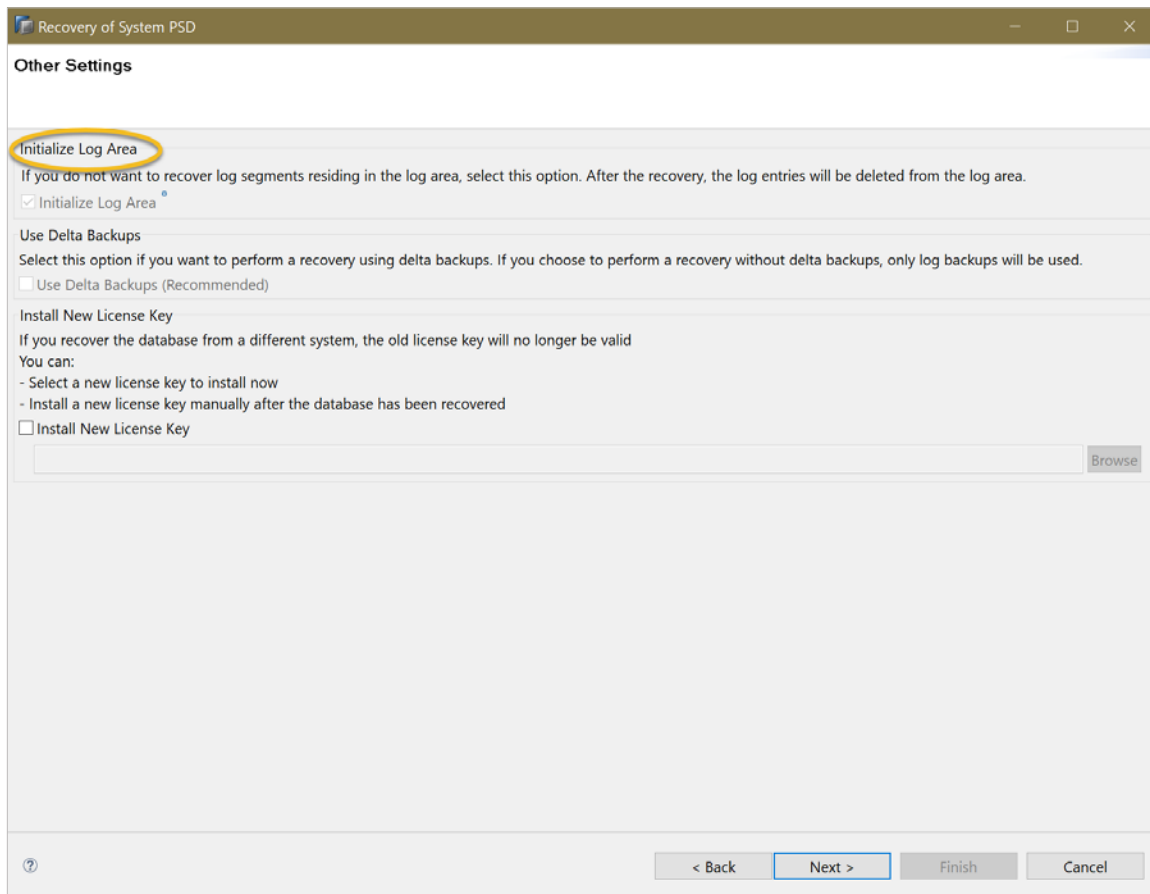


FIGURE 21. Other Settings pane

Before you press **Next**, make sure the snapshot is recovered from the NFS target.

RECOVERING AN SAP HANA SNAPSHOT FROM AN NFS TARGET

Even if the snapshot for this protection group is deleted, we can recover the snapshot from the NFS target with the following steps:

Go to the **Storage** tab of the Pure Storage GUI. Select the **Offload Target**.

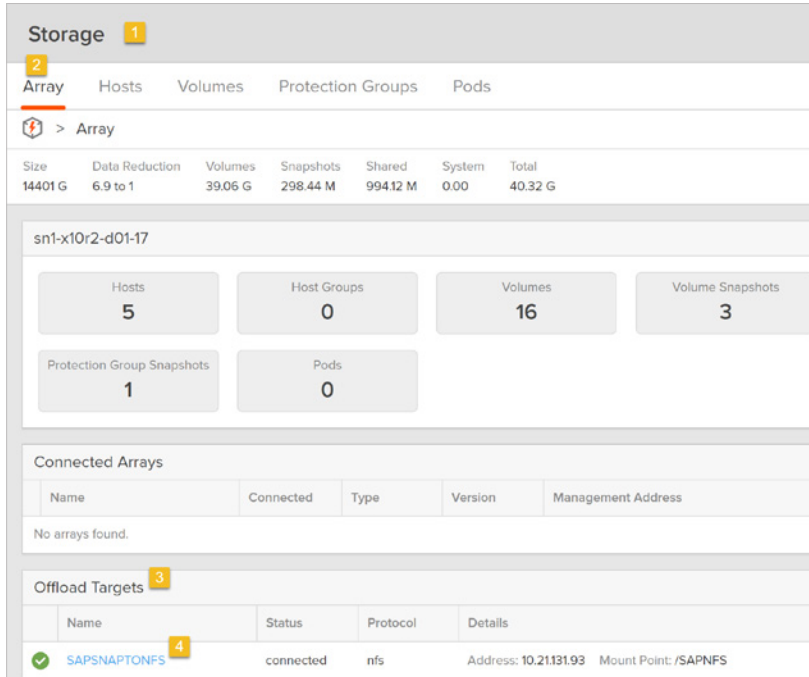


FIGURE 22. Storage pane, array tab

Select the download snapshot option shown in the GUI.

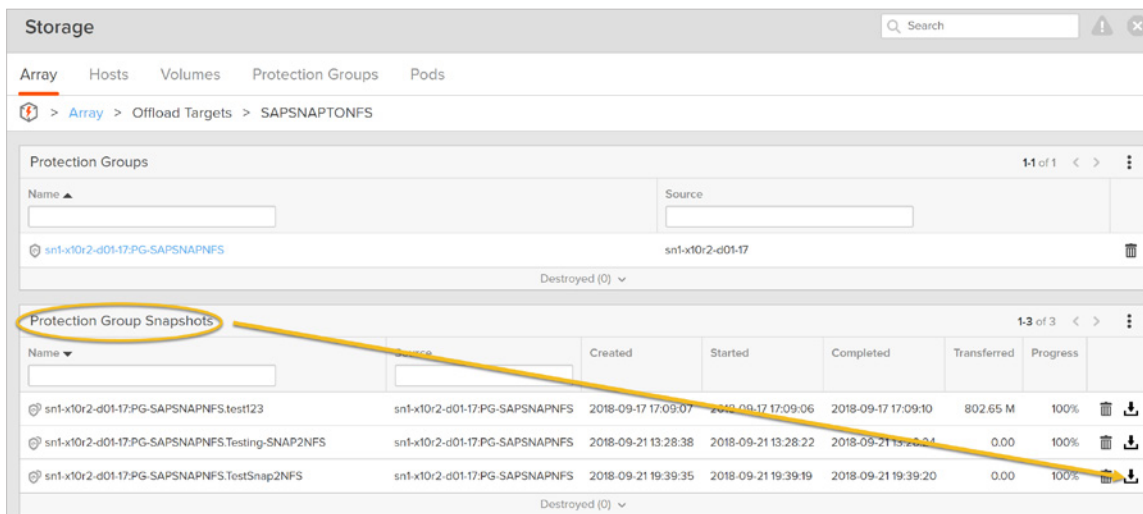


FIGURE 23. Download snapshot option

This will show the list of existing snapshots for this protection group: Select the snapshot and it will download from the NFS target.

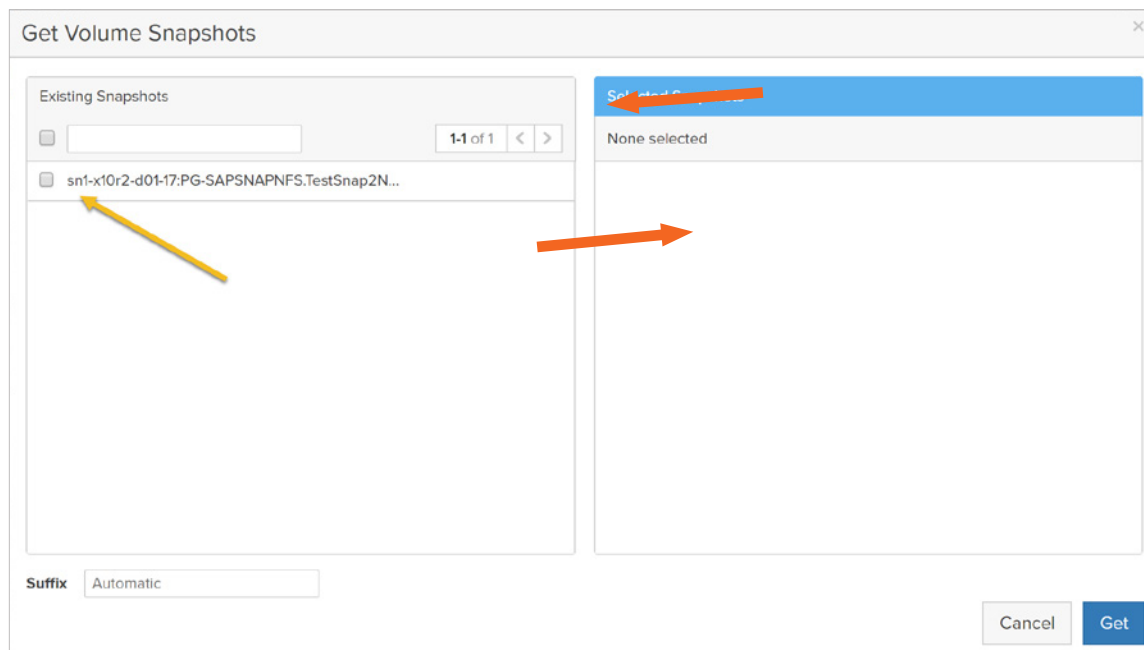


FIGURE 24. List of existing snapshots in the protection group

Click **Get** to download the snapshot.

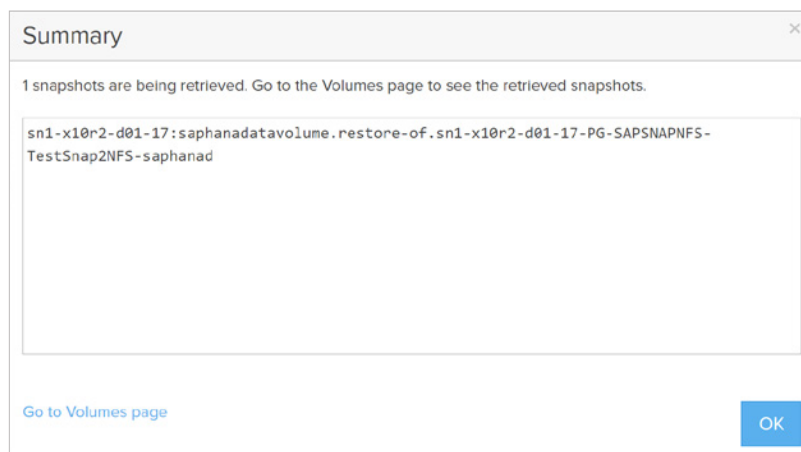


FIGURE 25. Summary of the download

Once the snapshot is downloaded, you can go the **Volumes** section in the **Storage** tab of the Pure Storage GUI. You will see the retrieved snapshot.

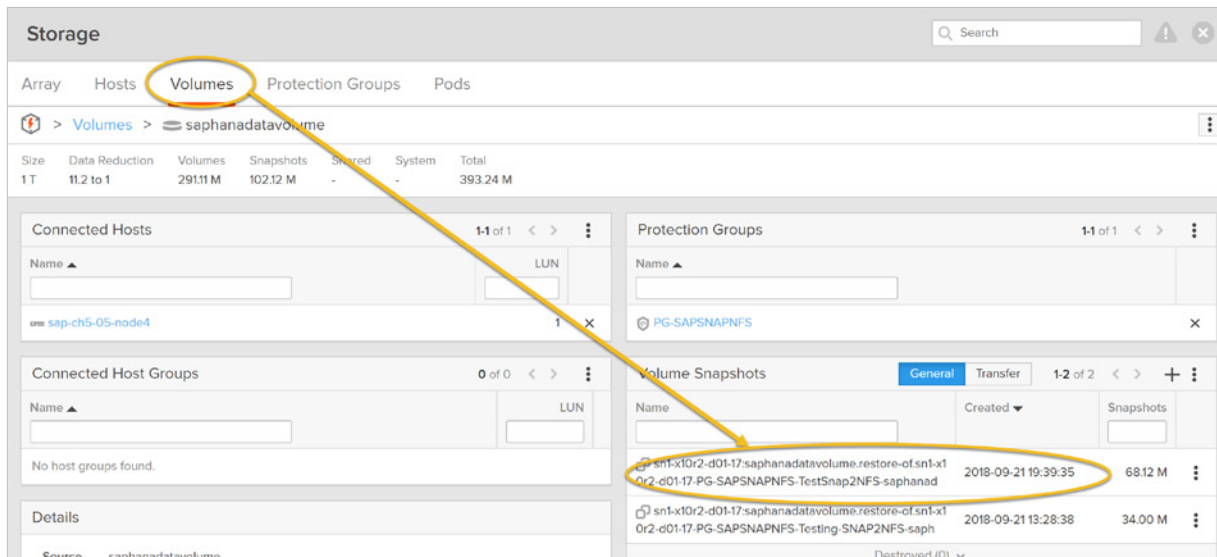


FIGURE 26. Retrieved snapshot displayed

You can restore this volume from the retrieved snapshot. Please unmount it before restoring.

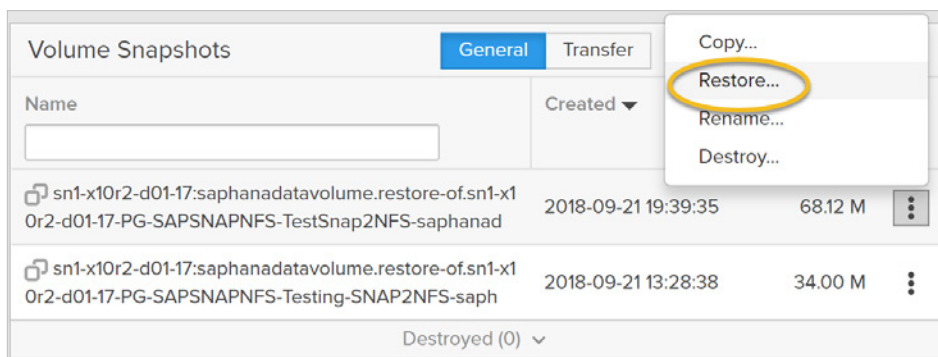


FIGURE 27. Restore snapshot option

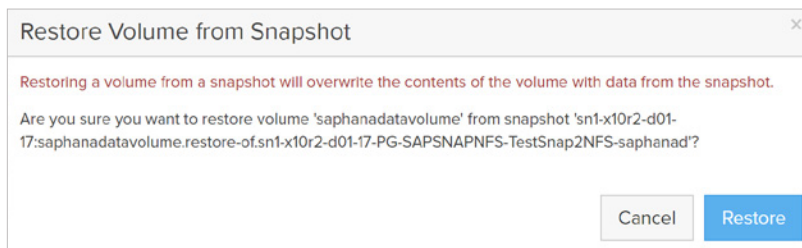


FIGURE 28. Restore volume from snapshot pane

Once the volume is restored, continue with the recovery process. The SAP HANA system will be recovered from this storage snapshot.



FIGURE 29. Recovery execution summary

Up to this point in SAP 2.0, only the System database has been recovered. Now we need to continue with the tenant recovery, as shown below:

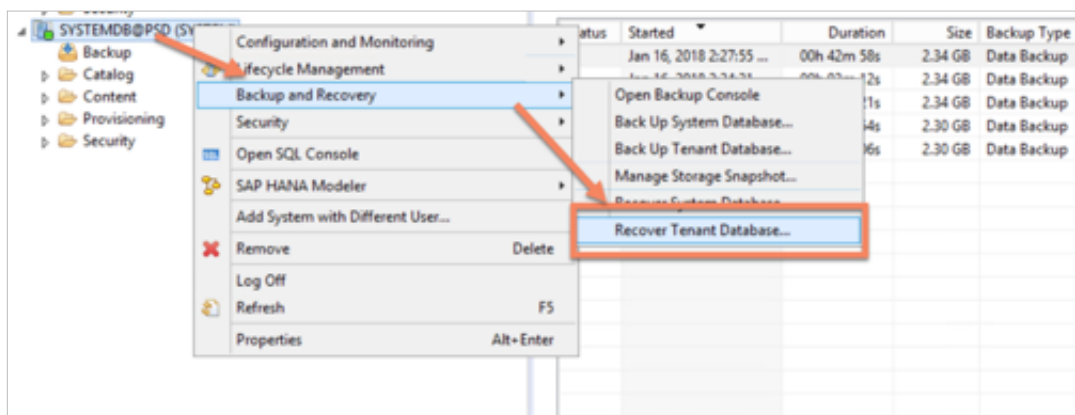


FIGURE 30. Tenant recovery

Select the tenant that needs to be recovered, which in this case is "PSD".

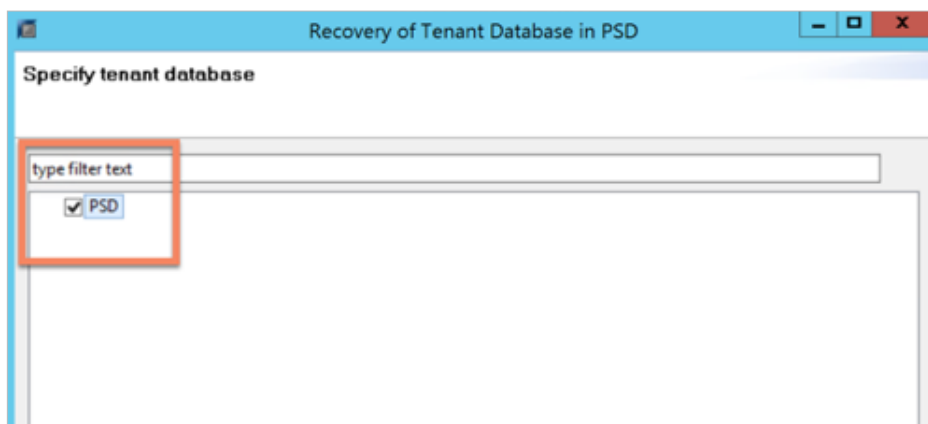


FIGURE 31. Recovery execution summary

Repeat the same steps we went through for the system database. This completes the recovery for the SAP HANA 2.0 MDC system as well.

REFERENCES

[Pure Storage FlashArray//X Datasheet](#)

[Pure Storage FlashArray//X Webpage](#)

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