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EXECUTIVE SUMMARY

SAP HANA system copy can be a time-consuming process for SAP Basis system administrators. Admins spend a considerable amount of time and effort preparing the software environment and going through complicated procedures to ensure that the backup and recovery process is carried out with minimum disruption to the business and in accordance with best practices.

This document describes the speed and efficiency of performing a homogeneous system copy of an SAP® HANA environment using Pure Storage FlashArray:

- SAP HANA SPS 11 (Single tenant)
- SUSE® Linux Enterprise 12 Service Pack 1
- Pure Storage snapshots and copy methods to move source system data to the target system

Pure Storage snapshots are instantaneous and do not depend on the capacity of the volume. Therefore, the entire process of an SAP HANA system copy refresh is accelerated. This saves SAP Basis consultants a great deal of time – so they can immediately start working on pre-refresh and post-refresh activities for the SAP application. Another great advantage that system copy offers is that the SAP HANA source system does not go offline.

At a high level, these are the steps for performing an SAP HANA system copy:

- Prepare the source SAP HANA database. This creates an internal snapshot of the source SAP HANA database, which can take a few minutes as it depends on the change rate between SAP HANA savepoints.
- Take a storage snapshot of the SAP HANA data area. Apply this snapshot to the target SAP HANA data area.
- Confirm the snapshot in the source system, which clears the internal states of the SAP HANA source system and enters an external backup ID in the backup catalog.
- Recover the target SAP HANA system by initializing the logs.

We perform a homogenous system copy on target systems which have the same operating system and database version as the source system. For scale-out SAP HANA systems, the source and target should have same number of active nodes and the same volume layout of data areas.

SAP HANA system copies are done to set up a test system, demo system, or training system.
Who knew that moving to all-flash storage could help reduce the cost of IT? FlashArray makes server and workload investments more productive, while also lowering storage spend. With FlashArray, organizations can dramatically reduce the complexity of storage to make IT more agile and efficient – accelerating your journey to the cloud.

FlashArray performance can also make your business smarter by unleashing the power of real-time analytics, driving customer loyalty, and creating new, innovative customer experiences that simply weren’t possible with disk.

FlashArray enables you to transform your data center, cloud, or entire business with an affordable all-flash array capable of consolidating and accelerating all your key applications.

Mini Size – Reduce power, space, and complexity by 90%

- 3U base chassis with 15-1500+ TBs usable
- ~1kW of power
- 6 cables

Mighty Performance – Transform your datacenter, cloud, or entire business

- Up to 370,000 32K IOPS
- Up to 11.5 GB/s bandwidth
- <1ms average latency

Modular Scale – Scale FlashArray inside and outside of the chassis for generations

- Expandable to 1.5 PB usable via expansion shelves
- Upgrade controllers and drives to expand performance and/or capacity
Meaningful Simplicity – Appliance-like deployment with worry-free operations

- Plug-and-go deployment that takes minutes, not days
- Non-disruptive upgrades and hot-swap everything
- Fewer parts = greater reliability

FlashArray is built on a modular, stateless architecture, designed to enable expandability and upgradability for generations. FlashArray leverages a chassis-based design with customizable modules, enabling both capacity and performance to be independently improved over time with advances in compute and flash, and thus to meet your business needs today and tomorrow.

Pure Storage FlashArray is ideal for:

**Accelerating Databases and Applications** – Speed transactions by 10x with consistent low latency, enable online data analytics across wide datasets, and mix production, analytics, dev/test, and backup workloads without fear.

**Virtualizing and Consolidating Workloads** – Easily accommodate the most IO-hungry Tier 1 workloads, increase consolidation rates (thereby reducing servers), simplify VI administration, and accelerate common administrative tasks.

**Delivering the Ultimate Virtual Desktop Experience** – Support demanding users with better performance than physical desktops, scale without disruption from pilot to >1000s of users, and experience all-flash performance for under $100/desktop.

**Protecting and Recovering Vital Data Assets** – Provide always-on protection for business-critical data, maintain performance even under failure conditions, and recover instantly with Purity Protect.

Pure Storage FlashArray sets the benchmark for all-flash enterprise storage arrays. It delivers:

**Consistent Performance** – FlashArray delivers consistent <1ms average latency. Performance is optimized for real-world applications workloads that are dominated by I/O sizes of 32K or larger – vs. typical 4K/8K hero performance benchmarks. Full performance is maintained even under failures and updates.

**Lower Cost than Disk** – Inline de-duplication and compression deliver 5 – 10x space savings across a broad set of I/O workloads, including databases, virtual machines, and virtual desktop infrastructure.

**Mission-Critical Resiliency** – FlashArray delivers >99.9999% proven availability, as measured across the Pure Storage installed base, and does so with non-disruptive everything and without performance impact.

**Disaster Recovery Built-In** – FlashArray offers native, fully-integrated, data reduction-optimized backup and disaster recovery at no additional cost. Setup disaster recovery with policy-based automation within minutes. Recover instantly from local, space-efficient snapshots or remote replicas.

**Simplicity Built-In** – FlashArray offers game-changing management simplicity that makes storage installation, configuration, provisioning, and migration a snap. No more managing performance, RAID, tiers, or caching. Achieve optimal application performance without any tuning at any layer. Manage FlashArray the way you like it: Web-based GUI, CLI, VMware® vCenter, Rest API, or OpenStack.
FLASHARRAY SPECIFICATIONS

<table>
<thead>
<tr>
<th>CAPACITY</th>
<th>CONNECTIVITY</th>
<th>PHYSICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>//M10</td>
<td>Up to 30 TB / 28 TiB effective capacity** 5 – 10 TB / 4.7 – 9.3 TiB raw capacity</td>
<td>16 Gb/s Fibre Channel 10 Gb/s Ethernet iSCSI 1 Gb/s Management &amp; Replication ports</td>
</tr>
<tr>
<td>//M20</td>
<td>Up to 250+ TB / 230+ TiB effective capacity** 5 – 80 TB / 4.7 – 74.4 TiB raw capacity</td>
<td>16 Gb/s Fibre Channel 10/40 Gb/s Ethernet iSCSI 1/10 Gb/s Replication ports 1 Gb/s Management ports</td>
</tr>
<tr>
<td>//M50</td>
<td>Up to 500+ TB / 450+ TiB effective capacity** 20 – 176 TB / 18.6 – 162.8 TiB raw capacity</td>
<td>16 Gb/s Fibre Channel 10/40 Gb/s Ethernet iSCSI 1/10 Gb/s Replication ports 1 Gb/s Management ports</td>
</tr>
<tr>
<td>//M70</td>
<td>Up to 1,500 TB / 1,360 TiB effective capacity** 42 – 512 TB / 39.6 – 474.6 TiB raw capacity</td>
<td>16 Gb/s Fibre Channel 10/40 Gb/s Ethernet iSCSI 1/10 Gb/s Replication ports 1 Gb/s Management ports</td>
</tr>
<tr>
<td>//X70</td>
<td>Up to 1,050 TB / 950 TiB effective capacity** 22 – 366 TB / 19.2 – 332.7 TiB raw capacity†</td>
<td>16 Gb/s Fibre Channel 10/40 Gb/s Ethernet iSCSI 1/10 Gb/s Replication ports 1 Gb/s Management ports</td>
</tr>
</tbody>
</table>

* Stated //M specifications are applicable to //M R2 versions. //X70 specifications are preliminary until GA.
** Effective capacity assumes HA, RAID, and metadata overhead, GB-to-GiB conversion, and includes the benefit of data reduction with always-on inline deduplication, compression, and pattern removal. Average data reduction is calculated at 5-to-1.
† 1PB scale is achieved with 18.3TB DirectFlash Modules, which will be available post-GA of //X.

Table 1. Pure Storage FlashArray series

PURITY OPERATING ENVIRONMENT

Purity implements advanced data reduction, storage management, and flash management features. All features of Purity are included in the base cost of the FlashArray.

Storage Software Built for Flash – FlashCare technology virtualizes the entire pool of flash within FlashArray, and allows Purity to both extend the life and ensure the maximum performance of consumer-grade MLC flash.

Granular and Adaptive – Purity Core is based upon a 512-byte variable block size metadata layer. This fine-grain metadata enables all of Purity’s data and flash management services to operate at the highest efficiency.

Best Data Reduction Available – Purity Reduce implements five forms of inline and postprocess data reduction to offer the most complete data reduction in the industry. Data reduction operates at a 512-byte aligned variable block size, to enable effective reduction across a wide range of mixed workloads without tuning.
Highly Available and Resilient – Purity Assure implements high availability, dual-parity RAID-3D, non-disruptive upgrades, and encryption, all of which are designed to deliver full performance to the FlashArray during any failure or maintenance event.

Backup and Disaster Recovery Built-In – Purity Protect combines space-saving snapshots, replication, and protection policies into an end-to-end data protection and recovery solution that protects data against loss locally and globally. All FlashProtect services are fully-integrated in the FlashArray and leverage native data reduction capabilities.

PURE1®

Pure1 Manage – By combining local, web-based management with cloud-based monitoring, Pure1 Manage allows you to manage your FlashArray wherever you are – with just a web browser.

Pure1 Connect – A rich set of APIs, plugins, application connectors, and automation toolkits enable you to connect FlashArray to all your data center and cloud monitoring, management, and orchestration tools.

Pure1 Support – FlashArray is constantly cloud-connected, enabling Pure Storage to deliver the most proactive support experience possible. Highly trained staff combined with big data analytics help resolve problems before they start.

Pure1 Collaborate – Extend your development and support experience online, leveraging the Pure1 Collaborate community to get peer-based support and to share tips, tricks, and scripts.

EXPERIENCE EVERGREEN™ STORAGE

Get storage that behaves like SaaS and the cloud. Deploy it once and keep expanding and improving performance, capacity, density, and/or features for 10 years or more – without downtime, performance impact, or data migrations. Our “Right Size” capacity guarantee ensures you get started knowing you’ll have the effective capacity you need. And our Capacity Consolidation program keeps your storage modern and dense as you expand. With Evergreen Storage, you’ll never re-buy a TB you already own.
GOALS AND OBJECTIVES

The purpose of this document is to describe the process for SAP HANA system copy using Pure Storage snapshots for both scale-up and scale-out SAP HANA systems. This document will serve as a guide for SAP Basis administrators who are going through the process of creating SAP HANA system copies/refreshes from a source production system to target development/quality systems.

AUDIENCE

This document is intended for SAP HANA Basis Administrators (DBAs), Storage Administrators, System Administrators, and anybody who wants to copy/refresh an SAP HANA environment on a Pure Storage FlashArray using snapshots. This technical paper assumes familiarity with SAP HANA administration as well as basic Linux system and storage administration tasks as required for a typical database installation, such as setting up file systems, LUN configuration, etc.

OPERATING SYSTEM

SAP HANA supports both Red Hat® Enterprise Linux (RHEL) and SUSE® Enterprise Linux. SAP HANA initially only supported SUSE Enterprise Linux. Red Hat support for SAP HANA came in mid-2014. Here are the master SAP Notes for SUSE Linux and RHEL:

- **SAP Note 1944799** – SAP HANA Guidelines for SLES Operating System
- **SAP Note 2009879** – SAP HANA Guidelines for Red Hat Enterprise Linux (RHEL) Operating System

SAP HANA system copy using Pure Storage FlashArray snapshots will work on both Red Hat and SUSE Linux.

SOURCE AND TARGET SYSTEM ARCHITECTURE (SUGGESTED)

The SAP HANA SPS11 certified infrastructure uses a single node scale-up and three nodes for scale-out cluster configuration. Cisco UCS® B200 M4 blades are used with SUSE 12 SP1 OS, including the High Availability Option and OCFS to create the environment for the scale-out SAP HANA.

The Pure Storage FlashArray used in this configuration is the FlashArray//M10. There are four 16GB Fibre channel ports from the array attached to the SAN Fabric. Each node has two Fibre channel ports for storage and four 10 GBPS ports for network.

All the servers boot from SAN with dedicated drive for their OS related partitions. All other LUNs are shared across the nodes. The `/hana/shared` partition is used for storing SAP binaries and is mounted in parallel simultaneously.
SAP HANA nodes have DATA and LOG LUNs that are needed for each node.

Figure 1. SAP HANA setup on Pure Storage
SCALE-UP SAP HANA SYSTEM COPY USING SNAPSHOTS

Figure 2. Pure Storage HANA setup for scale-up system copy

SCALE-UP SAP HANA SETUP

Here we are going to show, step by step, the process of a system copy. As seen above, we are using the SAP HANA scale-up systems with SIDs P66 and Q66. Both are scale-up systems with one data volume, one log volume, and one shared volume on FlashArray. SAP HANA SID P66 is the source system and SAP HANA SID Q66 is the target system. Later in the document we will cover the additional steps to perform a scale-out 3-node SAP HANA system copy.

STEPS FOR SAP HANA SYSTEM COPY USING SNAPSHOTS

Remember: before you start the process, shut down the target SAP HANA system Q66 and unmount the data volume.

STEP 1: PREPARE THE SOURCE SAP HANA SYSTEM P66 FOR STORAGE SNAPSHOT

In this step we prepare the source system P66 for storage snapshot, which will create an internal backup snapshot in the data area. This can be done in two ways, one with SAP HANA studio and the other with a SQL command. Let’s look at both methods:

SAP HANA Studio Approach

Open SAP HANA studio, select the P66 node, and go to the context menu. Select Backup and Recovery, then click Manage Storage Snapshot.
Figure 3. Manage storage snapshot menu for source SAP HANA system

This opens a window where you may provide an optional comment. Select OK. This triggers an SAP HANA internal snapshot and makes the system ready for a storage snapshot.

Figure 4. Manage storage snapshot view for source SAP HANA system
Now go to Backup Catalog and capture the External backup ID, as shown below.

Figure 5. Backup Catalog

**SAP HANA SQL Approach**

You can prepare the SAP HANA system for a storage snapshot using the following SQL statement.

```sql
BACKUP DATA CREATE SNAPSHOT;
```

This SQL statement can be issued from SAP HANA studio or from the `hdbsql` command line. The latter is very useful when doing scripting and automation.

Make sure the command creates a following file in the data area “snapshot_databackup_0_1”:

Figure 6. /hana/data file system

**STEP 2: FREEZE THE FILE SYSTEM FOR THE SOURCE SAP HANA SYSTEM DATA VOLUME’S FILE SYSTEM**

To make sure that the data volume file system does not produce dirty IO, it is extremely important to freeze the file system for the data volume. In this case, the file system we used is XFS.

Here are the mount points for the source P66 SAP HANA system:

Figure 7. Data, log, shared mount points

To freeze the XFS file system for the data volume, use the following command:

```
xfs_freeze -f /hana/data/P66
```
As seen from the mount points, we have used /hana/data/SID, which in this case is P66. SID is used here as part of the mount points. If you don’t use SID as part of a mount point, you will need to perform a few additional steps, especially when the target system SID is different from the source SID. This will be explained in Step 7.

**STEP 3: SNAPSHOT THE DATA VOLUME OF THE SOURCE SAP HANA SYSTEM**

This step can be performed from the Pure Storage GUI or can be done using commands in the CLI. Let’s look at both methods.

**Pure Storage GUI Approach**

Login to the Pure Storage GUI, go to the Storage tab, and select the host for the P66 system. Then select the data volume, as shown below.

![Figure 8. Pure Storage GUI (Storage section)](image)

Select the data volume and, from the menu on the right, click **Create Snapshot**, which will create a snapshot, as shown below.

![Figure 8. Pure Storage GUI (Storage-Snapshot section)](image)
Pure Storage CLI Command Approach

In this step we are taking a snapshot using the Pure Storage CLI command, as shown below. Pure Storage also has a REST API, a Python tool kit, and a Powershell tool kit.

```
purevol snap <Name of the data volume> --suffix=<give some unique suffix>
```

Give the name of the data volume here and unique suffix information

```
purevol snap p66hanadatavolume --suffix=test
```

**STEP 4: COPY THE SNAPSHOT TO THE DATA VOLUME OF THE TARGET SAP HANA SYSTEM**

This step can be performed from the Pure Storage GUI or can be done using the commands in the CLI. Let’s look at both options.

Login to Pure Storage GUI. Select the Storage tab, and click the source data volume in Volumes. In the Snapshots panel, select the snapshot. Here it is the suffix ending with test. Open the context menu and select Copy Snapshot, as seen below.

![Figure 9. Pure Storage GUI (Storage-Copy Snapshot section)](image)

Then provide the target SAP HANA system data volume, as shown below.

![Figure 10. Pure Storage GUI (Copy Snapshot)](image)

Next, you can confirm the “overwrite”, as shown below. This overwrites the target SAP HANA data volume with the source data volume.
Pure Storage CLI Command Approach

In this step, we are overwriting the source volume snapshot to the target system data volume using the Pure Storage CLI command, as shown below.

```
purevol copy --overwrite $finalsource $targetvolume
```

Provide the name of the source data volume snapshot (which, in this case, with the suffix “test”, is <name of datavolume>.<suffix>) and the target data volume.

```
purevol snap p66hanadatavolume.test q66hanadatavolume
```

**STEP 5: UNFREEZE THE SOURCE SYSTEM SAP HANA DATA VOLUME’S FILE SYSTEM**

In this step, we unfreeze the data volume XFS file system. Here are the mount points for the source P66 SAP HANA system:

![Figure 12. Mount points for source SAP HANA system](image)

To unfreeze the XFS file system for the data volume, use the following command:

```
xfs_freeze -u /hana/data/P66
```

**STEP 6: CLOSE THE SAP HANA SOURCE SYSTEM SNAPSHOT MODE**

In this step, we close the source system P66 prepare storage snapshot mode, which will clear the internal states and put the source SAP HANA system back into normal operation. There are two ways to do this, one with SAP HANA studio and the other with a SQL command. Let us explore both methods:

**SAP HANA Studio Approach**

Open the SAP HANA studio and select the P66 node and go to context menu. Choose Backup and Recovery, then select Manage Storage Snapshot.
Give the external Backup ID captured in Step 1 as shown below. This closes snapshot mode.
SAP HANA SQL Approach

You can close the SAP HANA system for storage snapshot using the following SQL statement.

```
BACKUP DATA CLOSE SNAPSHOT BACKUP_ID $varbackupid SUCCESSFUL $Text
```

Replace the $varbackupid with the External backup ID information and provide a comment or text for $Text.

**STEP 7: MOUNT POINT DOES NOT HAVE SID (OPTIONAL)**

This step is optional and needs to be done if you do not have SID in the data volume mount point. That means there is only /hana/data as your mount point. After the snapshot, do the following:

1. Move the contents of /hana/data/<Source SID> to /hana/data/<Target SID>. In this case, it would be
   
   `mv /hana/data/P66 /hana/data/Q66`

2. Make sure the files and directories inside after this move are accessible by <sid>adm user and group. In this case, it is q66adm.

**STEP 8: RECOVERY OF TARGET SAP HANA SYSTEM Q66**

Here we will start with the recovery of SAP HANA target system Q66. This step can also be executed in SAP HANA studio or SAP HANA SQL. Let’s explore both approaches.

**SAP HANA Studio Approach**

In SAP HANA studio, in the Systems tab, choose Target system Q66, then click Backup and Recovery and Recover System...

![SAP HANA studio – Recover System](image)
In the **Recovery** window, select the option **Recover the database to a specific data backup or storage snapshot**, then click **Next**.

![Recovery window](image1.png)

*Figure 16: SAP HANA studio – Recover System*

Select the **Specify backup without catalog**. Click **Next**.

![Specify backup location](image2.png)

*Figure 17: SAP HANA studio – Recover System*

Select Destination Type **Snapshot**. Click **Next**.

![Specify the backup to recover](image3.png)

*Figure 18: SAP HANA studio – Recover System*
Check **Initialize Log Area** and click **Next**.

![Figure 19: SAP HANA studio – Recover System](image1)

Then select **Finish** to start the recovery.

![Figure 20: SAP HANA studio – Recover System](image2)

SAP HANA should be up and running.

**SAP HANA Recovery Commands Approach**

To do the final recovery, we’ll use the SAP HANA recovery command line. To do this, login to the OS and switch to `<sid>adm` user, which in this case is q66adm.

Then execute the following command, which will start the snapshot-based recovery and will initialize the logs.

```bash
./HDBSettings.sh recoverSys.py --silent --command=RECOVER\ DATA\ USING\ SNAPSHOT\ CLEAR\ LOG --masterOnly
```
STEPS FOR SCALE-OUT SAP HANA SYSTEM COPY

In this section, we’ll explore additional steps to perform system copy for a scale-out SAP HANA system. For scale-out SAP HANA system copy using snapshots, consider only the active nodes – the standby nodes need not be considered.

For SAP HANA scale-out system copy to work, the following rules must be satisfied:

- The number of active nodes in the source SAP HANA system should be same as the number of active nodes in the target system.
- The volume layout should be same for both source and target SAP HANA systems.

Figure 21: SAP HANA scale-out system (Source and Target system)

As you can see in the figure above, there is a scale-out SAP HANA system with three active nodes – one master node and two worker nodes. The source SAP HANA system is P66 SID and the target SAP HANA system is Q66 SID. Both have three active node systems and each node has one data volume attached, as shown above.

In order to perform the system copy using storage snapshots for this kind of scale-out system, the steps involved are different from the scale-up system described above.

STEPS FOR SAP HANA SYSTEM COPY USING SNAPSHOTS

Before you start the process, remember to shut down the target SAP HANA system Q66 and unmount the data volume.
STEP 1: PREPARE THE SOURCE SAP HANA SYSTEM P66 FOR STORAGE SNAPSHOT

This step is the same as for the scale-up SAP HANA system. Please refer to the previous scale-up section for information on preparing the source SAP HANA system P66 for storage snapshot.

STEP 2: FREEZE THE FILE SYSTEM FOR THE SOURCE SAP HANA SYSTEM

This step is the same as for the scale-up SAP HANA system. Repeat this step for each active node of the source SAP HANA system. Please refer to the previous scale-up section for freezing the XFS file system for each active node.

STEP 3: SNAPSHOT THE DATA VOLUMES OF THE SOURCE SCALE-OUT SAP HANA SYSTEM

This step is different from the scale-up system, since for the scale-out system there are multiple data volumes which need to be snapshotted at the same time. The best way to do this on a Pure Storage FlashArray is to create a protection group and add all the data volumes to it.

This step can be performed from the Pure Storage GUI or can be done using commands in the CLI. Let’s review both methods.

Pure Storage GUI Approach

In order to capture point-in-time consistent snapshots across data volumes, we need to create a protection group. Login in to the Pure Storage GUI and go to the Protection tab, then select the + sign next to the Source Groups. Click Create Protection Group in the dialog and provide a name for the protection group, as shown below.

![Figure 22: Pure Storage GUI (Protection group section)](image)

Then select the protection group as shown. Click Members, then Add Volumes.
Add all the source data volumes to this protection group. The data volumes in this case for P66 are based on Figure 21: SAP HANA scale-out system (Source and Target system). Select the scale-out SAP HANA Source and Target systems (DATA1 → p66hanadatavolume1, DATA2 → p66hanadatavolume2, DATA3 → p66hanadatavolume3), then click **Confirm**.

Once added, the volumes take a snapshot of this protection group. To do this, go to the **Snapshots** tab and select **Create Snapshot**, as shown below.

Create a snapshot after giving the optional suffix.
This will create a point-in-time consistent snapshot across data volumes.

**Pure Storage CLI Command Approach**

In this step, we are taking a snapshot of the protection group using a Pure Storage CLI command.

```
purepgroup snap <Name of the Protection group> --suffix <Give unique suffix>
```

Give the name of the protection group name and unique suffix information.

```
purepgroup snap P66SOURCEDATAVOLS --suffix q66systemcopy
```

**STEP 4: COPY THE DATA VOLUME SNAPSHOTS TO THEIR RESPECTIVE DATA VOLUMES ON THE TARGET SAP HANA SYSTEM**

In this step, we need to copy the snapshot of each of the data volumes to the corresponding target data volume. As shown in Figure 21: SAP HANA scale-out system (Source and Target system), the source system data volumes were added to the protection group, which was snapshotted as discussed in the previous step. Now we copy the individual data volume snapshots from the source and overwrite the target volumes.

So it would look like:

- P66 DATA1 snapshot overwrite → Q66 DATA A data volume
- P66 DATA2 snapshot overwrite → Q66 DATA B data volume
- P66 DATA3 snapshot overwrite → Q66 DATA C data volume
This translates into the following scenario:

- P66 p66hanadatavolume1.q66systemcopy → Q66 q66hanadatavolumeA
- P66 p66hanadatavolume2.q66systemcopy → Q66 q66hanadatavolumeB
- P66 p66hanadatavolume3.q66systemcopy → Q66 q66hanadatavolumeC

This step can be performed from the Pure Storage GUI or can be done using commands in the CLI. Let’s explore both methods.

Login to the Pure Storage GUI, click Protection, then in Source Groups select the Protection Group “P66SOURCEDATAVOLS”. Click the Snapshots tab and, for each data volume, select the snapshot for each that volume and from the … menu click Copy Snapshot, as shown below.

![Figure 28: Pure Storage GUI (Protection group)](image)

Provide the respective target SAP HANA system data volume name, as shown below.

![Figure 29: Pure Storage GUI (Copy snapshot)](image)

Next, Confirm the “overwrite”, as shown below. This overwrites the target SAP HANA data volume with the respective source data volume’s snapshot.
Pure Storage CLI Command Approach

In this step, we are overwriting the source data volume’s snapshot to the respective target system data volume using the Pure Storage CLI command, as shown below.

```
purevol copy --overwrite $source $targetvolume
```

Provide the name of the source data volume’s snapshot and the target data volume name. Here are the commands for all three data volumes:

```
purevol copy --overwrite p66hanadatavolume1.q66systemcopy q66hanadatavolumeA
purevol copy --overwrite p66hanadatavolume2.q66systemcopy q66hanadatavolumeB
purevol copy --overwrite p66hanadatavolume3.q66systemcopy q66hanadatavolumeC
```

STEP 5: UNFREEZE THE SOURCE SYSTEM SAP HANA DATA VOLUMES FILE SYSTEM

This step is the same as for the scale-up SAP HANA system. Repeat this step for each active node of the source SAP HANA system. Please refer to the previous scale-up section for unfreezing the XFS file system for each active node.

STEP 6: CLOSE THE SAP HANA SOURCE SYSTEM SNAPSHOT MODE

This step is the same as for the scale-up SAP HANA system. Please refer to the previous scale-up section on closing the source SAP HANA system P66 for a storage snapshot.

STEP 7: MOUNT POINT DOES NOT HAVE SID (OPTIONAL)

This step is the same as for the scale-up SAP HANA system. Please refer to the previous scale-up section for reorganizing the mount points in the target SAP HANA system Q66. This step needs to be performed for all three nodes.

STEP 8: RECOVERY OF SAP HANA SYSTEM

This step is the same as for the scale-up SAP HANA system. Please refer to the previous scale-up section for recovery of the source Q66 SAP HANA system.
PRE AND POST REFRESH ACTIVITIES FOR THE SAP NETWEAVER APPLICATION ON SAP HANA

IMPORTANT PRE-REFRESH ACTIVITIES

Below are some of the important pre-refresh activities, which need to be executed if this is an existing target system.

**Note:** This document does not cover all the pre- and post-activity steps. For additional information, refer to the SAP system copy guide.

<table>
<thead>
<tr>
<th>Slno.</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Stop all background jobs</td>
<td>Stop all background jobs using the BTCTRNS1 program.</td>
</tr>
<tr>
<td>2.</td>
<td>Delete all finished and canceled jobs.</td>
<td>Run the RSBTCDEL2 program to delete all finished and canceled jobs. Delete other background jobs directly using transaction SM37.</td>
</tr>
<tr>
<td>3.</td>
<td>Create User Export with profile SAP_USER</td>
<td>Note: Do not delete all jobs, such as SAP_CCMS* jobs, SAP_REORG* jobs, SAP_SLD* jobs, SPOOL, and SAP jobs.</td>
</tr>
<tr>
<td>4.</td>
<td>Export RFCs</td>
<td>Create the user export using transaction SCC8. This creates transport requests at the operating system (OS) level, which you must import after a system refresh.</td>
</tr>
<tr>
<td>5.</td>
<td>Export Partner profiles</td>
<td>Attach tables entries, from tables such as RFCDES, RFCDOC, RFCATTRIB, and RSEC* to a transport request so that they can be imported (co-files and data files) once the system refresh is complete.</td>
</tr>
<tr>
<td>6.</td>
<td>Export Background jobs</td>
<td>Note: You can script the RFCs export for faster export and import capabilities.</td>
</tr>
<tr>
<td>7.</td>
<td>Export SAPLICENSE</td>
<td>Attach the table entries from tables EDPP1, EDP12, EDP13, and EDP21 to a transport request so they can be imported (co-files and data files) once the system refresh is complete.</td>
</tr>
<tr>
<td>Slno.</td>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 8.   | Take screenshots of the following transactions which will help with reconfiguring and checking the Target system after a system refresh. | SM59 (RFC destinations)  
BD54 (logical systems)  
SPAD (printers --> could be done by export on flat file).  
DB13 (export DBA scheduling calendar).  
SM37 (export name of released jobs with details).  
AL11 (SAP Directories)  
WE20 (Partner profile)  
WE21 (Post IDOCS Processing)  
SMLG (Logon Group)  
RZ12 (RFC Server Group)  
RZ70 (SLD Configuration)  
RZ04 (Operation Mode)  
SM63 (Time Table)  
SCC4 (Clients Overview)  
SPAM (Package level) |

**POST-REFRESH ACTIVITIES**

Important Post-Refresh Activities: Below are some of the important post-refresh activities which need to be performed on the Target system. This document does not cover all the post activity steps. Please refer to the SAP System Copy guide.

<table>
<thead>
<tr>
<th>Slno.</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Check post installation inconsistencies</td>
<td>Execute transaction SICK or SM28 to check any installation inconsistencies.</td>
</tr>
<tr>
<td>2.</td>
<td>Run Transaction SLICENSE</td>
<td>Import the saved license or install from service market place.</td>
</tr>
<tr>
<td>3.</td>
<td>Post installation Actions for the Transport Organizer</td>
<td>Execute SE06 transaction and select the option Database copy and Migration.</td>
</tr>
<tr>
<td>4.</td>
<td>Go to STMS transaction</td>
<td>Adapt the transport parameters and transport routes in the Transport Management System.</td>
</tr>
<tr>
<td>5.</td>
<td>Run transaction RZ10</td>
<td>Import the target System profiles.</td>
</tr>
<tr>
<td>6.</td>
<td>Run transaction RZ04</td>
<td>Maintain operation modes and number of work processes.</td>
</tr>
<tr>
<td>7.</td>
<td>Import the Users</td>
<td>You must import the transport requests created during the pre-installation task of exporting using SCC8.</td>
</tr>
<tr>
<td>Sno.</td>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>Import RFCs</td>
<td>Attach the table entries in the tables, such as, RFCDES, RFCDOC, RFCATTRIB, and RSEC* entries to a transport request so they can later be imported (co-files and data files) once the system refresh is complete. The RFCs export and import can be scripted for a faster export and import.</td>
</tr>
<tr>
<td>9</td>
<td>Import Partner profiles</td>
<td>Attach the table entries in the tables EDPP1, EDP12, EDP13, and EDP21 to a transport request so it can later be imported (co-files and data files) once the system refresh is complete. You can script the partner profiles export and import for a faster export and import.</td>
</tr>
<tr>
<td>10</td>
<td>Delete all canceled and finished jobs.</td>
<td>In SE38, execute the program RSBTCDEL.</td>
</tr>
<tr>
<td>11</td>
<td>Import Background jobs</td>
<td>Attach the table entries in the tables BTCCTL, BTCDELAY, BTCEVTJOB, BTCH1000, BTCH1010, TBTC0, and TBTCP to a transport request, so it can be imported later once the system refresh is complete. You can script the background jobs for a faster export and import.</td>
</tr>
<tr>
<td>12</td>
<td>Import SAPLICENSE</td>
<td>Use saplicense – show to save the SAP License and apply this saved license.</td>
</tr>
<tr>
<td>13</td>
<td>Delete all entries from the following tables.</td>
<td>LCONSEG, ALSYSTEMS, DBSNP, MONI, OSMON, PAHI, SDBAD, SDBAH, SDBAP, SDBAR</td>
</tr>
<tr>
<td>14</td>
<td>Delete entries in buffer synchronization</td>
<td>Delete the entries in the table DDLOG.</td>
</tr>
<tr>
<td>15</td>
<td>Check the ABAP Secure Store</td>
<td>Execute transaction SECSTORE and choose check entries and execute. If you see any error message you need to restore the legacy key file that was used in the source system.</td>
</tr>
<tr>
<td>16</td>
<td>Delete repair requests</td>
<td>Delete all entries from table TLOK.</td>
</tr>
<tr>
<td>17</td>
<td>Restore database actions based on the screenshots saved during pre-installation activities</td>
<td>Restore database actions (backup, update statistics) in the DB13 transaction (DBA Calendar).</td>
</tr>
<tr>
<td>18</td>
<td>Configure or Restore load balancing</td>
<td>Go to transaction SMLG and check the logon groups and assignment of the application servers to the logon groups.</td>
</tr>
<tr>
<td>19</td>
<td>Check the communication table and Host tables</td>
<td>TXCOM table SM54 and THOST table in SM55</td>
</tr>
<tr>
<td>20</td>
<td>Check/Configure the connection to SAPNet</td>
<td>Using the transaction OSS1 check/configure the connection service market place.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Slno.</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Delete the unused and unnecessary clients in the target system</td>
<td>Remove the unnecessary clients in the target system using the transaction SCC5.</td>
</tr>
<tr>
<td>22.</td>
<td>Maintain SLD and start Data collection programs</td>
<td>Run transaction RZ70.</td>
</tr>
<tr>
<td>24.</td>
<td>Perform necessary adjustments to database specific objects</td>
<td>Run the program RS_BW_POST_MIGRATION with the variant SAP&amp;POSTMGR. This program performs necessary adjustments to the database-specific ABAP dictionary entries (modify, delete, and enhance), invalidating database-specific (generated) programs, deleting temporary objects from specific LRU buffers, migrating more recent versions for the PSA tables, and adjusting table DBDIFF. Note: This program has a long run time.</td>
</tr>
</tbody>
</table>

**IMPORTANT POINTS REGARDING SAP HANA STORAGE SNAPSHOTS**

Here are some of the most important points regarding the SAP HANA storage snapshots methodology.

Let’s start with the advantages of using storage snapshots:

- Storage snapshots are useful as they provide very fast data backups and perform system copies for huge amounts of data with a negligible impact to the network, overall I/O performance, and the SAP HANA database itself.
- Also, storage snapshots are most suitable for fast database recovery (recovery-time-objective; RTO). If your RTO requirement is very low storage snapshots are the best way to recover an SAP HANA database.

Some of the disadvantages of storage snapshots in the SAP HANA database:

- In contrast to file-based or backint-based data backups, no database internal integrity check (checksum calculation) on page resp. block level is performed while a storage snapshot is created, meaning storage snapshots could contain damaged data pages.
- Compared to file-based or backint-based data backups, a storage snapshot will consider the entire data area of all SAP HANA database services and not only the payload of each service specific data volume.

Storage snapshots are not supported for SAP HANA dynamic tiering at present, nor are multi-tenant database containers.
CONCLUSION

The SAP HANA-based system copy process is faster and more efficient than the regular SAP HANA backup and restore methodology. The whole process of SAP HANA system copy using snapshots can be automated by scripting. In this document, we have explained the GUI based approach as well as the command line approach.

The entire system copy process using Pure Storage FlashArray storage snapshots can be completed in minutes rather than hours. FlashArray storage snapshots are instantaneous and the latest version of Purity for FlashArray supports 50,000 of these snapshots.

The SAP HANA system copy process of using File-based backups and restore of the target would take hours, but with snapshots the whole process is vastly accelerated. This saves SAP Basis consultants a considerable amount of time, so they can immediately start working on pre-refresh and post-refresh activities for the SAP application.