

Acronis



Acronis Backup 12.5 Update 4

Table of contents

1	Introduction	3
2	SAP HANA backup basics.....	3
3	Acronis snapshot solution overview	4
4	Supported SAP HANA versions	4
5	Backing up physical servers	5
6	Backing up virtual servers	7
7	Recovering an entire server.....	7
8	Recovering a database by using SAP HANA Studio	8
8.1	Recovery from the most recent backup	8
8.2	Recovery from a specific backup	12

1 Introduction

SAP HANA is a relational database management system designed to store data in memory. In certain scenarios, this architecture offers significant advantages over traditional databases that rely on a disk storage mechanism. However, this same in-memory design creates additional challenges when protecting servers running SAP HANA because the data located in the memory is not normally copied as part of regular backup.

This document describes the solution for creating consistent disk-level backups of servers running SAP HANA, in a simple, straightforward manner that does not require any SAP HANA knowledge or expertise. The solution allows you to recover SAP HANA servers to bare metal, same or different hardware, migrate them from a physical machine to a virtual machine and vice versa – something that is not offered by traditional and legacy database backup solutions.

2 SAP HANA backup basics

Although the SAP HANA data resides in the memory, this database uses persistent storage like any other database, to be able to survive across power cycles. This persistent data is split into two areas: the data area and the log area.

Data is automatically saved to the data area at regular intervals (savepoints) and all changes are captured in the redo log entries. As with other databases, an entry is placed in the log after every committed database transaction.

After a sudden power failure, SAP HANA can be restarted like a traditional database: it loads the last savepoint and replays the redo logs from that point up to the last committed transaction.

However, this system does not protect the data from disk storage failures and logical errors. Backups are required to protect against disk failures or to return a database to an earlier point in time.

SAP HANA backup methods

SAP HANA offers three backup methods:

- Backup to the file system
- Backup via the Backint API provided by SAP
- Backup using snapshots

Backup to the file system

This method creates a backup of the data and logs in a folder on the file system, for example, in an NFS folder. A backup can be triggered manually as an action in the SAP HANA Studio, through SQL commands, or scheduled by using the DBA Cockpit.

This is an easy way to obtain a copy of the data, but it requires additional storage and time to create the copy, and it impacts the network load and performance.

Backups via Backint API

This method is similar to backups made to the file system, but the data and logs are redirected through the API to a third-party backup server or storage solution.

As with the previous method, Backint creates a copy of the database only and not of the underlying system. This means that a recovery of the entire server would require a long multi-step process or a standby server.

Acronis does not yet offer integration with the Backint API.

Backup using snapshots

This method makes use of a data snapshot preparation mechanism built-in to SAP HANA, which works in conjunction with an external tool (like a storage snapshot or Acronis snapshot) that creates a snapshot of the entire data area.

Acronis Backup uses the SAP HANA snapshot preparation mechanism to create disk-level, application-consistent backups of the entire SAP HANA server, employing the deep expertise that Acronis holds in this area. This solution provides the following advantages:

- Bare-metal recovery to the same or dissimilar hardware, with support for LVM
- Physical-to-virtual and virtual-to-physical conversion, including conversion to a virtual machine on a schedule
- Almost-instant restore by running a VMware ESXi virtual machine from a SAP HANA server backup

3 Acronis snapshot solution overview

- Acronis provides the tested and verified pre- and post-data capture scripts that handle the intricacies of preparing the internal SAP HANA snapshot and closing the snapshot correctly.
- These scripts are included in a backup plan that backs up the entire SAP HANA server.
- Every time this backup plan runs, the pre-data capture script calls on SAP HANA to prepare the internal snapshot that leaves the database in a ready and consistent state on the disk. This sets the stage for Acronis' own snapshot to capture this state.
- Acronis Backup takes the disk snapshot.
- The post-data capture script releases the SAP HANA snapshot.
Preparing, taking, and releasing the snapshot are nearly instantaneous. The database remains operational throughout this time.
- Acronis Backup creates a backup of the entire machine, including the SAP data area, frozen in time at the moment of snapshot creation.

This backup can be used to recover the entire server, converted to a virtual machine, or mounted to a file system as a volume. Every time, the SAP HANA data inside the backup will be consistent.

4 Supported SAP HANA versions

HANA 2.0 SPS 03 installed in RHEL 7.6 running on a physical machine or VMware ESXi virtual machine.

Because SAP HANA does not support recovery of multitenant database containers by using storage snapshots, this solution supports SAP HANA containers with only one tenant database.

5 Backing up physical servers

Prerequisites

- Acronis Backup Management Server is installed in your environment.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36418.html
- You can sign in to the management server by using a supported browser.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36544.html
- Acronis Backup Agent for Linux is installed on the machine running SAP HANA and added to the management server.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36553.html
- An Advanced Server license is assigned to the machine running SAP HANA.

Installing the scripts

- Download the file <https://dl.managed-protection.com/u/SAPHANA/SAP-HANA-modules.tar>
- Unpack the file: **tar -xvf SAP-HANA-modules.tar**
- Give the executable permissions to the setup script: **sudo chmod 777 setup.sh**
- Run the setup script **setup.sh**

Configuring access to the databases

1. Change the directory:

```
cd /usr/lib/Acronis/SAPHANA/bash/
```

2. Specify the access credentials by using the commands described below.

The user whose credentials you specify must have the Backup Admin and Catalog Read privileges on the respective instance.

- To add credentials by specifying a user name and password

```
sudo ./config.sh ADD -i <instance_number> -d <database> -u <user> -p <password>
```

The credentials that you provide are stored at `/var/lib/Acronis/SAPHANA/Config/config.yaml` and are only accessible by the root user. The password is encoded in base64 and not encrypted.

- To add a user from a secure user store

```
sudo ./config.sh ADD -i <instance_number> -d <database> -U <key>
```

- To remove credentials for a specific database

```
./config.sh REMOVE -i <instance_number> -d <database>
```

- To view the list of added credentials

```
sudo ./config.sh LIST
```

- To view credentials for a specific database

```
sudo ./config.sh GET -i <instance_number> -d <database>
```

3. Specify the SAP HANA installation path:

```
sudo ./config.sh SET_INSTALL_PATH --install_path <path>
```

Here, <path> is the path to the **sapservices** file that SAP HANA uses to keep track of where the databases are installed. The default path is `/usr/sap`.

Creating a backup plan

Create a backup plan for the entire SAP HANA server according to your server protection requirements, as described at https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#41030.html.

When creating the plan:

1. Click the gear icon to access **Backup options**, and then select the **Pre-post data capture commands** option.
2. Enable the **Execute a command before the data capture** switch.
3. In the **Command or batch file path on the machine with an agent** field, enter the pre-data capture script path: `/usr/lib/Acronis/SAPHANA/bash/pre_freeze.sh`
4. Enable the **Execute a command after the data capture** switch.
5. In the **Command or batch file path on the machine with an agent** field, enter the post-data capture script path:
 - `/usr/lib/Acronis/SAPHANA/bash/post_thaw.sh` – if you do not want to truncate logs
 - `/usr/lib/Acronis/SAPHANA/bash/post_thaw_with_truncate_logs.sh` – if you want to truncate the logs after each backup. This modified script will delete redo logs after successfully closing the snapshot.

Backup options

Search by name
backup

File filters

LVM snapshotting

Multi-volume snapshot

Performance

Pre-post commands

Pre-post data capture commands

SAN hardware snapshots

Scheduling

Sector-by-sector backup

Tape management

Task failure handling

Task start conditions

Volume Shadow Copy Service (VSS)

Volume Shadow Copy Service (VSS) for virtual machines

Execute a command before the data capture

No Yes

Command or batch file path on the machine with an agent

`/usr/lib/Acronis/SAPHANA/bash/pre_freeze.sh`

Working directory

Arguments

Fail the backup if the command execution fails

Do not perform the data capture until the command execution is complete

Execute a command after the data capture

No Yes

Command or batch file path on the machine with an agent

`/usr/lib/Acronis/SAPHANA/bash/post_thaw.sh`

Working directory

Arguments

Fail the backup if the command execution fails

Do not back up until the command execution is complete

DONE

6. Select the **Multi-volume snapshot** option and make sure it is enabled.

7. Click **Done**.
8. Specify other settings of the backup plan as appropriate, and then click **Create**.

The backup plan will be created and applied to your SAP HANA server. The backups created by this plan will contain a consistent database while making use of the powerful functionality that Acronis provides for all disk-level backups.

6 Backing up virtual servers

Prerequisites

- A VMware ESXi virtual machine is running SAP HANA and has VMware tools installed.
- Acronis Backup Management Server is installed in your environment.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36418.html
- You can sign in to the management server by using a supported browser.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36544.html
- Acronis Backup Agent for VMware is installed in VMware vSphere or on a Windows machine, and is added to the management server.
https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#36417.html
- An Advanced Server license is assigned to the ESXi that hosts the virtual machine running SAP HANA.

Further steps

Log in to the guest system and perform the "Installing the scripts" and "Configuring access to the databases" procedures described in "Backing up physical servers" (p. 5).

Create a backup plan to back up the entire SAP HANA server according to your server protection requirements, as described at https://www.acronis.com/en-us/support/documentation/AcronisBackup_12.5/index.html#41030.html. For virtual machines, you do not need to specify pre- and post-data capture commands. The scripts will be called automatically by VMware Tools every time a quiesced snapshot is required. However, make sure that the **Multi-volume snapshot** option is enabled.

To enable or disable log truncation, edit the file `/usr/sbin/post-thaw-script`. By default, this script calls `/usr/lib/Acronis/SAPHANA/bash/post_thaw.sh`, which means that the logs are not truncated. To enable the truncation, change the `/usr/lib/Acronis/SAPHANA/bash/post_thaw.sh` string to `/usr/lib/Acronis/SAPHANA/bash/post_thaw_with_truncate_logs.sh`.

7 Recovering an entire server

Recover the physical or virtual server as described in the "Recovering a machine" section of the user documentation.

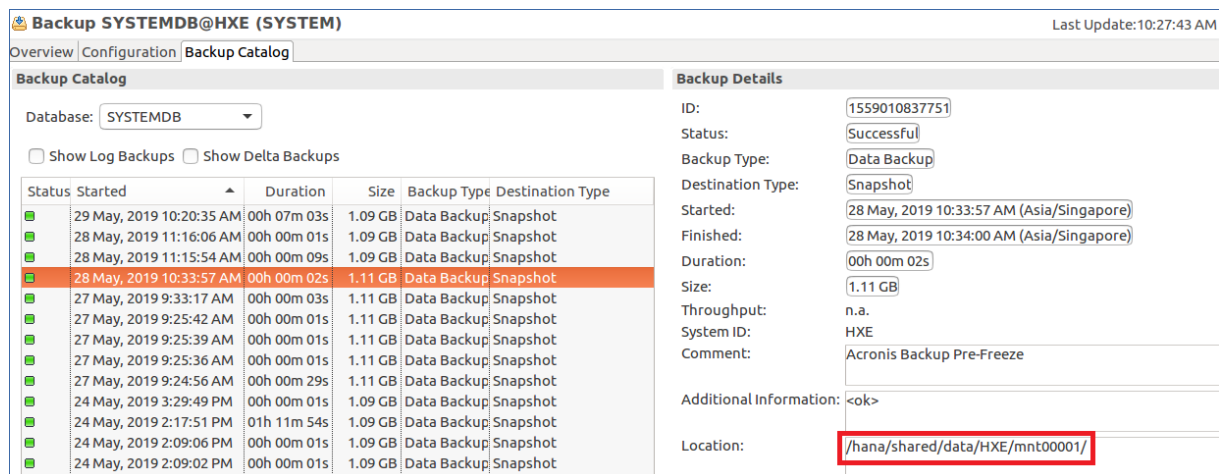
If you want to run a VMware ESXi virtual machine from a backup, proceed as described in the "Running a virtual machine from a backup (Instant Restore)" section of the user documentation.

8 Recovering a database by using SAP HANA Studio

If there is no need to recover the entire server, you can revert a database to a snapshot by using the native SAP HANA tools. Below are the examples of database recovery from HANA snapshots created during the pre-data capture commands execution.

These snapshots can be identified by the comment "Acronis Backup Pre-Freeze" in the backup details, for example, in the SAP HANA backup catalog.

Prior to starting a recovery, make a note of the folder where the snapshots are located:



Status	Started	Duration	Size	Backup Type	Destination Type
●	29 May, 2019 10:20:35 AM	00h 07m 03s	1.09 GB	Data Backup	Snapshot
●	28 May, 2019 11:16:06 AM	00h 00m 01s	1.09 GB	Data Backup	Snapshot
●	28 May, 2019 11:15:54 AM	00h 00m 09s	1.09 GB	Data Backup	Snapshot
●	28 May, 2019 10:33:57 AM	00h 00m 02s	1.11 GB	Data Backup	Snapshot
●	27 May, 2019 9:33:17 AM	00h 00m 03s	1.11 GB	Data Backup	Snapshot
●	27 May, 2019 9:25:42 AM	00h 00m 01s	1.11 GB	Data Backup	Snapshot
●	27 May, 2019 9:25:39 AM	00h 00m 01s	1.11 GB	Data Backup	Snapshot
●	27 May, 2019 9:25:36 AM	00h 00m 01s	1.11 GB	Data Backup	Snapshot
●	27 May, 2019 9:24:56 AM	00h 00m 29s	1.11 GB	Data Backup	Snapshot
●	24 May, 2019 3:29:49 PM	00h 00m 01s	1.09 GB	Data Backup	Snapshot
●	24 May, 2019 2:17:51 PM	01h 11m 54s	1.09 GB	Data Backup	Snapshot
●	24 May, 2019 2:09:06 PM	00h 00m 01s	1.09 GB	Data Backup	Snapshot
●	24 May, 2019 2:09:02 PM	00h 00m 01s	1.09 GB	Data Backup	Snapshot

Backup Details

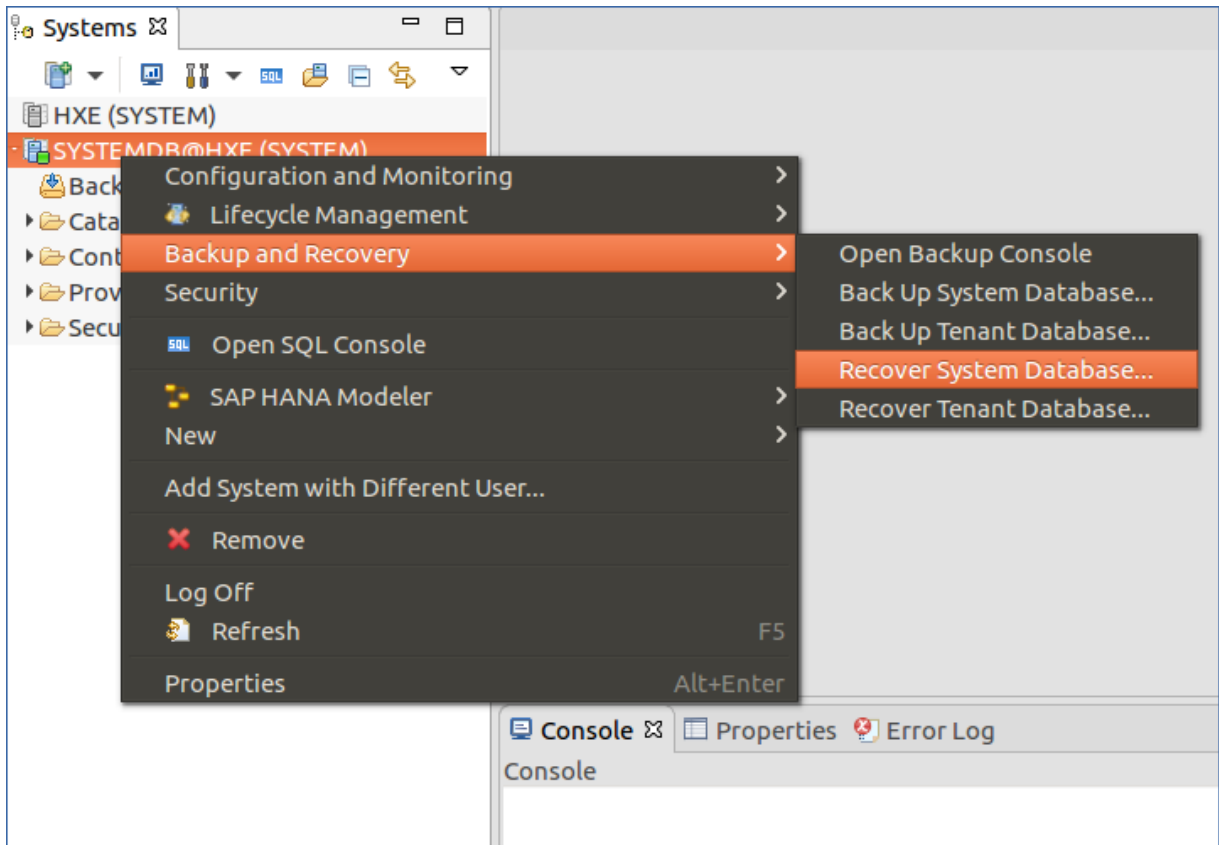
ID: 1559010837751
Status: Successful
Backup Type: Data Backup
Destination Type: Snapshot
Started: 28 May, 2019 10:33:57 AM (Asia/Singapore)
Finished: 28 May, 2019 10:34:00 AM (Asia/Singapore)
Duration: 00h 00m 02s
Size: 1.11 GB
Throughput: n.a.
System ID: HXE
Comment: Acronis Backup Pre-Freeze
Additional Information: <ok>
Location: /hana/shared/data/HXE/mnt00001/

During a recovery, we will first recover the folder containing a snapshot, and then revert the databases to this snapshot by using SAP HANA Studio.

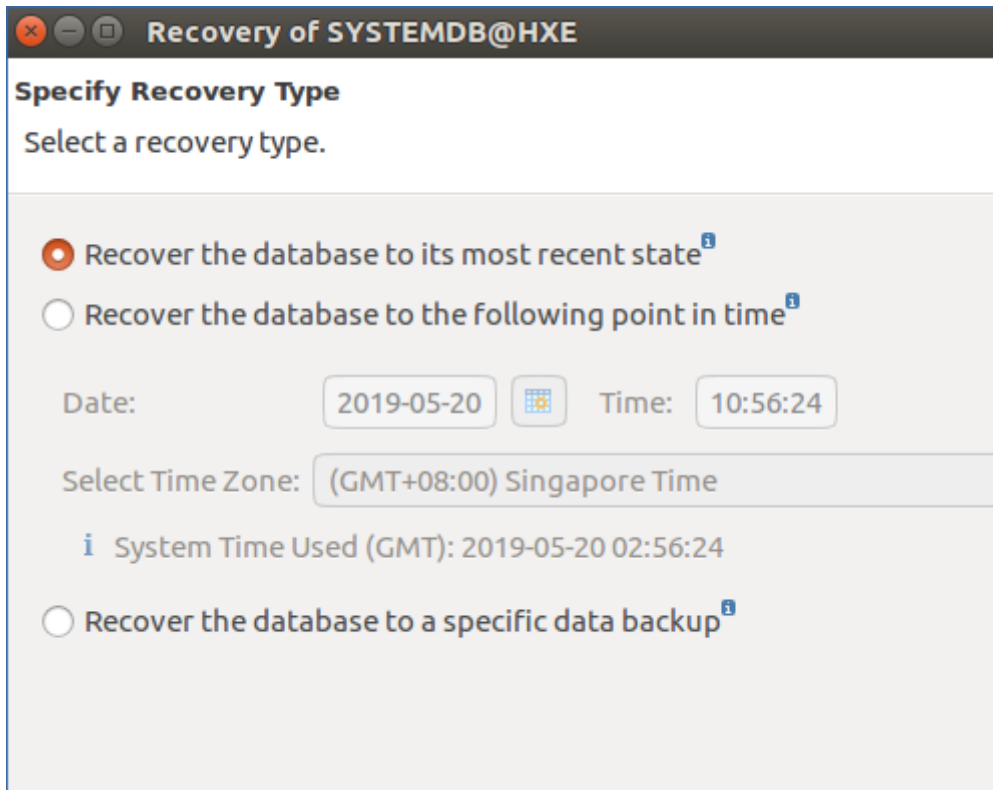
8.1 Recovery from the most recent backup

1. Stop the SAP services.
 - a. Open the terminal and switch to SAP HANA user: **su <sid>adm**. For example, **su hxeadm**.
 - b. Type **HDB stop**.
2. Recover the folder where the snapshots are located from the most recent backup created by the backup service. The recovery procedure is described in the "Recovering files by using the web interface" section of the user documentation.
3. Start SAP HANA Studio.

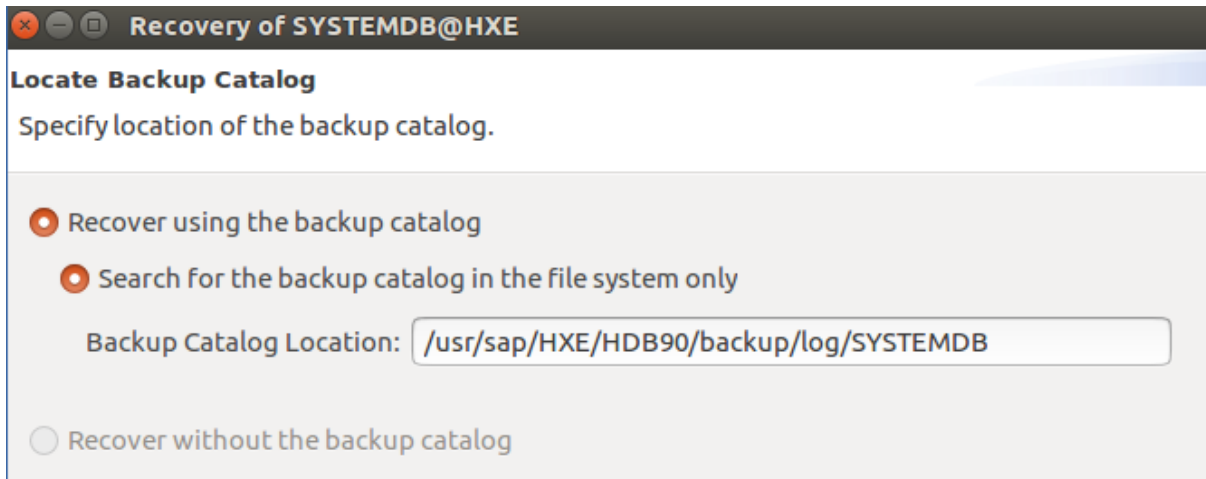
4. Right-click the system database, and then select **Backup and Recovery > Recover System Database...**



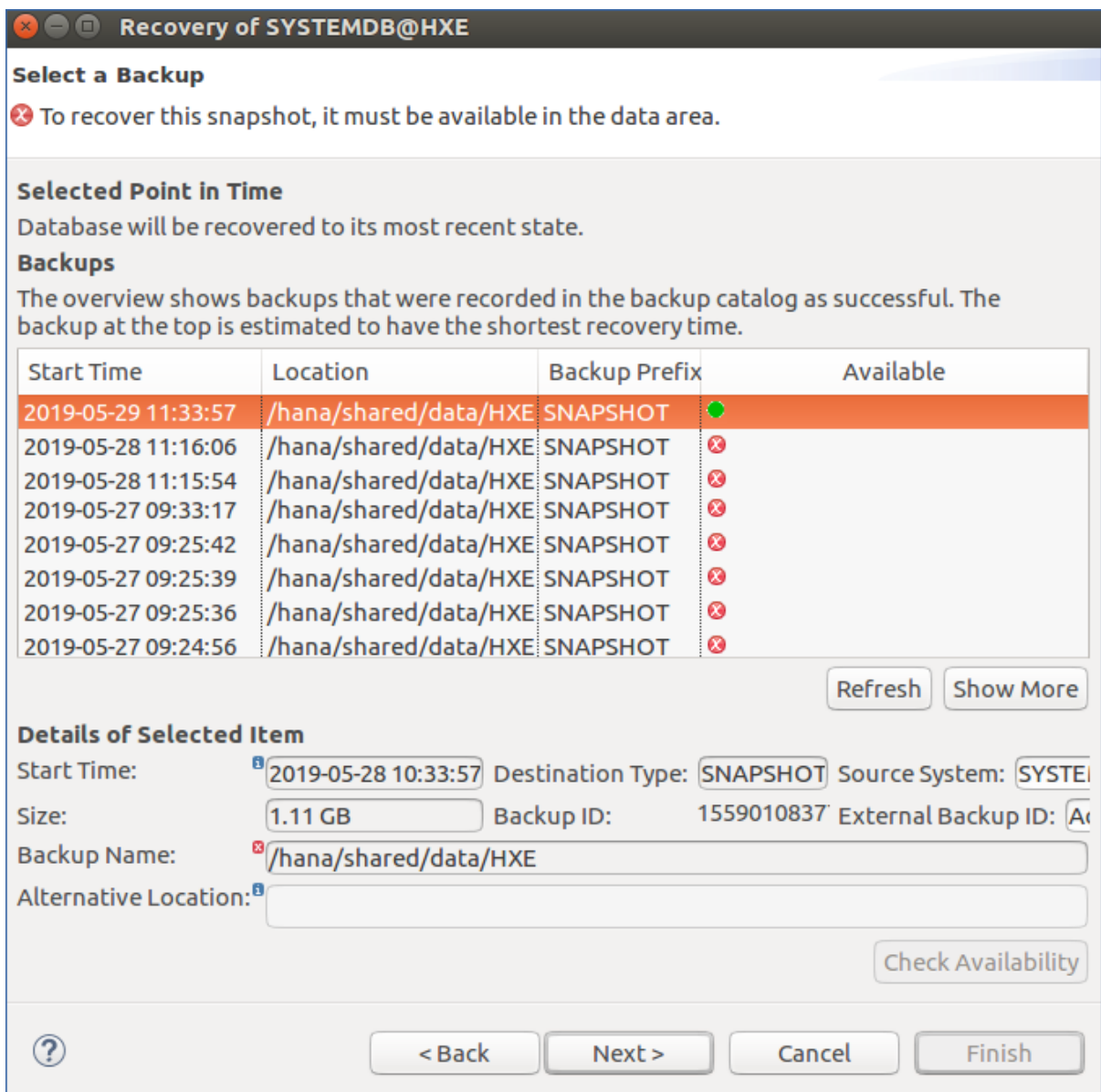
5. Select **Recover the database to its most recent state**.



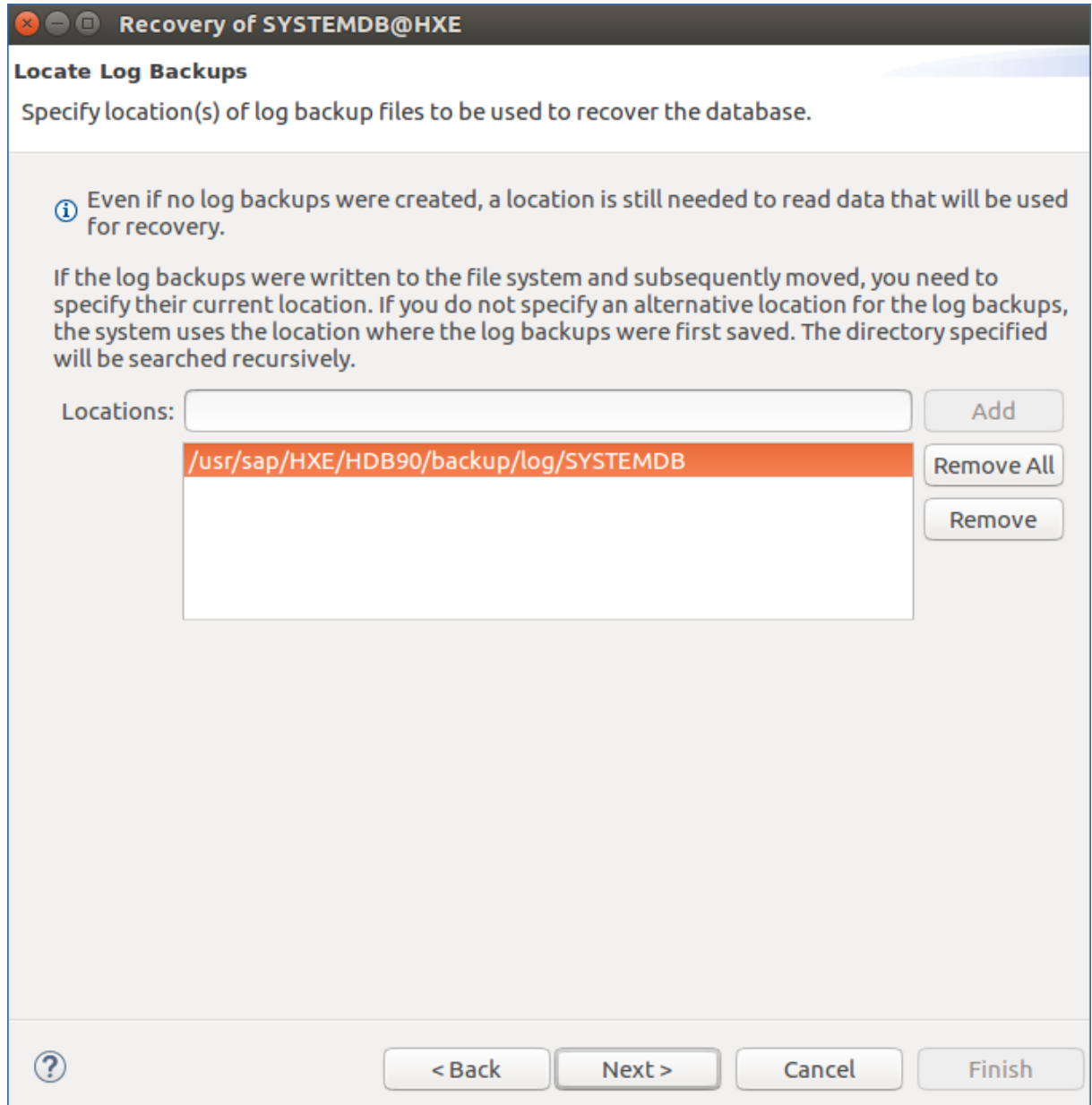
6. Check the backup catalog path and change it if necessary.



7. The latest snapshot should be available because it was recovered in step 2. Click **Refresh** if it is not.

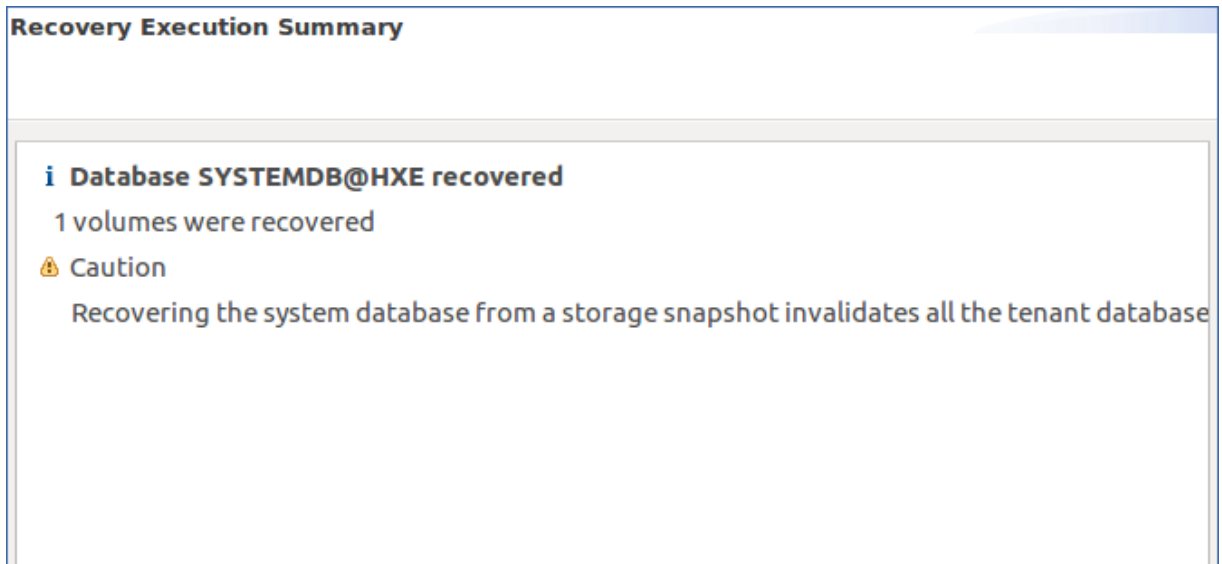


8. Check the log files path and change it if necessary.

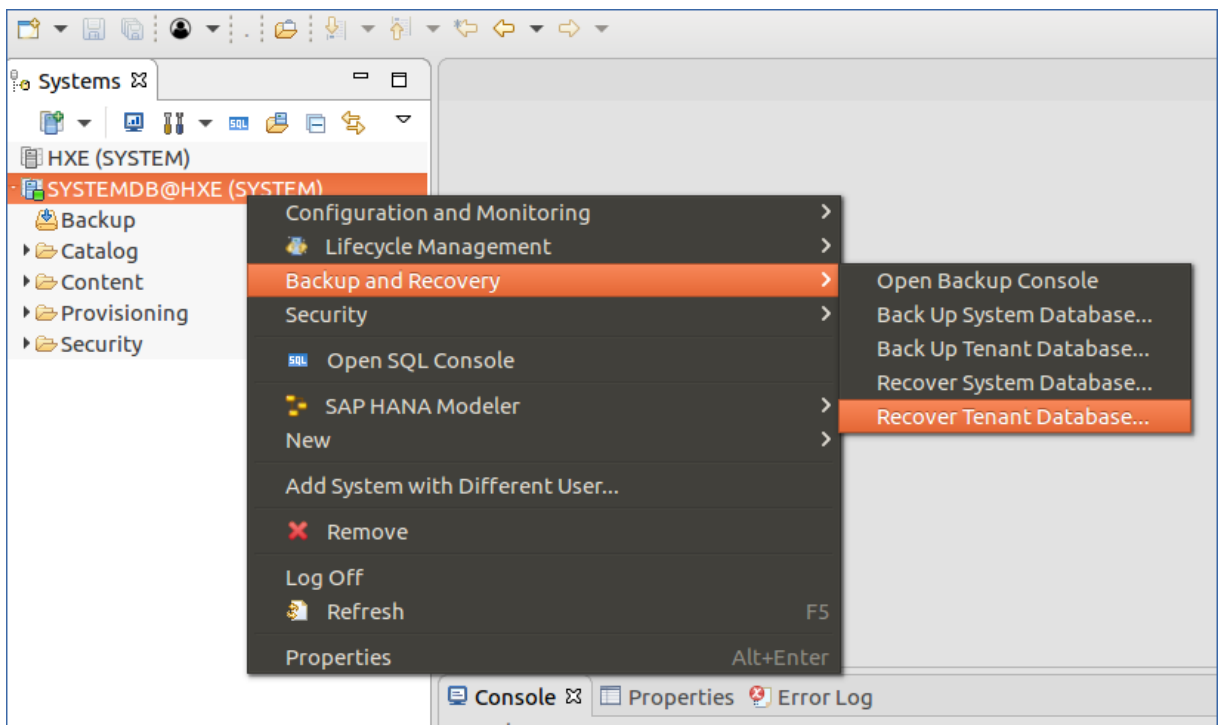


9. In the **Other Settings** step, leave the default settings and click **Next**.

- Review the recovery settings, and then click **Finish**. After a successful recovery, a message about the tenant database is shown.



- Right-click the system database, and then select **Backup and Recovery > Recover Tenant Database...**



- Repeat steps 5-10 for the tenant database.
- After a successful recovery, open the terminal, switch to SAP HANA user, and then type **HDB start**.

8.2 Recovery from a specific backup

- Start the SAP HANA studio and log on to the system database.
- Right-click the system database, and then select **Backup and Recovery > Recover System Database...**

3. Select **Recover the database to a specific data backup**, and then click **Next**.

Specify Recovery Type

Select a recovery type.

Recover the database to its most recent stateⁱ

Recover the database to the following point in timeⁱ

Date: Time:

Select Time Zone:

ⁱ System Time Used (GMT): 2019-05-21 10:48:02

Recover the database to a specific data backupⁱ

4. Select **Recover using the backup catalog**. Check the backup catalog path and change it if necessary.
5. In the backup catalog, the snapshots are shown as not available. Choose the snapshot to revert the database to and note the snapshot's **Start Time**.
6. Recover the folder where the snapshots are located from the backup created by Acronis Backup at the moment corresponding to the **Start Time** value. The recovery procedure is described in the "Recovering files by using the web interface" section of the user documentation.

- Return to the backup catalog and click **Refresh**. The chosen snapshot is now shown as available. Select this snapshot and click **Next**.

Recovery of SYSTEMDB@HXE

Select a Backup

⊗ To recover this snapshot, it must be available in the data area.

Backups
The overview shows backups that were recorded in the backup catalog as successful.

Start Time	Location	Backup Prefix	
2019-05-29 10:20:35	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-28 11:16:06	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-28 11:15:54	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-28 10:33:57	/hana/shared/data/HXE	SNAPSHOT	●
2019-05-27 09:33:17	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-27 09:25:42	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-27 09:25:39	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-27 09:25:36	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-27 09:24:56	/hana/shared/data/HXE	SNAPSHOT	⊗
2019-05-24 15:29:49	/hana/shared/data/HXE	SNAPSHOT	⊗

Refresh Show More

Details of Selected Item

Start Time: 2019-05-29 10:20:35 Destination Type: SNAPSHOT Source System: SYSTEMDB@HXE

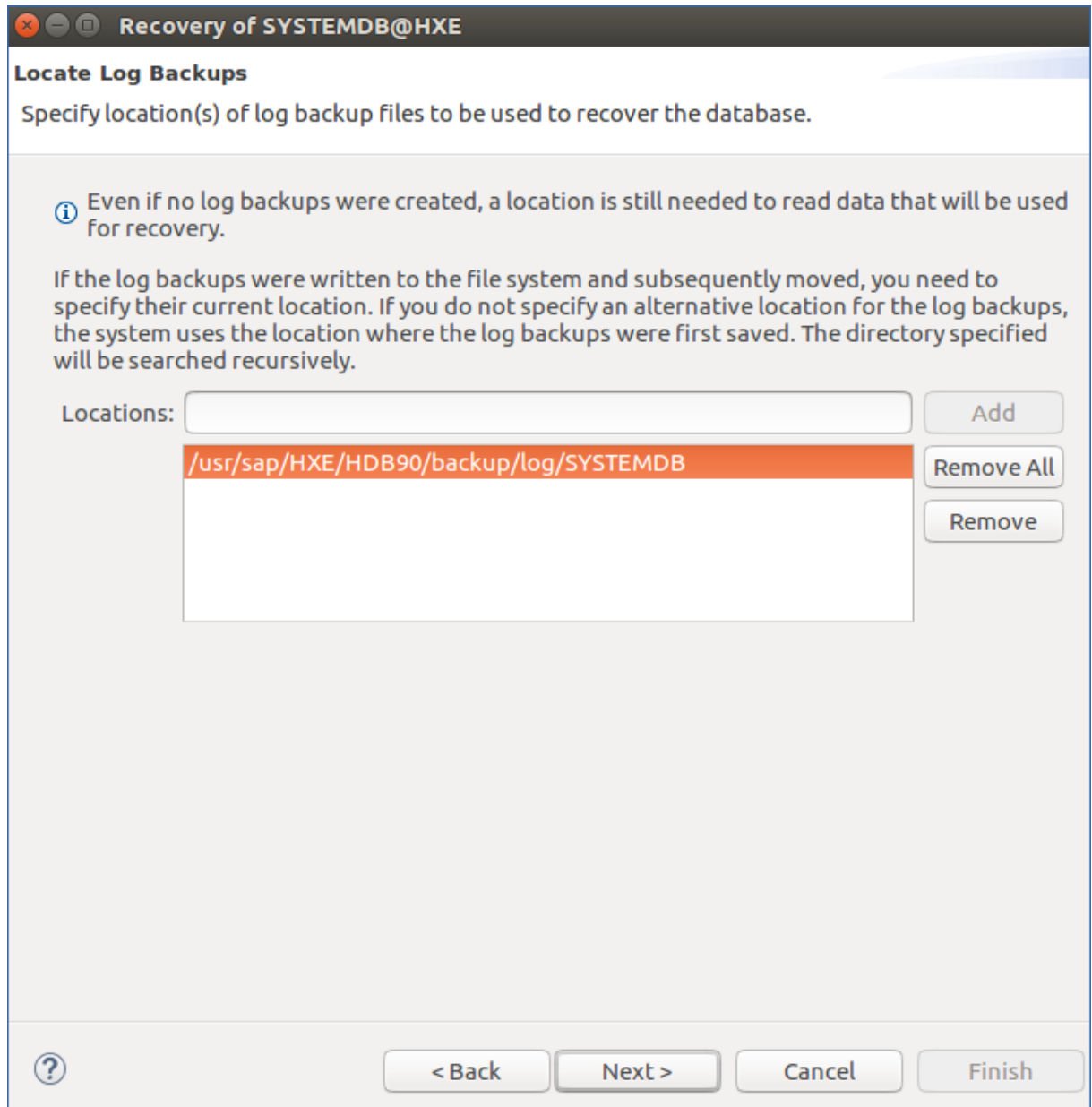
Size: 1.09 GB Backup ID: 1559096435 External Backup ID: A...

Backup Name: ⊗ /hana/shared/data/HXE

Alternative Location:

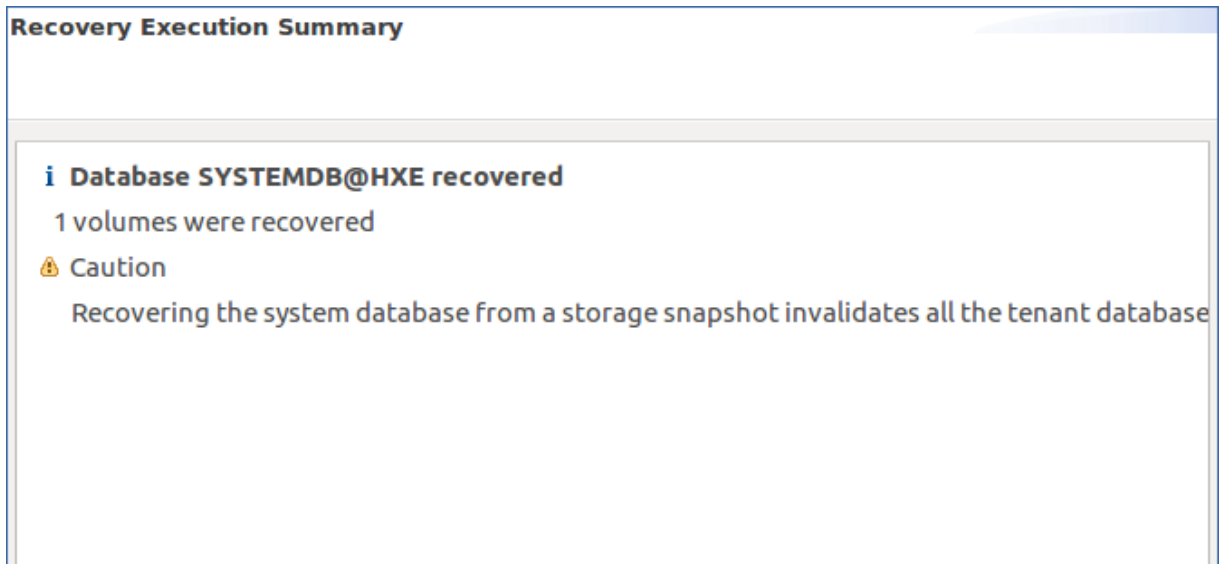
Check Availability

8. Check the log files path and change it if necessary.

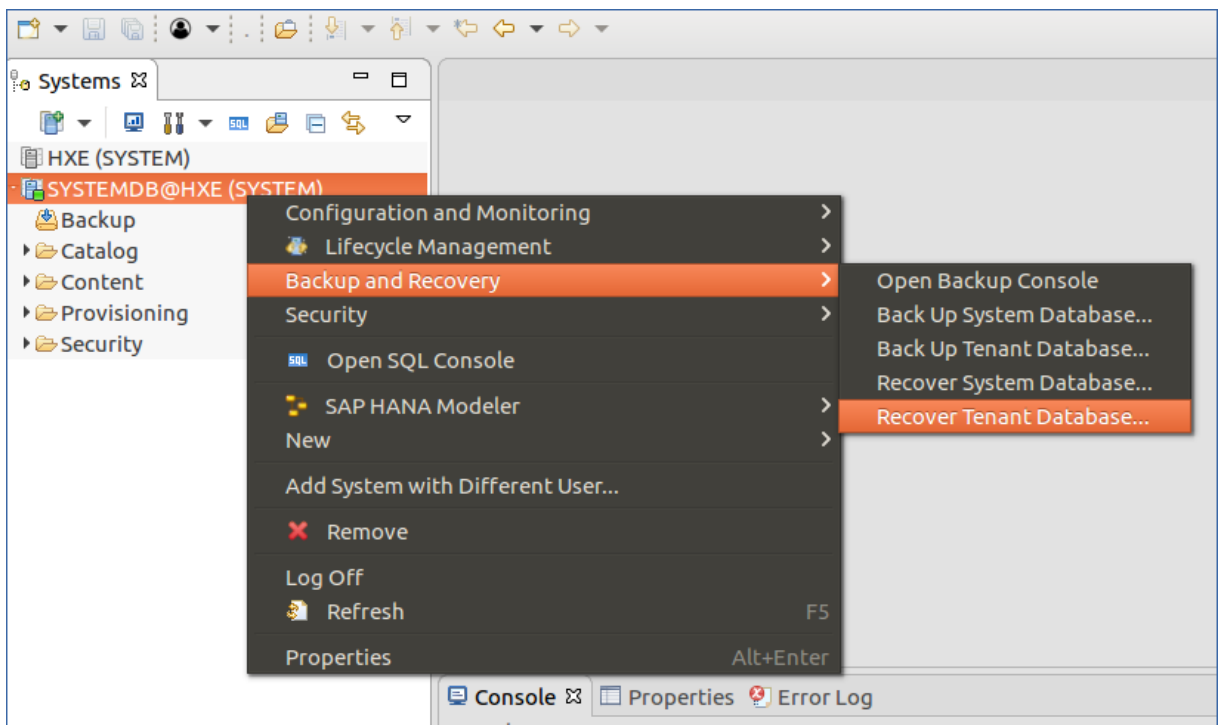


9. In the **Other Settings** step, leave the default settings and click **Next**.

- Review the recovery settings, and then click **Finish**. After a successful recovery, a message about the tenant database is shown.



- Right-click the system database, and then select **Backup and Recovery > Recover Tenant Database...**



- Repeat steps 3-4 and 7-10 for the tenant database.
- After a successful recovery, open the terminal, switch to SAP HANA user, and then type **HDB start**.