SAP HANA DBA's Guide to the IBM InfoSphere Virtual Data Pipeline

InfoSphere VDP 9.0

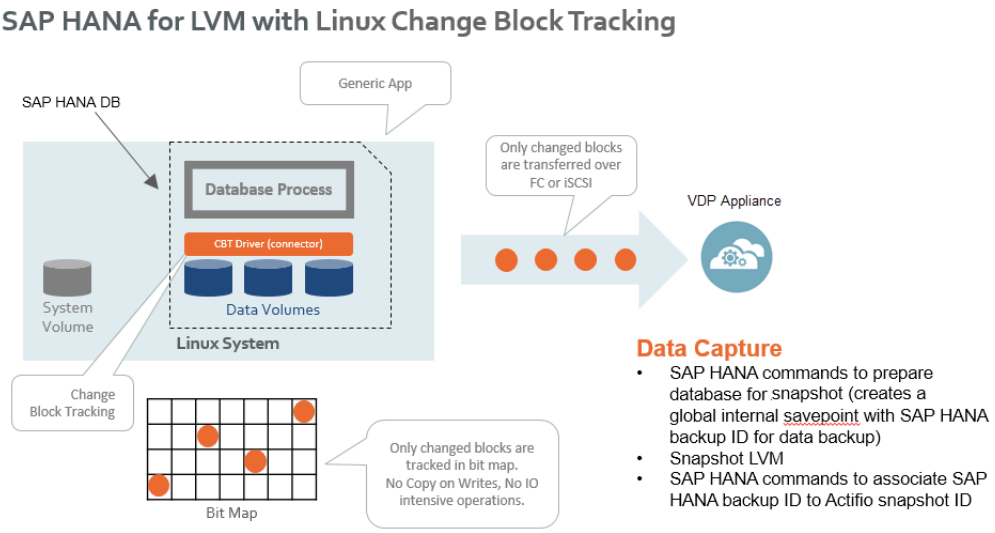
Contents

1 SAP HANA DBA's Introduction to IBM InfoSphere Copy Data Management

This chapter introduces IBM InfoSphere concepts and the procedures used to capture and access databases. It includes:

IBM InfoSphere Data Virtualization

An InfoSphere VDP Appliance is a highly scalable copy data management platform that virtualizes application data to improve the resiliency, agility, and cloud mobility of your business. It works by virtualizing data in much the same way other technologies have virtualized servers and networks. This enables you to capture data from production systems, manage it in the most efficient way possible, and use virtual copies of the data however they are needed.



SAP HANA for LVM with Linux Change Block Tracking

Application data is captured at the block level, in application native format, according to a specified SLA. A Golden copy of that data is created and stored once, and is then updated incrementally with only the changed blocks of data in an "incremental forever" model. Unlimited virtual copies of the data can be made available instantly for use, without proliferating physical copies and taking up additional storage infrastructure.

Capturing Data

Capturing data consists of four simple steps:

1. Add servers that host databases.
2. Discover the database.
3. Define IBM InfoSphere Policy Templates and Resource Profiles according to your RPOs and RTOs.
4. Assign IBM InfoSphere Policy Templates and Resource Profiles to discovered databases.

The VDP Connector

The VDP Connector is used to capture selected databases. The VDP Connector is a small-footprint, lightweight service that can be installed on either virtual or physical servers.

Specifically, the VDP Connector:

- Discovers the application to which data and log volumes will be added.
- Uses Linux changed block tracking to capture data at block level in incremental forever fashion.
- Identifies changes to database data for IBM InfoSphere's incremental forever capture strategy.

Replicating Data

Data can be replicated to a second InfoSphere VDP Appliance or to the cloud for recovery, disaster recovery, or test/development purposes.

Data replication has traditionally been an inhibitor to efficient data management in a geographically distributed environment. IBM InfoSphere replication addresses these issues with a global deduplication and compression approach that:

- Drives down overall network usage.
- Eliminates the need for a dedicated WAN accelerator/optimizer.
- Does not require storage array vendor licenses as data is sent from one InfoSphere VDP Appliance to another.
- Is heterogeneous from any supported array to any supported array: Tier 1 to Tier 2 and/or Vendor A to Vendor B.
- Preserves write-order, even across multiple LUNs.
- Is fully integrated with VMware Site Recovery Manager (SRM) and IBM InfoSphere Resiliency Director.

IBM InfoSphere Replication is controlled by IBM InfoSphere Policy Template policies:

- Production to Mirror policies have several options to replicate data to a second InfoSphere VDP Appliance.
- Dedup Backup to Dedup DR policies use a fixed, IBM InfoSphere proprietary replication engine to replicate data to a second InfoSphere VDP Appliance. In addition, Dedup Backup to Dedup DR policies allow you to replicate data to two locations.
- Production to Vault policies use a fixed, IBM InfoSphere proprietary replication engine to replicate data to the cloud.

Accessing Data

The InfoSphere VDP Appliance can instantly present a copy of the database rolled forward to a specific point of time.

Access options include:

Mounts

LiveClones

Restores

Workflows

Mounts

The IBM InfoSphere mount function provides instant access to data without moving data. Captured copies of databases can be rolled forward via the IBM InfoSphere user interface and mounted on any database server. Mounts are described in Chapter 8, Restoring, Accessing, or Recovering an SAP HANA Database.

LiveClones

The LiveClone is an independent copy of data that can be refreshed when the source data changes. The advantage of LiveClones is that they are independent copies of data that can be incrementally refreshed and masked before being made available to users. This allows teams such as development and test to ensure they are working on the latest set of data without having to manually manage the data and not access or interfere with the production environment.

Restores

The restore function reverts the production data to a specified point in time. Restore operations actually move data. Typically restore operations are performed to restore a database to a valid state after a massive data corruption or storage array failure. The amount of time required to complete a restore operation depends on the amount of data involved. Restores are described in Chapter 8, Restoring, Accessing, or Recovering an SAP HANA Database.

Workflows

While SLAs govern the automated *capture* of a production database, Workflows automate *access* to the captured database.

Workflows are built with captured data. Workflows can present data as either a direct mount or as a LiveClone:

- Direct mounts (standard or application aware) work well for data that does not need to be masked prior to being presented. A mounted copy of data can be refreshed manually or on automatically on a schedule. Direct mounts allow you to instantly access captured data without actually moving the data.
- A LiveClone is a copy of your production data that can be updated manually or on a scheduled basis. You can mask sensitive data in a LiveClone prior to making it available to users.

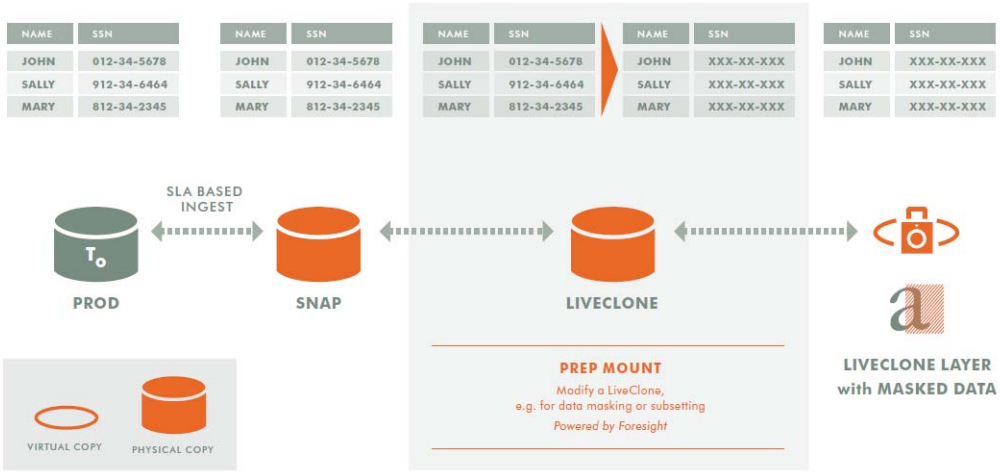
Combining IBM InfoSphere's automated data capture and access control with Workflows and their optional data masking capabilities allows you to create self-provisioning environments. Now, instead of having to wait for DBAs to update test and development environments, users can provision their own environments almost instantly.

For example, an IBM InfoSphere administrator can create an SLA Template Policy that captures data according to a specified schedule. Optionally, the administrator can mark the captured production data as sensitive and only accessible by users with the proper access rights.

After access rights have been defined and data has been captured, the administrator can create a Workflow that:

- Makes the captured data available as a LiveClone or as a direct mount
- Updates the LiveClone or mountable data on a scheduled or on-demand basis
- (Optional) Automatically applies scripts to the LiveClone's data after each update. This is useful for masking sensitive data.

Once the Workflow completes, users with proper access can provision their environments with the LiveClone or mountable data.



Workflow With Masked Social Security Data

Introduction to IBM InfoSphere SAP HANA Administration

IBM InfoSphere can virtualize and protect:

- **Single Container system (HANA 1.0) Dedicated**: In single-container system the system database and tenant database are perceived as a single unit and are therefore administered as one.
- **MDC: Multiple-Container Systems (HANA 2.0)**: Multiple isolated databases in a single SAP HANA system. These are referred to as multi-tenant database containers. A multiple-container system always has exactly one system database used for central system administration, and any number of multi-tenant databases (including zero), also called tenant databases.

IBM InfoSphere Support for SAP HANA Configurations

Configurations	SAP Storage Snapshot API	SAP File-Based API (hdbsql): IBM InfoSphere Block Mapping	SAP File-Based API (hdbsql): IBM InfoSphere NFS Mapping
Single Container System (HANA 1.0)	Yes (preferred)	Yes	Yes
MDC: Multiple-Container Systems (HANA 2.0) with one tenant database	Yes (preferred)	Yes	Yes
MDC: Multiple-Container Systems (HANA 2.0) with more than one tenant database		Yes	Yes
Scale-Out MDC: Multiple-Container Systems (HANA 2.0) with one or more tenant databases			Yes
Scale-Out MDC Local HA (N Active Host + 1 or More Standby Nodes)			Yes

Notes

- SAP storage snapshot API - leverages IBM InfoSphere CBT with incremental-forever and instant mount
- SAP file-based API - traditional backup with weekly full, daily incremental & copy-based restore
- NFS mapping is always to all HANA nodes
- HANA log backup is handled automatically in all options and integrated with database backup policies

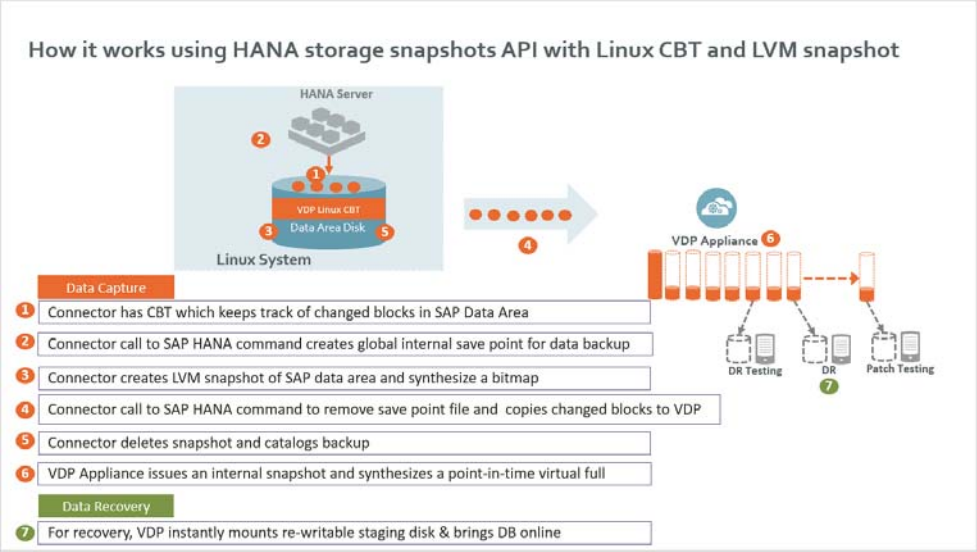
SAP HANA Backup Methods

IBM InfoSphere offers these methods of protecting SAP HANA databases:

- Block-Based LVM Snapshot with CBT Integrated with SAP HANA Database Storage Snapshot API
- File-Based Backup Integrated with HANA Traditional Backup API
- SAP HANA Log Backup

Block-Based LVM Snapshot with CBT Integrated with SAP HANA Database Storage Snapshot API

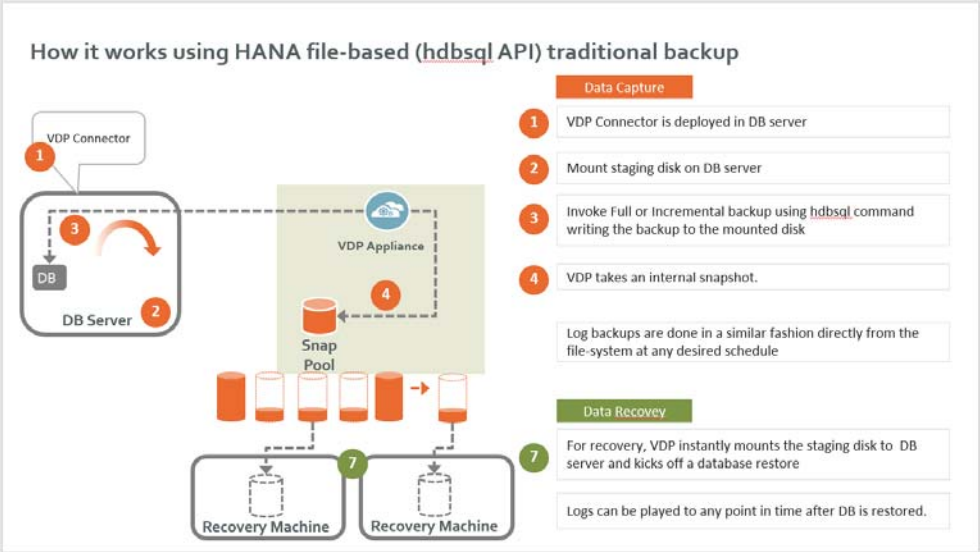
The SAP HANA database creates a database internal snapshot based on a system wide save point executed during the PREPARE step. The database internal snapshot is stored in the data volumes area.



How it Works Using HANA Storage Snapshot API with Linux CBT and LVM Snapshot

File-Based Backup Integrated with HANA Traditional Backup API

This provides the full and incremental backups of the data area, which is in backup format. The recovery API recovers the data area by overwriting the data area. When the data area is backed up, the entire payload data from all server nodes of the SAP HANA database instance is backed up. This applies in both single-host and multi-host environments.



How it Works Using HANA File-Based (hdbsql API) Traditional Backup

SAP HANA Log Backup

Log backups start automatically if the parameters enable_auto_log_backup and log_mode = normal have been configured. During a log backup, the payload of the log segments is copied from the log area to the location specified by the parameter basepath_logbackup.

References

1. Category > Administration Guide: http://help.sap.com/hana_platform
2. Storage Snapshots: https://help.sap.com/saphelp_hanaplatform/helpdata/en/ac/114d4b34d542b99bc390b34f8ef375/content.htm
3. 1642148 - FAQ: SAP HANA Database Backup & Recovery: https://launchpad.support.sap.com/#/notes/1642148/E
4. Create a homogeneous copy of an SAP HANA database by recovering an existing database to a different database:

   `https://help.sap.com/saphelp_hanaplatform/helpdata/en/ea/70213a0e114ec29724e4a10b6bb176/content.htm?frameset=/en/ca/c903c28b0e4301b39814ef41dbf568/frameset.htm&current_toc=/en/00/0ca1e3486640ef8b884cdf1a050fbb/plain.htm&node_id=773&show_children=false`

2 Preparing the SAP HANA 1.0 Database

Prerequisites

- All the configured services (see SAP Note 1697613 and SAP Note 1649519) such as nameserver, indexserver, etc. must be running. You can check this in the Overview of SAP HANA studio -> Operational State: All Services are started.
- Make sure log_mode for database is set to normal. (Check under HANA Studio configuration tab.)
- Use a SAP HANA hdbuserstore key to execute Backup and Recovery instead of a user name and password to communicate with HANA database using the SAP HANA Secure User Store. For HANA 1.0 userstore key needs to be created for a single container under database.

Preparing the HANA 1.0 database requires:

Creating the Database User Account on page 9

Get the SQL Port ID on page 11

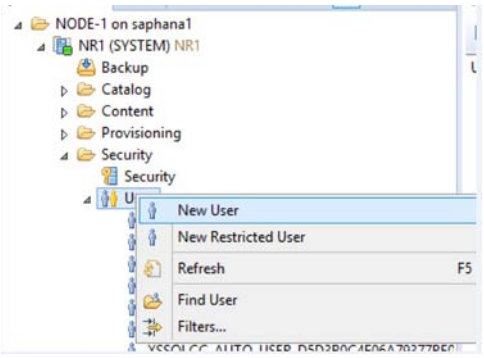
Adding SAP HANA Hdbuserstore Key in SAP HANA 1.0 (single container system) on page 11

Creating the Database User Account

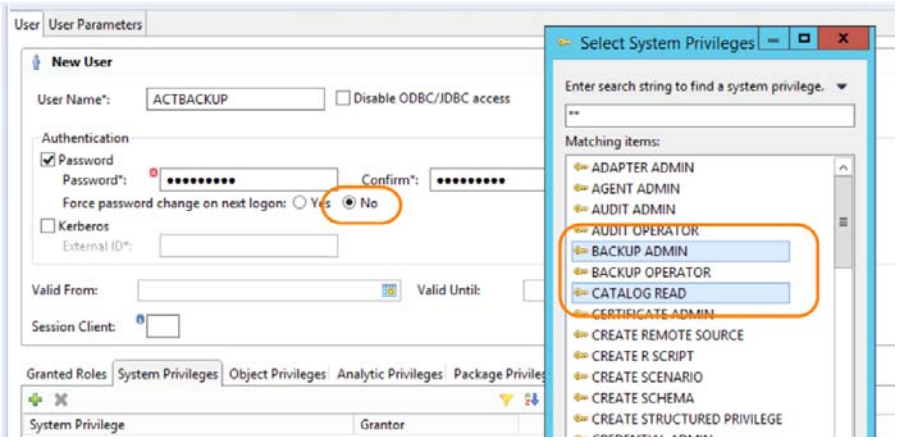
Make sure to create this user account under a single container database. Make sure to provide BACKUP ADMIN and CATALOG READ to back up the user created under database. Choose a database user name based on company's standard.

To create the user:

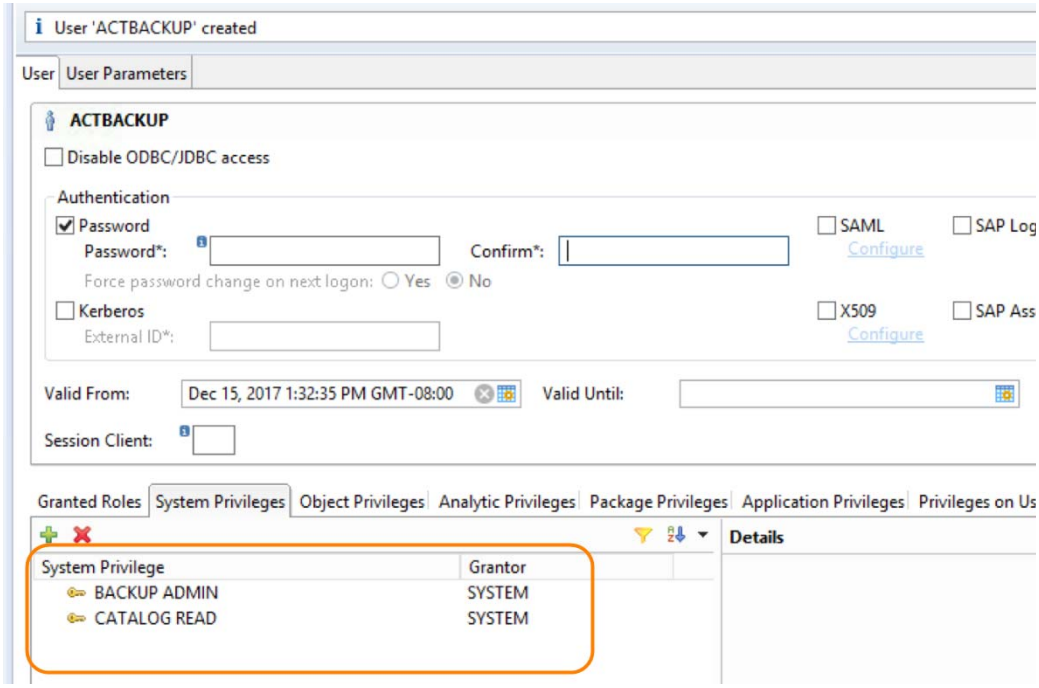
1. From SAP HANA Studio go to System > Security > Users > New User.



2. Assign a user name and a password.
3. Select Force password change on next logon to No.
4. Click on the System Privilege tab and assign privilege by selecting BACKUP ADMIN and CATALOG READ.

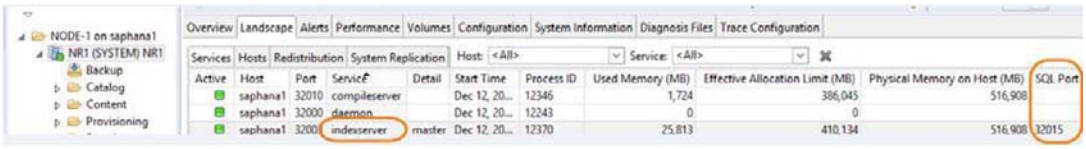


You will get a User Created message and the System Privileges will show the user has been granted BACKUP ADMIN and CATALOG READ privileges.



Get the SQL Port ID

For a HANA 1.0 single container system, get the SQL PORT from HANA Studio. At System > Landscape, get the value of SQL Port for indexserver. In the example below, 32015 is the SQL port, and the instance number here is 20.



Adding SAP HANA Hdbuserstore Key in SAP HANA 1.0 (single container system)

To communicate with HANA database, use a SAP HANA hdbuserstore key instead of a user name and password. Create the hdbuserstore key using the SAP HANA Secure User Store.

Hdbuserstore Key Naming Convention

Set the key name = DATABASE BACKUP USERNAME.

For example:

DATABASE BACKUP USERNAME = ACTBACKUP

Set SYSTEMDB key name = ACTBACKUP

Procedure

To create the SAP HANA hdbuserstore key:

1. Open the putty window to the HANA database server and login to <sid>adm by su to <sid>adm.
2. `cd exe`
3. Create entries in the hdbuserstore by calling:

```
# ./hdbuserstore SET <key_name> <server>:<port> <DB_user_name> <DB_user_password>
```

The <port> is the SQL port of the systemdb or tenant database, see above.

For example:

- DATABASE Backup username from above: ACTBACKUP
- KEY NAME: ACTBACKUP (same as database backup username)
- SQL Port from above: 32013
- Hostname : saphana3

```
./hdbuseratore SET ACTBACKUP saphana3:32013 ACTBACKUP <database backup user password
********************>
```

4. Check the keystore: `./hdbuserstore list`

3 Preparing a HANA 2.0 Database

Prerequisites

- All the configured services (see SAP Note 1697613 and SAP Note 1649519) such as nameserver, indexserver, etc. must be running. You can check this in the Overview of SAP HANA studio -> Operational State: All Services are started.
- Make sure log_mode for database is set to normal. (Check under HANA Studio configuration tab.)
- Use a SAP HANA hdbuserstore key to execute Backup and Recovery instead of a user name and password to communicate with HANA database using the SAP HANA Secure User Store. For HANA 2.0 userstore key needs to be created for SYSTEMDB and all tenant db.
- Create the database user account and hdbuserstore key names in accordance with the company's naming convention. Make sure to create this user account under SYSTEMDB and all tenant databases.

This includes:

Creating the System Database and Tenant Database Users

Creating the System Database User Account from HANA STUDIO

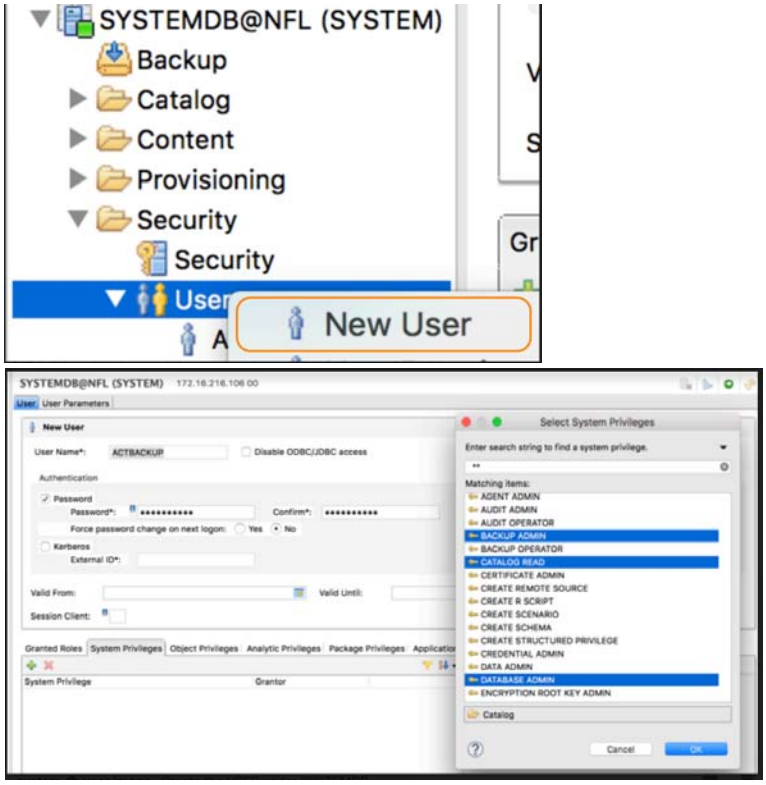
Naming convention for database user account

Choose a database user name based on company's standard. Make sure to create this user account under SYSTEMDB. Make sure to provide BACKUP ADMIN, CATALOG READ, and DATABASE ADMIN the to backup user created under database.

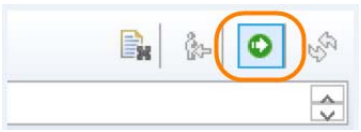
Procedure

To create the system database user account:

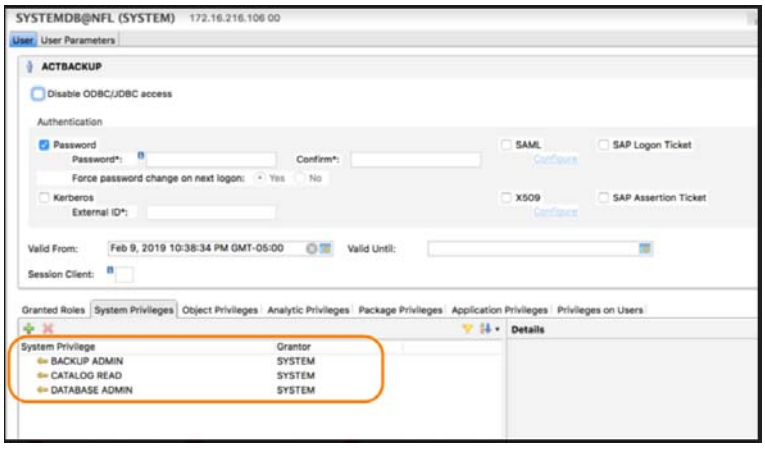
1. Create the USER under SYSTEMDB
    - Assign a User Name and a Password.
    - Select Force password change on next logon to No.
    - Click on the System Privilege tab and assign privileges by selecting BACKUP ADMIN, CATALOG READ, and DATABASE ADMIN
    - From SAP HANA Studio SYSTEMDB, go to System > Security > Users > New User.



2. Deploy the newly created user by clicking the green arrow in the top right corner



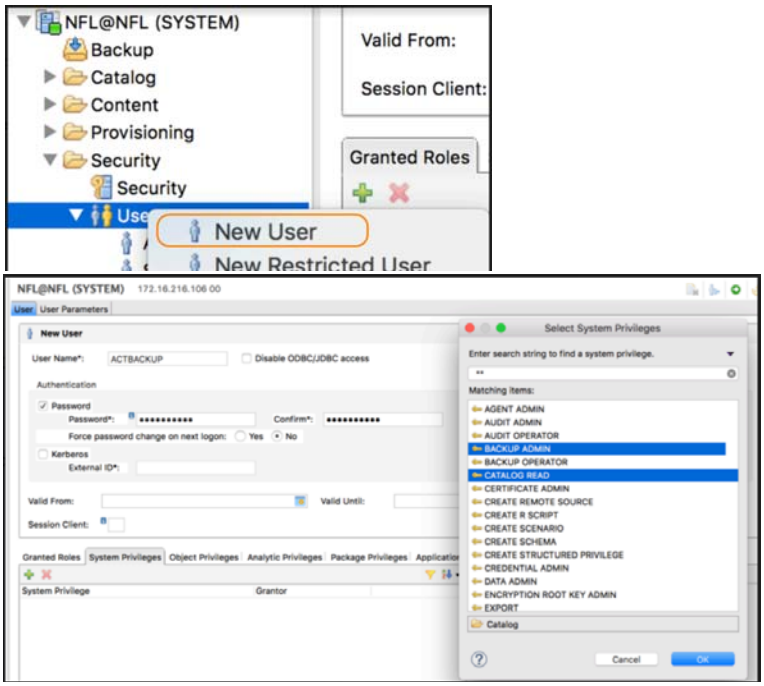
You will get a User Created message and the System Privileges will show the user has been granted BACKUP ADMIN, CATALOG READ, and DATABASE ADMIN privileges.



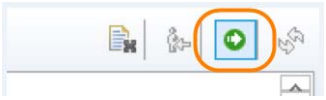
Creating the User under the Tenant DB

To create the tenant database user account:

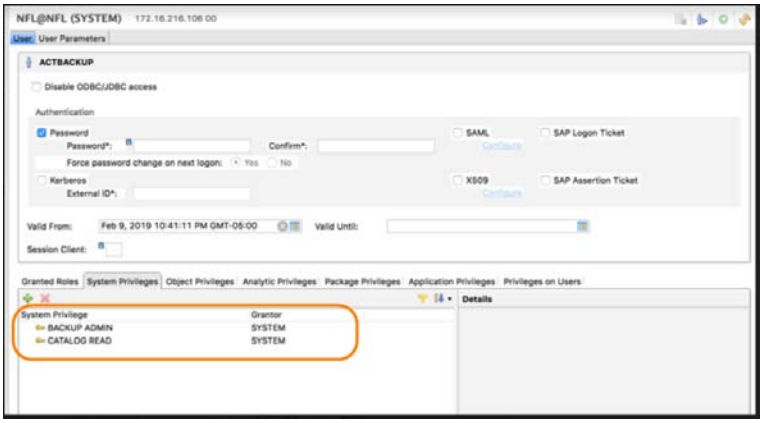
1. Create the USER under TENANTDB
   - Assign a User Name and a Password.
   - Set Force password change on next logon to **No**.
   - Click on the System Privilege tab and assign privileges by selecting **BACKUP ADMIN** and **CATALOG READ**.
   - From SAP HANA Studio SYSTEMDB, go to TENANTDB > Security > Users > New User.



2. Deploy the newly created user by clicking the green arrow in the top right corner

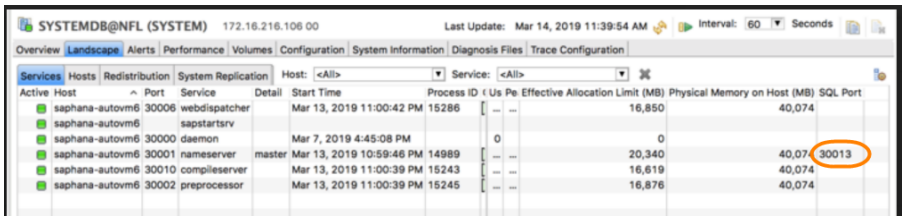


You will get a User Created message and the System Privileges will show the user has been granted BACKUP ADMIN and CATALOG READ privileges.



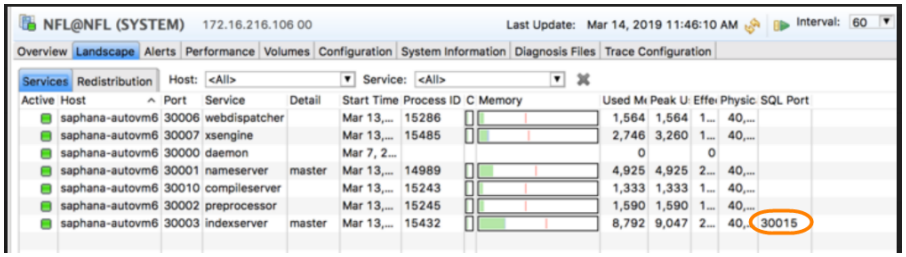
Getting the Instance and SQL Port Numbers

SYSTEMDB: From SYSTEMDB go to System > Landscape and get the value of SQL port for the nameserver. In the example below, 30013 is the SQL port, and the instance number is 00.



TENANT DB: From HANA Studio. At tenantdb-System > Landscape, get the value of SQL Port for indexserver. The <port> is the SQL port of the specific tenant database, i.e. 3<instance>15

In the example below, 30015 is the SQL port, and the instance number here is 00.



Creating the SAP HANA Hdbuserstore Key

Use a SAP HANA hdbuserstore key to execute Backup and Recovery instead of a user name and password to communicate with HANA database using the SAP HANA Secure User Store. For HANA 2.0, the userstore key needs to be created for SYSTEMDB and all tenant db.

This includes:

Creating the SAP HANA Hdbuserstore Key for the System Database and Each Tenant Database in a Single Node System on page 17

Creating the SAP HANA Hdbuserstore Key for the System Database and each Tenant Database in a Scale-Out Multi-Node SAP HANA System on page 18

Hdbuserstore Key Naming Convention

For SYSTEMDB set the key name = DATABASE BACKUP USERNAME.

For TENANTDB set the key name = <SYSTEMDB Key Name><TENANT DB Name>.

For example:

DATABASE BACKUP USERNAME = ACTBACKUP across SYSTEMDB and all TENANT DB

Set SYSTEMDB key name = ACTBACKUP

For tenant TDB, set TENANTDB key name = ACTBACKUPTDB

For tenant SDB, set TENANTDB key name = ACTBACKUPSDB

Creating the SAP HANA Hdbuserstore Key for the System Database and Each Tenant Database in a Single Node System

1. Open the putty window to the HANA database server and login to <sid>adm by su to <sid>adm.
2. `cd exe`
3. Create entries in hdbuserstore by calling:

```
# ./hdbuserstore SET <key_name> <server>:<port> <DB_user_name> <DB_user_password>
```

   The <port> is the SQL port of the systemdb or tenant database.

4. Check the keystore: `./hdbuserstore list`

Example

Creating a SYSTEMDB hdbuserstore key:

```
./hdbuserstore SET ACTBACKUP saphana3:30013 ACTBACKUP <database backup user password
********************>
```

Where:

- SYSTEM DB DATABASE (Backup username from above): ACTBACKUP
- KEY NAME (same as DATABASE backup username): ACTBACKUP
- SQL Port (for systemdb from above): 30013
- Hostname: saphana3

Example

Creating a TENANTDB hdbuserstore key:

```
./hdbuserstore SET ACTBACKUPTBD saphana3:30015 ACTBACKUP <database backup user password
********************>
```

Where:

- TENANT DB DATABASE Backup username from above: ACTBACKUP
- KEY NAME (systemdb key name postfix tenant db name): ACTBACKUPTDB
- SQL Port (for tenant db from above): 30015
- Hostname: saphana3

Creating the SAP HANA Hdbuserstore Key for the System Database and each Tenant Database in a Scale-Out Multi-Node SAP HANA System

For a three node scale-out system with server 1, server 2, and server 3:

1. Open the putty window to each HANA database server and login to <sid>adm by su to <sid>adm.
2. `cd exe`
3. On each of the HANA scale-out nodes, create entries in Hdbuserstore by running the command below:

```
# ./hdbuserstore SET <key_name> "<server 1>:<port>;<server 2>:<port>;<server 3>:<port>"
<DB_user_name> <DB_user_password>
```

   Where the <port> is the SQL port of the systemdb or tenant database.

4. Check the keystore: `./Hdbuserstore list`

Example, SYSTEMDB hdbuserstore key

Where:

- SYSTEM DB DATABASE Backup username from above: ACTBACKUP
- KEY NAME: ACTBACKUP (same as DATABASE backup username)
- SQL Port for systemdb from above: 30013
- Hostname : saphana1, saphana 2, saphana 3

```
./hdbuseratore SET ACTBACKUP "saphana1:30013; saphana2:30013; saphana3:30013" ACTBACKUP
<database backup user password ********************>
```

Example, TENANTDB (TDB) hdbuserstore key

TENANT DB DATABASE Backup username from above: ACTBACKUP

KEY NAME: ACTBACKUPTDB (systemdb key name postfix tenant db name)

SQL Port for tenant db from above: 30015

Hostname : saphana1, saphana2, saphana3

```
./hdbuseratore SET ACTBACKUPTDB "saphana1:30015; saphana2:30015; saphana3:30015" ACTBACKUP
<database backup user password ********************>
```

SAP HANA Database Application Details and Settings

From the Application Details & Settings dialog box (accessed through Details & Settings), you can modify application-specific settings for capturing Microsoft SQL Server databases. Application settings may be useful or required in certain circumstances. After you configure your application settings, click **Save Changes**.

Note: *To reset one or more application settings back to its default state, click the check box to the left of the selection you want to reset.*
To reset all application selections back to their default state, click Select options that will revert back to default.

Application Setting	Description
HANA DB User Store Key	This is the SAP HANA hdbuserstore key for the system database created in earlier. This field is mandatory.
Percentage of Reserve Space in Volume Group	For Block-Based Capture with CBT: This is needed for LVM snapshot temporary space. Recommended value is 20%. For File-Based Backup in NFS: Not applicable.
Backup Capture Method	For Block-Based Capture with CBT: Select Changed block tracking based backup. For File-Based Backup in NFS: Select full+incremental filesystem backup. File-based backup also requires additional CLI configuration. It is important to ensure that the Backup Capture Method is configured correctly. Do not skip this step.
Force Full FileSystem Backup	For Block-Based Capture with CBT: Not applicable. For File-Based Backup in NFS: Use for an ad hoc full backup.
Database Filesystem Staging Disk Size (GB)	For Block-Based Capture with CBT: Not applicable. For File-Based Backup in NFS: Default calculation is based on (database size * 1.5) + 10% and the disks will grow dynamically.
Log Backup Staging Disk Size (GB)	By default, IBM InfoSphere calculates the daily log generation * retention of log backup SLA(+20% overhead). Keeping the default is recommended. Providing a fixed value will override the default calculation and the log disk will not grow dynamically. This will become a fixed size.
Retention of Production DB Logs in Days	This value is used to purge the HANA log backup from basepath_logbackup destination. Based on this setting the last data backup id will be selected (CURRENT_TIMESTAMP, - the # days set) and the log will be purged older than the data backup id. Default value is 0 days. With default value all logs prior to last data backup will be purged.
Tenant DB User Store Key Prefix	See Using the Tenant DB User Store Key Prefix on page 20.
Script Timeout	The timeout value is applied to internal backup and recovery scripts called by connector. The default value is recommended.

Using the Tenant DB User Store Key Prefix

The default value for this field is <SYSTEMDB user store key><tenant db name>.

If the Tenant DB user store key uses the SYSTEMDB user store key as prefix, then you do not need a prefix value.

If the Tenant DB user store key does **not** use the SYSTEMDB user store key as prefix, then you must provide the prefix value in Application Details & Settings (see SAP HANA Database Application Details and Settings on page 19).

Use case 1

You have created a user store key and you have a tenant database TD1:

SYSTEMDB user store key = ACTBACKUP

TENANT DB user store key = ACTBACKUPTD1

Under Application Details & Settings:

1. At HANA DB USER STORE KEY, provide the user store key of SYSTEMDB:

2. Leave TENANT DB USER STORE KEY PREFIX value empty.

Use case 2

You have created a user store key and you have a tenant database TDBACKUPTD1 (tenant db name is different from system db name):

SYSTEMDB user store key = ACTBACKUP

TENANT DB user store key = TDBACKUPTD1

Under Application Details & Settings:

1. At HANA DB USER STORE KEY, provide the user store key of SYSTEMDB:

2. At TENANT DB USER STORE KEY PREFIX (at the bottom of the screen), enter the “TDBACKUP” part of the name as a prefix:

4 Adding a SAP HANA Database Host and Discovering the Database

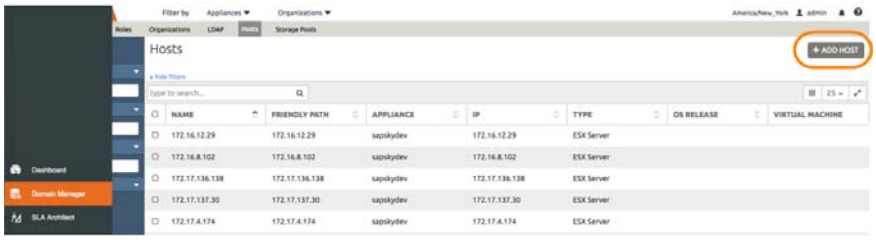
Before you can protect a SAP HANA database, you must add the host and discover the database. This requires:

1. Adding the Host from the Domain Manager on page 21
2. Discovering the HANA Database Application from the Application Manager on page 23
3. Finding the Discovered HANA Database in the Application Manager on page 24

Adding the Host from the Domain Manager

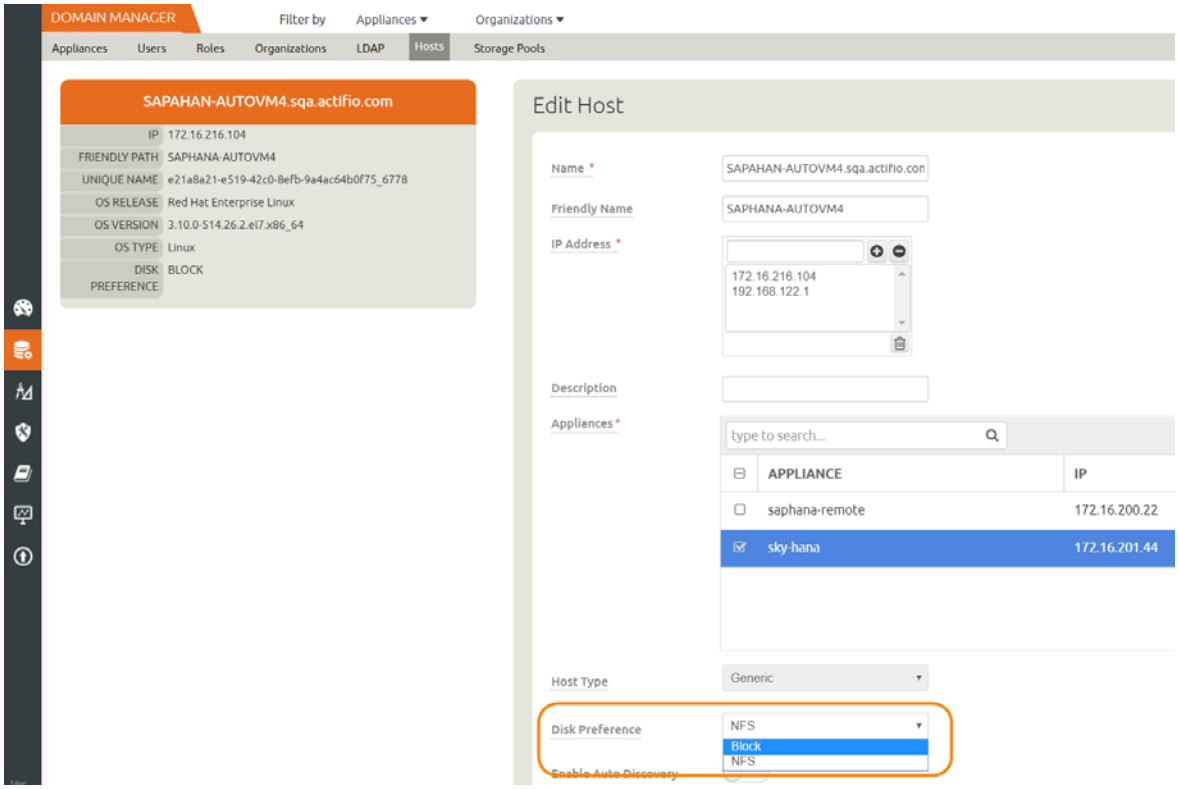
Add the host to Domain Manager. If the host is already added then edit the host and make sure to set the Disk Preference correctly.

1. From the IVGM Domain Manager, Hosts tab, click +Add Host.



2. On the Add Host page:
   - Name: Provide the HANA database server name.
   - IP Address: Provide the HANA database server IP and click the + sign on the right corner.
   - Appliances: Select the check box for the appliance.
   - Host Type: Make sure this is Generic.
   - Click Add at bottom right to add the host.

   The Host will get added.
3. Right-click the host and select Edit.
4. On the Edit Host page, select the disk preference:
   - For block-based backup with CBT: select **Block**
   - For file-based backup with Full+Incremental file system backup: select **NFS**

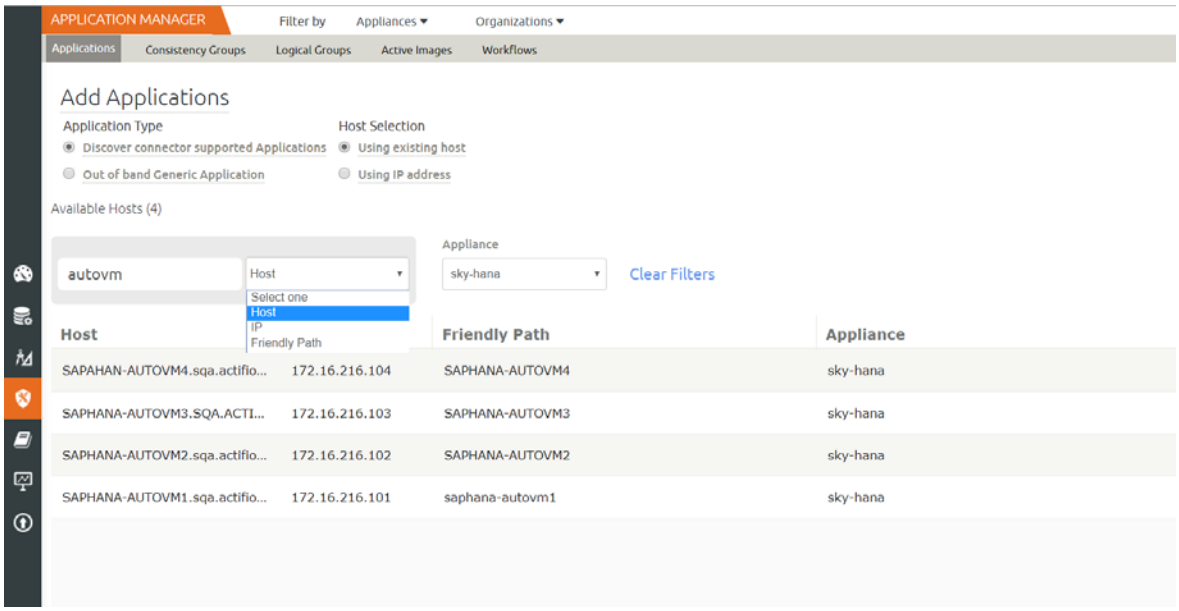


5. Select Save at the bottom of Edit Host page

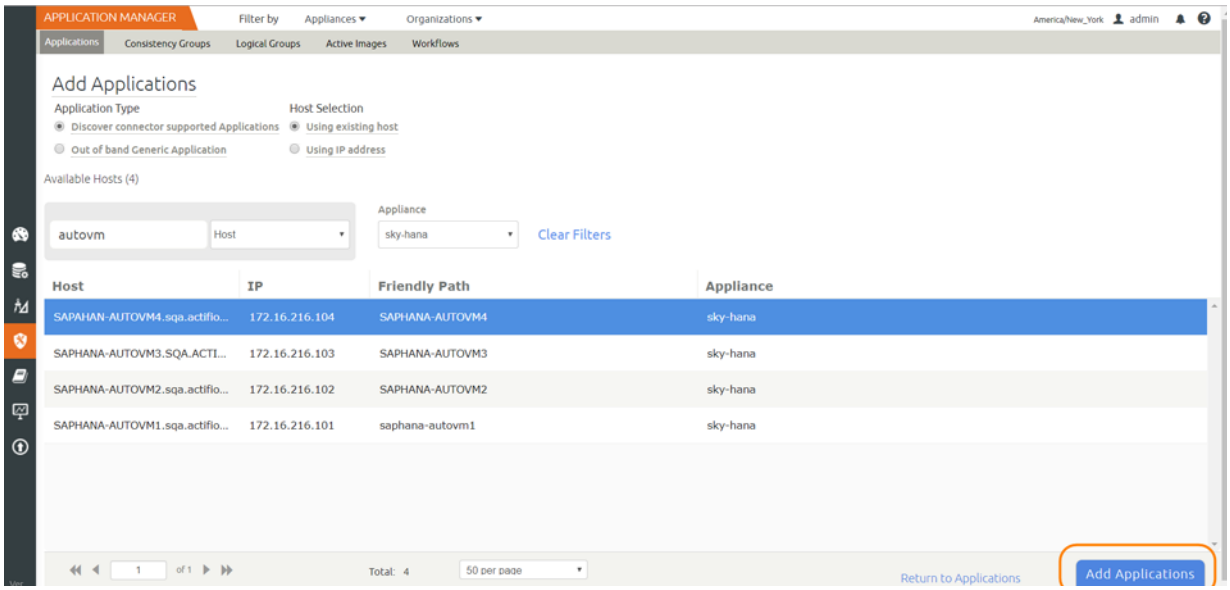
Discovering the HANA Database Application from the Application Manager

To discover the HANA database:

1. From the IVGM Application Manager, Applications tab, select Add Application in the upper right corner.
2. On the Add Application page, select Discover connector supported applications and Using existing host, then select the HANA database host. If you have many hosts, you can use the search feature or use the filter to see only hosts that are managed by a specific InfoSphere VDP Appliance.



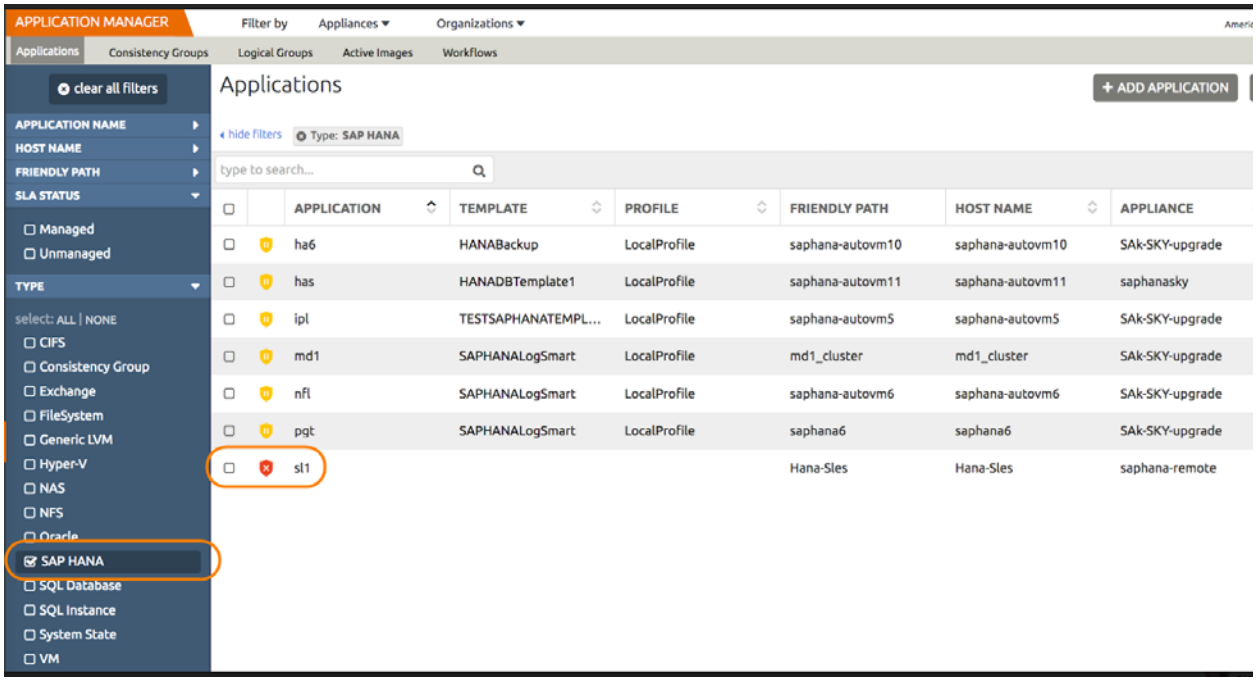
3. Select the host and click Add Applications in the bottom right corner. This will run the discovery on the HANA database host and will discover all HANA databases running on it.



Finding the Discovered HANA Database in the Application Manager

To find the newly-discovered database, go to the IVGM Application Manager Applications tab. All applications known to the IVGM of all types are listed. Use the Type application filter on left pane to show only SAP HANA databases.

The new HANA database will appear in the list as unmanaged (the red shield icon).



5 Configuring the SAP HANA Backup Method

You can back up the database:

- Using Block-Based Database Storage Snapshots with CBT
- Using File-Based Traditional Backup and Recovery in NFS

Setting	Block-Based LVM Snapshot with CBT	File-Based Backup in NFS
Percentage of Reserve Space in Volume Group	This is needed for LVM snapshot temporary space. Recommended value is 20%	Not applicable
Backup Capture Method	Use Changed block tracking based backup	Use full+incremental filesystem backup
Force Full Filesystem Backup	Not applicable	Use for an ad hoc full backup
Database Filesystem Staging Disk Size in GB	Not applicable	Use the default calculation: (database size * 1.5)+ 10%. The disks will grow dynamically.
Log Backup Staging Disk Size in GB	By default IBM InfoSphere calculates this as daily log generation * retention of log backup SLA plus 20% buffer. Default is recommended. Providing a value will override the default calculation and the log disk will not grow dynamically. This will become a fixed size	
Retention of Production DB Logs in Days	This value is used to purge the HANA log backup from basepath_logbackup destination. Based on this setting the last data backup id will be selected (CURRENT_TIMESTAMP, - the # days set) and the log will be purged older than the data backup id. Default value is 0 days. With default value all logs prior to last data backup will be purged.	
HANA DB User Store Key	This is the SAP HANA hdbuserstore key for the system database created in earlier. This field is mandatory.	
Script Timeout	This value is applied to internal backup and recovery scripts called by connector. Default value is recommended.	

File-based backup also requires that the CLI command DB dump schedule be configured. See Setting the Schedule for Dumps on page 30.

Whichever method you select, you must:

Ensure that the Disk Preference on the Host is Set Correctly on page 26
Ensure that the Backup Capture Method in the Application Settings is Set Correctly on page 28

Ensure that the Disk Preference on the Host is Set Correctly

Choose between:

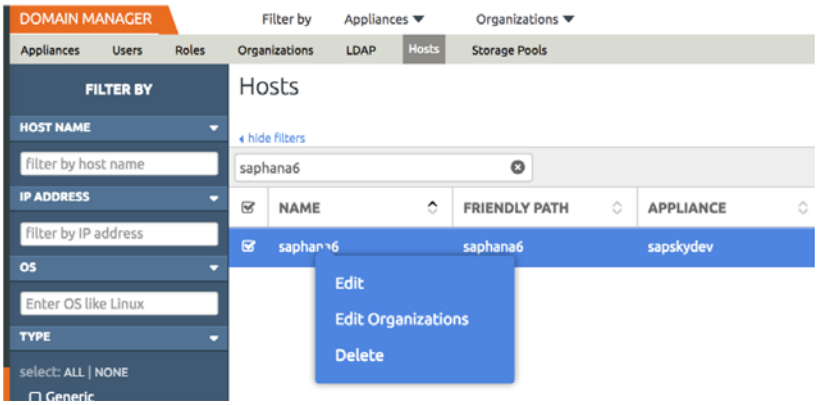
Setting Disk Preference for Block-Based Database Storage Snapshots with CBT on page 26

Setting Disk Preference for File-Based Traditional Backup and Recovery in NFS on page 27

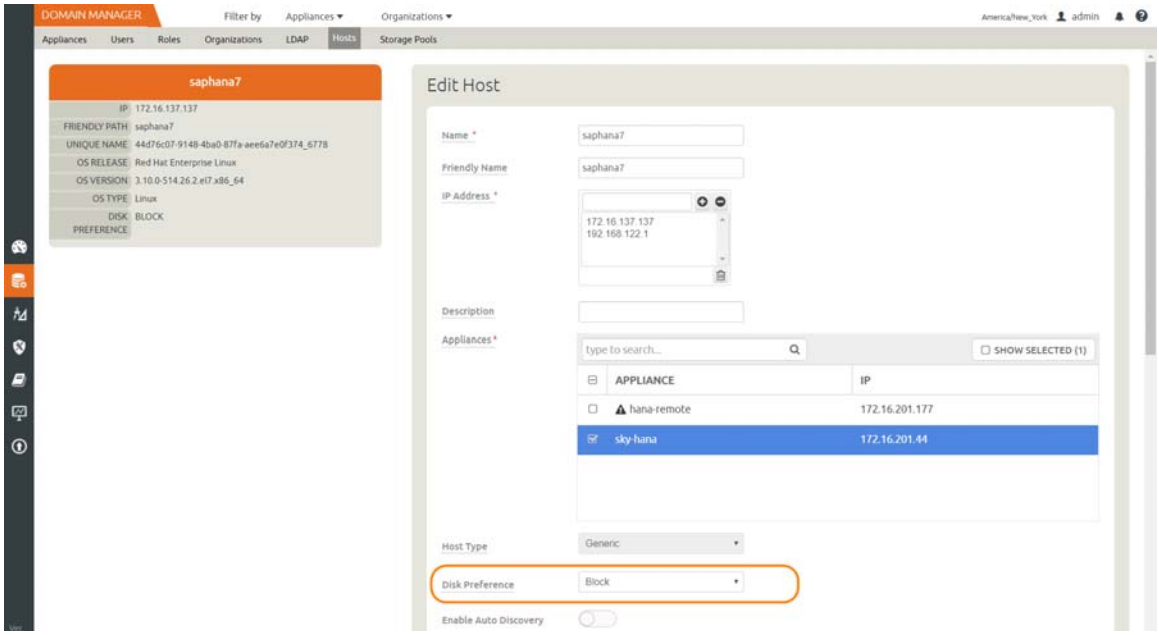
Setting Disk Preference for Block-Based Database Storage Snapshots with CBT

To set disk preference for block-based database storage snapshots with CBT:

1. From IVGM Domain Manager, Hosts tab, right-click the host and select Edit.



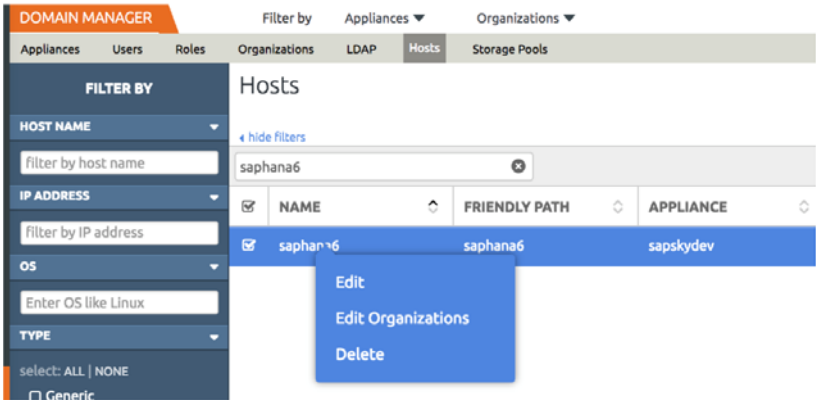
2. In the Edit Host pane, set Disk Preference to *Block* and click Save at the bottom of the page.



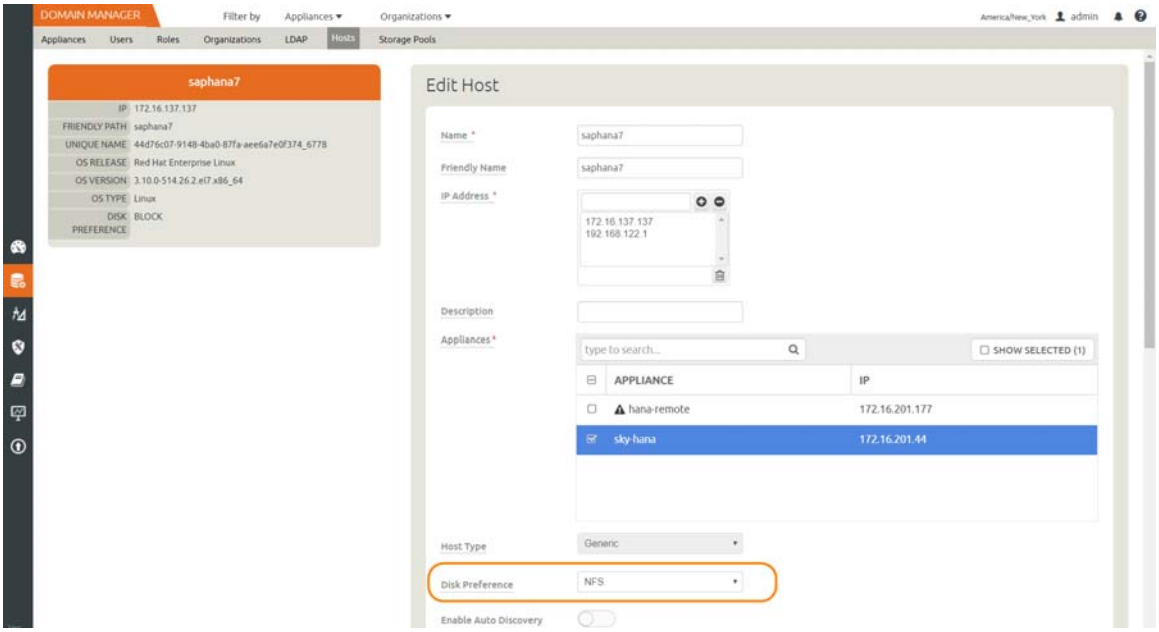
Setting Disk Preference for File-Based Traditional Backup and Recovery in NFS

To set disk preference for File-Based Traditional Backup and Recovery in NFS:

1. From IVGM Domain Manager, right-click the host and select Edit.



2. In the Edit Host pane, set Disk Preference to *NFS* and click Save at the bottom of the page.



Ensure that the Backup Capture Method in the Application Settings is Set Correctly

Choose between:

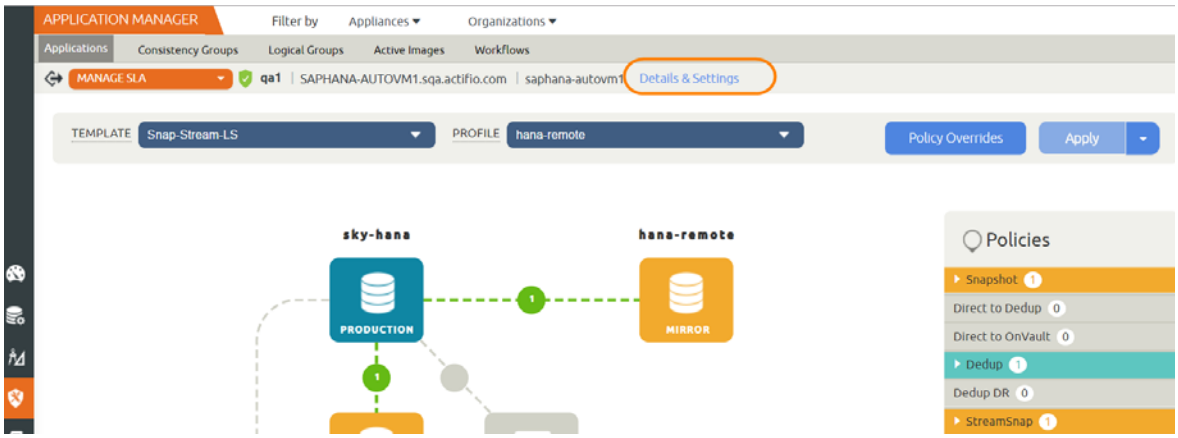
Setting Backup Capture Method for Block-Based Database Storage Snapshots with CBT on page 28

Setting Backup Capture Method for File-Based Backup and Recovery in NFS on page 29

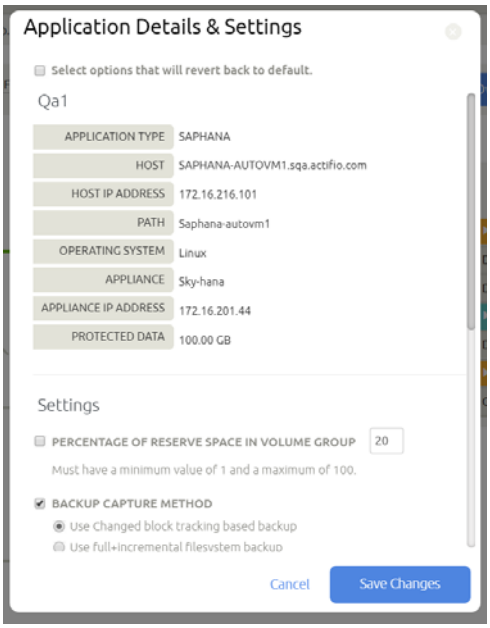
Setting Backup Capture Method for Block-Based Database Storage Snapshots with CBT

To set the backup capture method for block-based database storage snapshots with CBT:

1. Go to the Application Manager. In the Applications tab, right-click the application and select Manage SLA. At the top of the page, click the blue Details & Settings link.



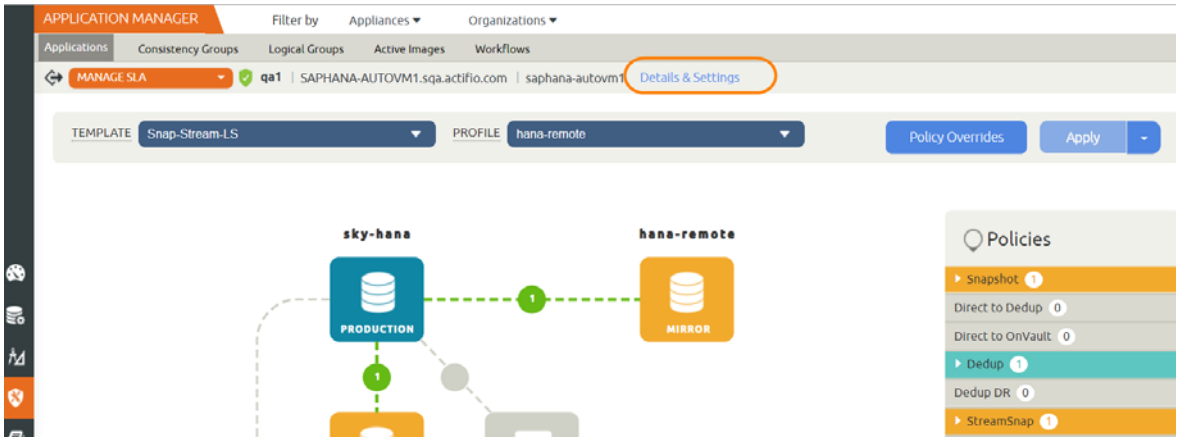
2. Set the Backup Capture Method to Use Changed block tracking based backup and click Save Changes. For details on the other settings, see Configuring the SAP HANA Backup Method on page 25.



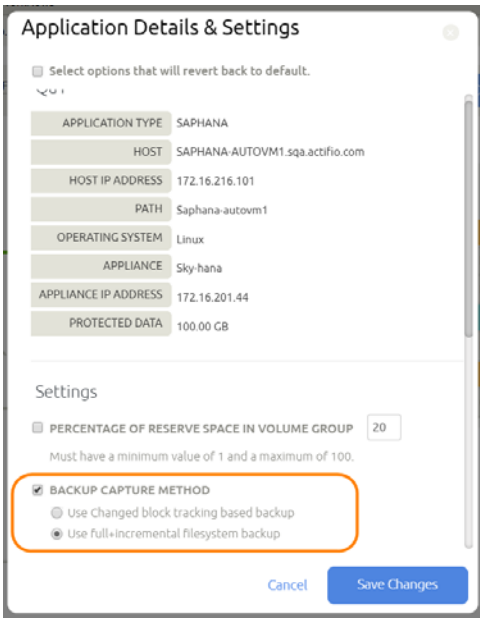
Setting Backup Capture Method for File-Based Backup and Recovery in NFS

To set the backup capture method for file-based backup and recovery in NFS:

1. Go to the Application Manager. In the Applications tab, right-click the application and select Manage SLA. At the top of the page, click the blue Details & Settings link.



2. Set the Backup Capture Method to Use full+incremental filesystem backup and click Save Changes. For details on the other settings, see Configuring the SAP HANA Backup Method on page 25.



Setting the Schedule for Dumps

The database dump schedule is set by the IBM InfoSphere CLI policy parameter dumpschedule. The default value of dumpschedule="FIIIIII":

- The string must be seven characters - either an 'F' or an 'I'
- Each position within the string represents a weekday, starting with Sunday.
- **F** represents a full db dump
- **I** represents an incremental db dump

For example, "FIIIIII" results in:

- Sunday: Full backup
- Monday through Saturday: Incremental backups
- The following Sunday: Full backup again

To check the dump schedule, run this CLI command from the appliance:

```
udstask lskpolicyoption -filtervalue appid=<appid> | grep dumpschedule
```

If this does not return any value, then the dumpschedule is set to default.

To modify the dump schedule run this CLI command from Appliance:

```
udstask mkpolicyoption -appid <appid> -name "dumpschedule" -value "FIIIIII"
```

Replace <appid> with the application id of the SAPHANA application.

Replace "FIIIIII" as needed.

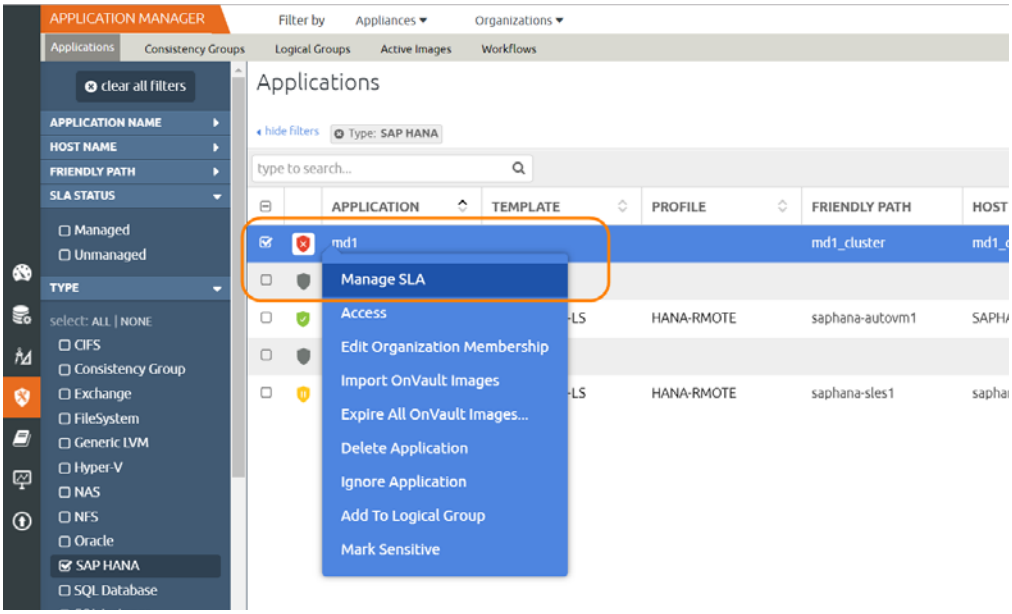
Example

To run full backup on Saturday and Tuesday, set `dumpschedule="IIFIIIF"`

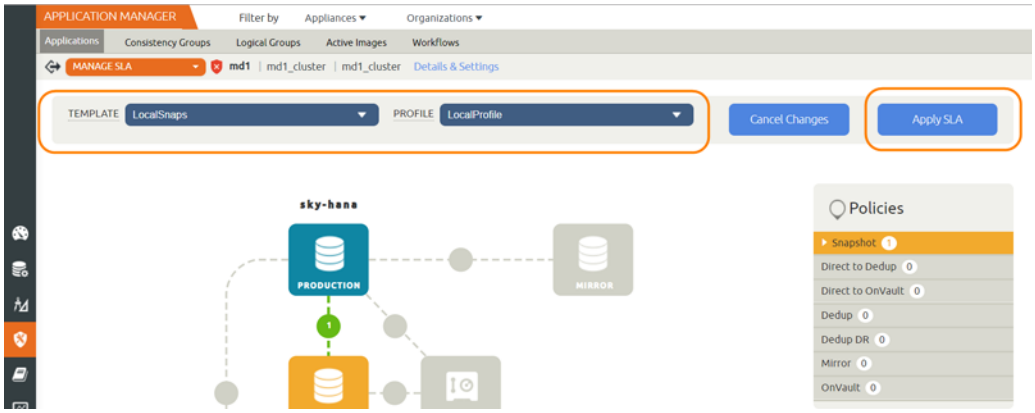
6 Protecting the HANA Database

To protect the database:

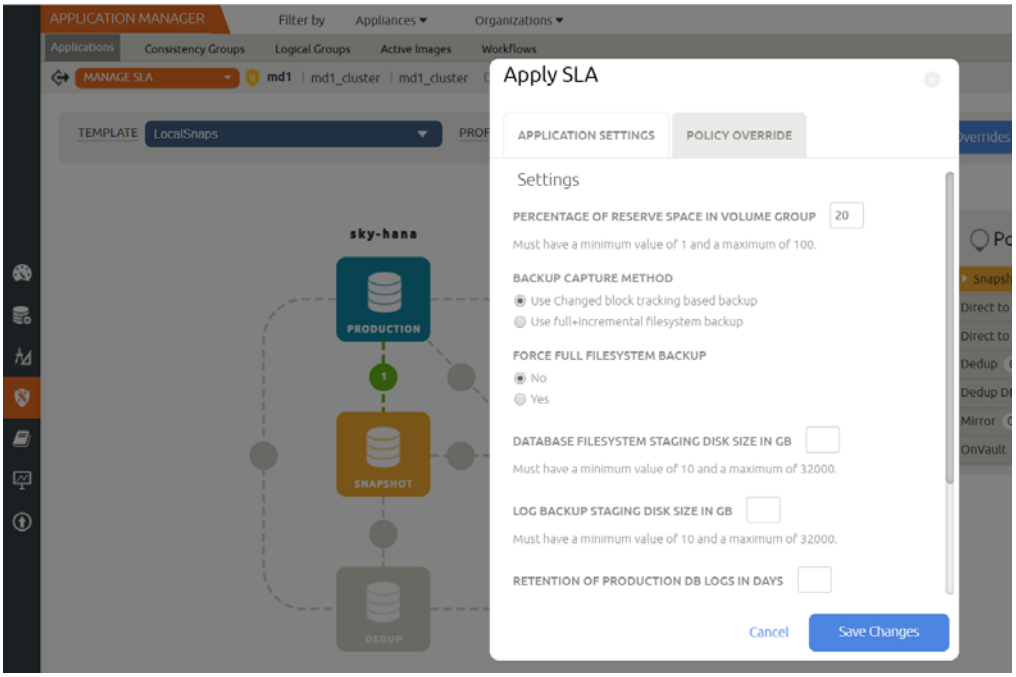
1. Right-click the HANA database and select Manage SLA.



2. On the Manage SLA page, select your desired template from Choose a template and profile, then click Apply SLA.



3. On the Apply SLA page, fill in the required field based on type of backup as detailed in Configuring the SAP HANA Backup Method on page 25. Click Save Changes.



The database will be protected when the snapshot job runs according to the schedule in the template. After the first successful snapshot job, the database will appear in the Application Manager as protected, with a green shield icon.

7 Protecting SAP HANA Database Logs

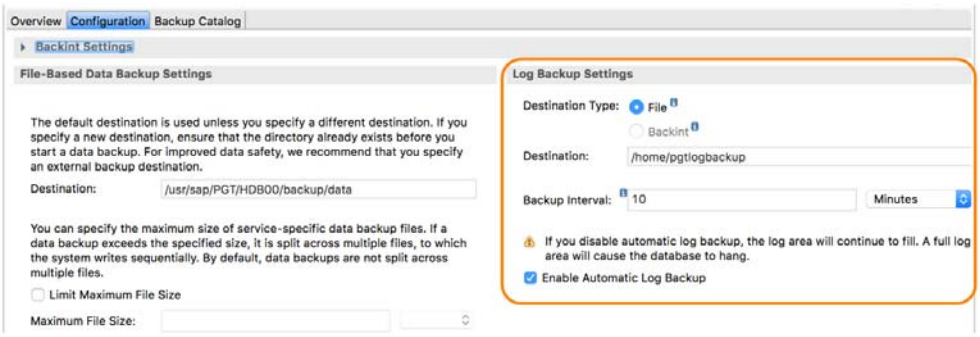
There are two parts to configuring protection of SAP HANA database logs:

Setting up the Log Mode and Log Backup in HANA Studio on page 33

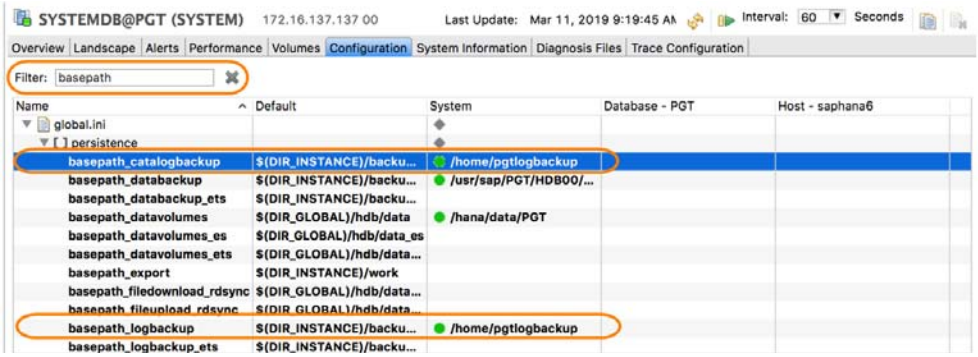
Setting up the Log Backup in IBM InfoSphere IVGM on page 35

Setting up the Log Mode and Log Backup in HANA Studio

1. In SAP HANA HDB studio, make sure log backup is set correctly under DATABASE (SYSTEMDB FOR HANA 2.0) - Backup - Configuration page
   - Destination Type is File.
   - Destination is set to a local file system mount path.
   - Backup Interval is set to required RPO.
   - Automatic Log Backup is enabled.

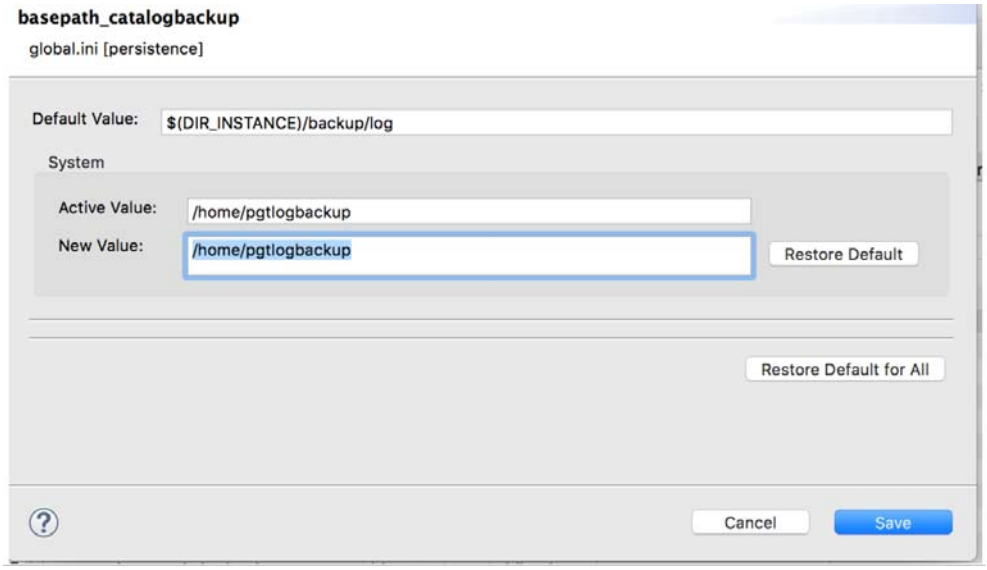


2. Check under Database configuration: DATABASE (SYSTEMDB FOR HANA 2.0) - Configuration page. In the filter, type **basepath**.

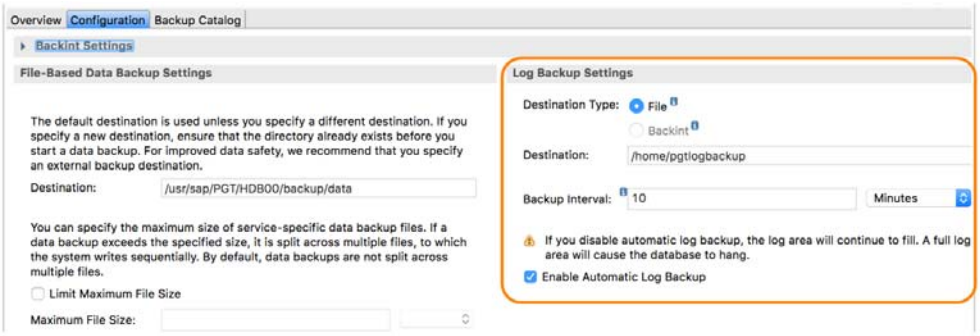


3. Verify that basepath_logbackup is set correctly:
   - Set the basepath_catalogbackup to same as basepath_logbackup.

- Open the basepath_catalogbackup edit page.
- Set the New Value to same as basepath_logbackup and click **Save**. This will ensure the backup of catalog with log backup for point in time recovery.



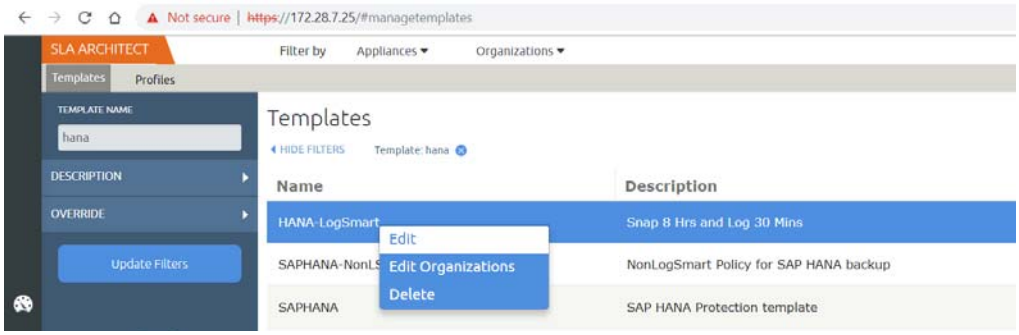
4. Make sure tenant db log backup is set correctly under DATABASE (TENANTDB FOR HANA 2.0) - Backup - Configuration page
   - Destination Type is File.
   - Destination is set to a local file system mount path.
   - Backup Interval is set to required RPO.
   - Automatic Log Backup is enabled.



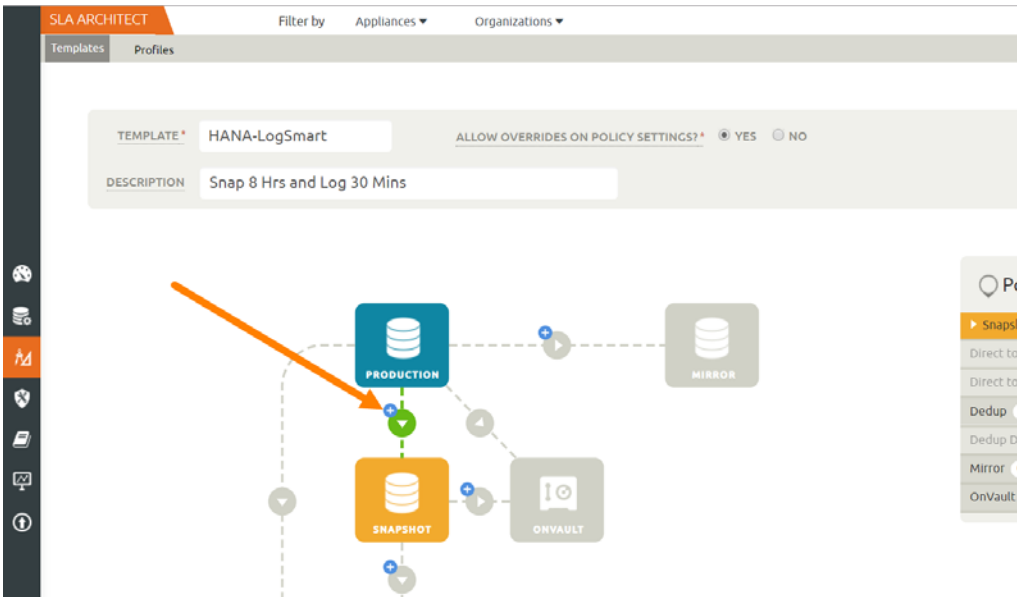
Setting up the Log Backup in IBM InfoSphere IVGM

To enable and set up the HANA database log backup:

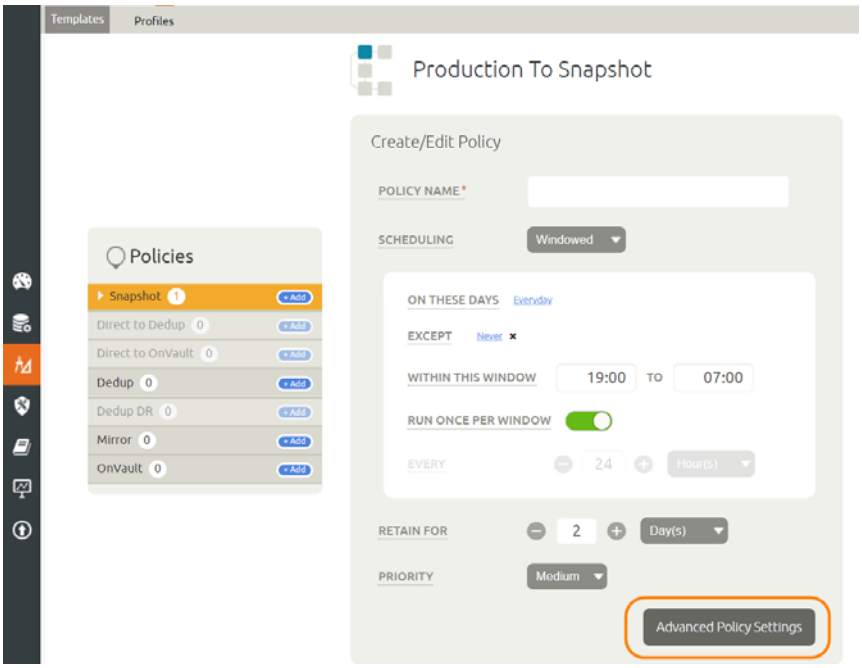
1. From the SLA Architect page, edit the template created for HANA database protection:



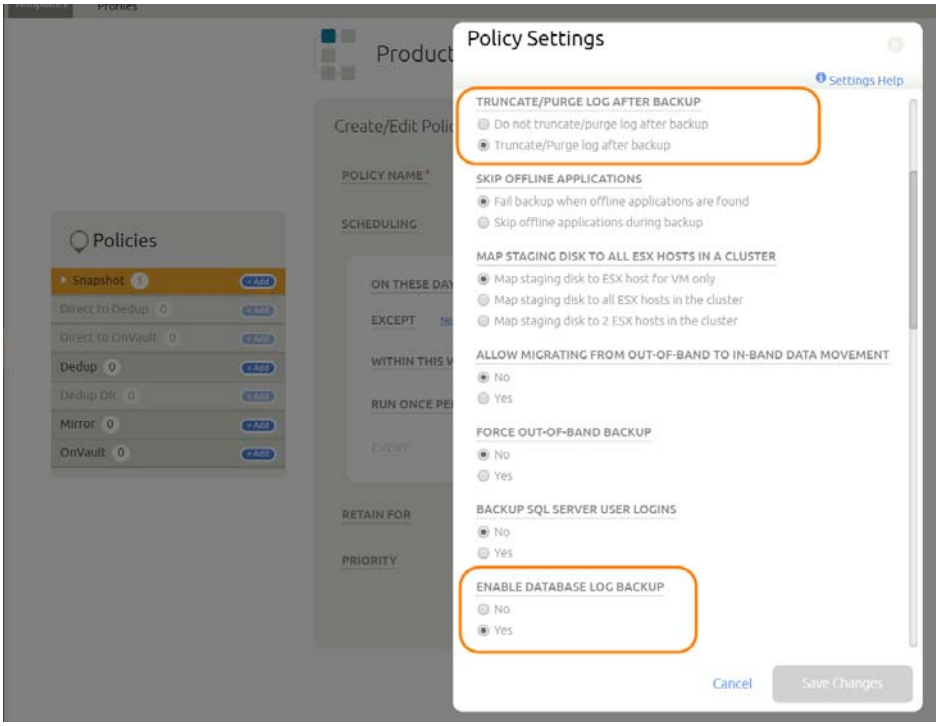
2. Click the Production to Snapshot "**+**".



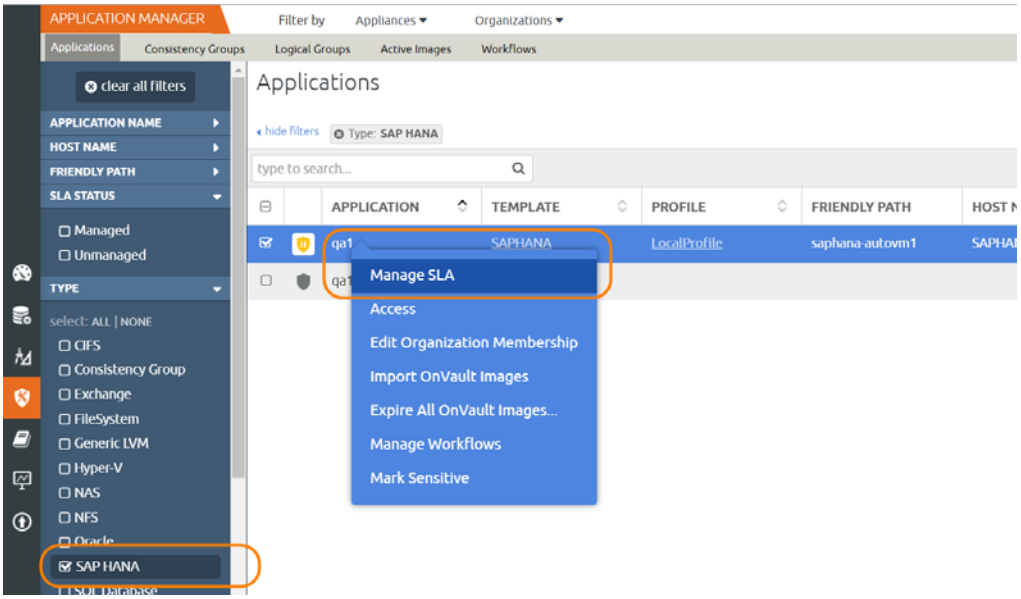
3. Select **Advanced Policy Settings**.



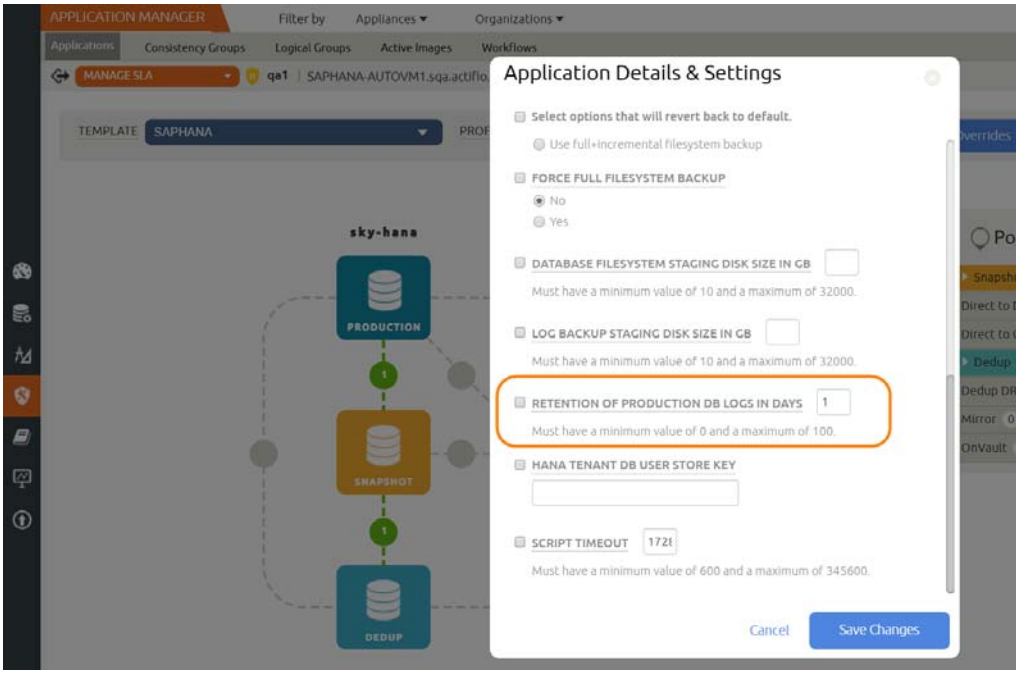
4. Set the log policy options (you will have to scroll to see them all):
    - Truncate/Purge Log After Backup: Select this.
    - Enable Database Log Backup: Select this.
    - RPO (Minutes): Enter the desired frequency of log backup
    - Log Backup Retention Period (in Days): the SLA to retain the backup of log for point in time recovery.
    - Replicate Logs (Uses StreamSnap Technology): Select this to enable StreamSnap replication of log backup to a DR site.



5. From Application Manager, select the HANA database. You can use the SAP HANA checkbox to filter the list. Select **Manage SLA**.



6. At the top of the screen, select **Details & Settings**.



7. Set the Retention of Production DB Logs in Days. This value is used to purge the HANA log backup from basepath_logbackup destination. Based on this setting the last data backup id will be selected (CURRENT_TIMESTAMP - the # days set) and the log will be purged older then the data backup id. Default value is 0 days. With the default value, all logs prior to last data backup are purged.

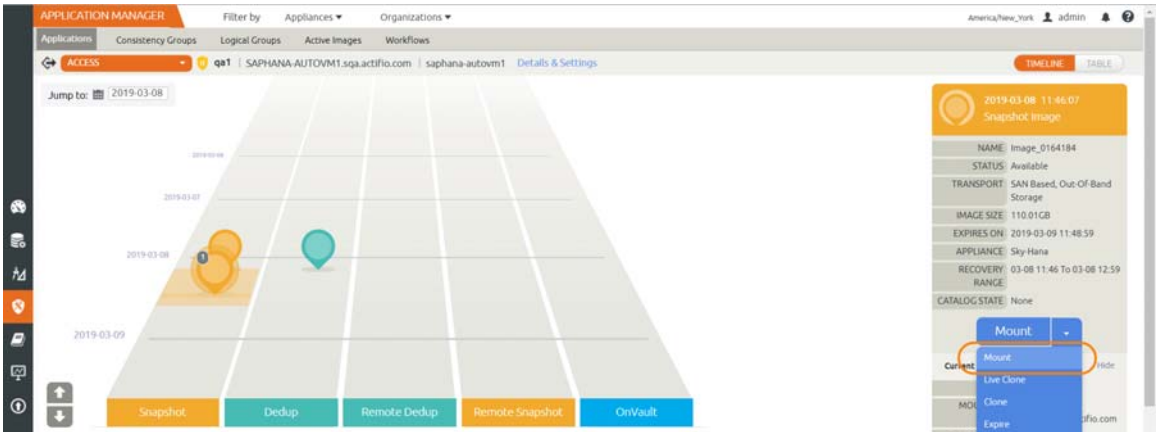
8 Restoring, Accessing, or Recovering an SAP HANA Database

This section includes:

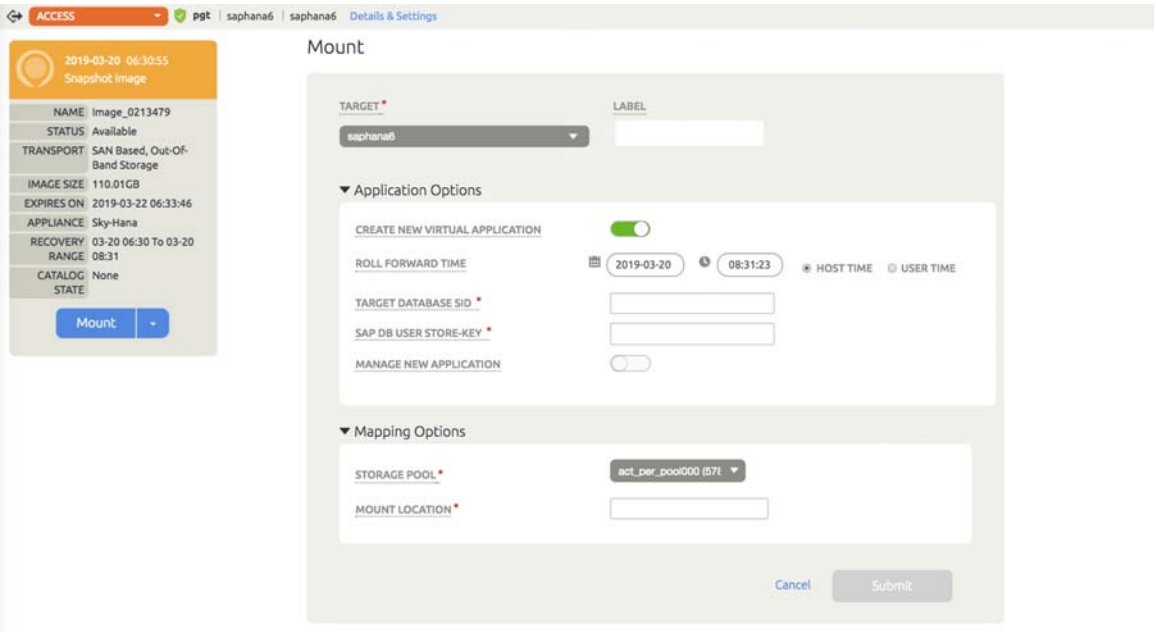
Mount and Refresh from Block-Based LVM Snapshot with CBT to a Target SAP HANA Database as a Virtual Application

To mount the database image as a virtual application (an application aware mount) to a new target:

1. From Application Manager > Protected Application > Access, from the latest snapshot, choose Mount.



2. On the Mount page, from Target, choose the desired target HANA server from the dropdown.
3. Under Application Options:
   - Select Create New Virtual Application.
   - Choose a point in time on the slider bar for a database protected with log roll-forward to recover to.
   - Target Database SID > Provide the target HANA database name.
   - SAP DB User Store-Key > Provide the hdbuserstore key for the target database (HANA 2.0: SYSTEMDB).
   - Mount Location> Specify a Mount Point to mount to new target.
   - Manage New Application> To reprotect, click and enable Manage New Application.
   - Template > Choose a template to protect the database.
   - Profile> Choose a profile.

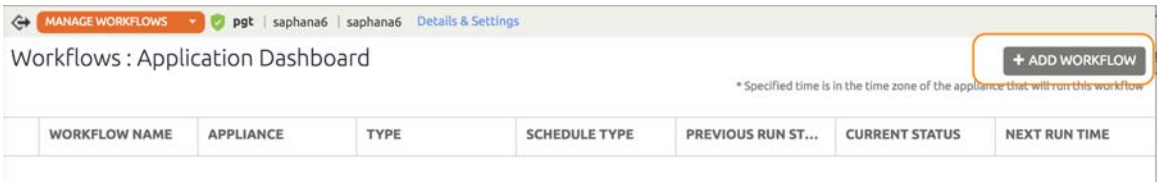


4. Click Submit.

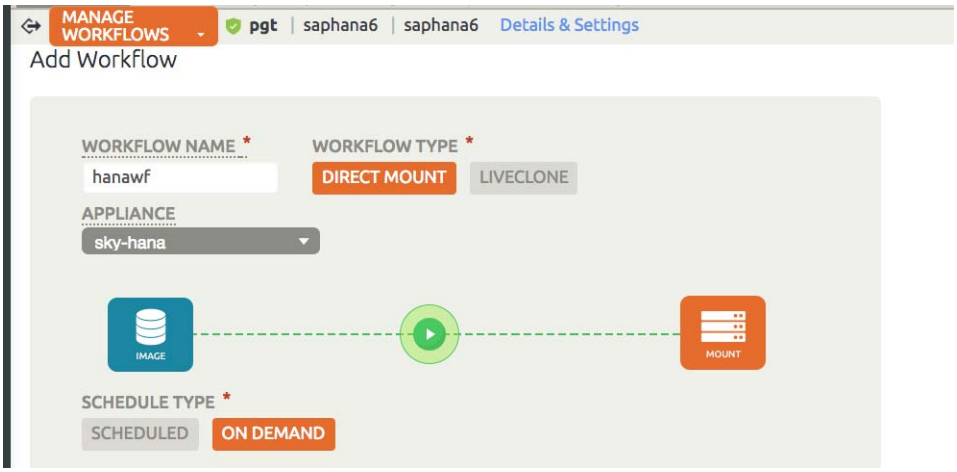
Workflow to Automate Mount and Refresh from Block-Based LVM Snapshot with CBT to a Target SAP HANA Database as a Virtual Application

You can use a workflow to automate the process of mounting and refreshing a HANA database from a snapshot:

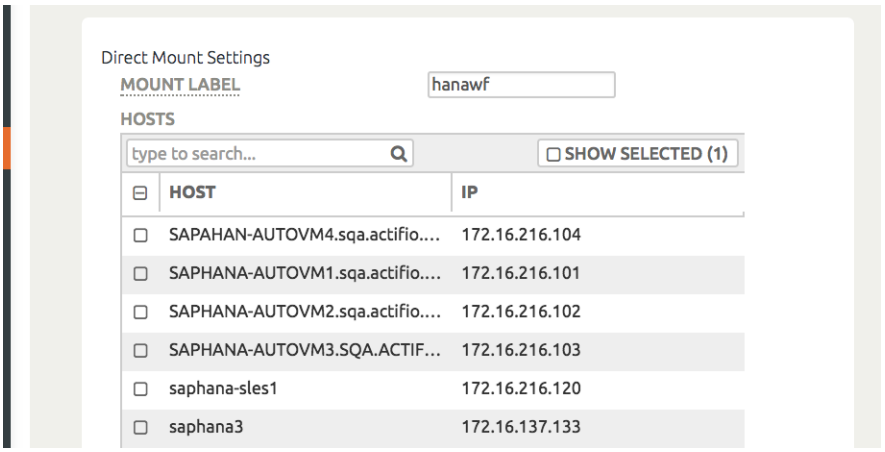
1. From the IVGM Application Manager, right-click the HANA database and select Manage Workflows.
2. In the upper right corner of the Workflows: Application Dashboard page, click + Add Workflow.



3. Specify:
   - Workflow Name: Enter a name for this workflow.
   - Workflow Type: Select Direct Mount.
   - Schedule Type: Choose Scheduled or On Demand based on your requirement. For a scheduled workflow, specify the frequency as well.

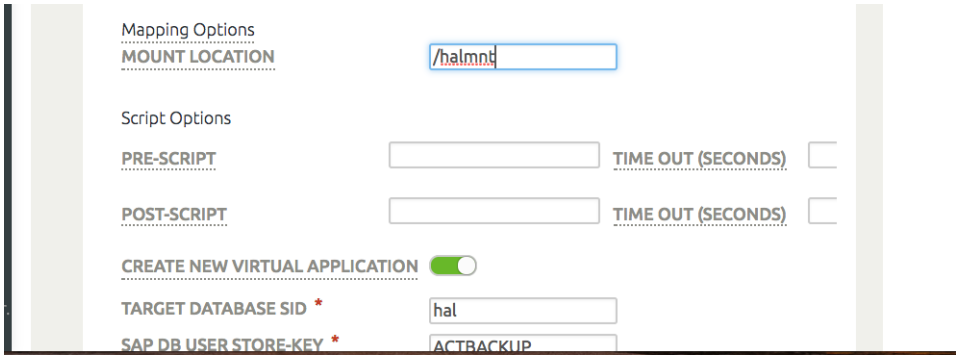


   - Mount Label: (Optional) Specify a mount label for the mounted image.
   - Hosts: Select the target host or hosts where the virtual HANA database copy will be created.



   - Mount Location: Specify a mount point to mount the data volume and log volume of the target.

- Post-Script: Specify post script name to be run virtual HANA database copy at the end of refresh
- (Refer work flow post script creation)
- Create New Virtual Application: Enable Create New Virtual Application.
- Target Database SID: Provide the target HANA database name.
- SAP DB User Store-Key: Provide the hdbuserstore key for the target database (HANA 2.0: SYSTEMDB).



Optional, if you want to re-protect the new virtual database:

- Manage New Application: Enable Manage New Application.
- Template: Choose a template to protect the database.
- Profile: Choose a profile.

4. Click Add. This will create an on-demand or scheduled work flow to create or refresh the HANA database virtual copy.

Restoring and Recovering an SAP HANA Database

Depending on how you protected the database, you need the procedure for:

Recovering from Block-Based LVM Snapshot with CBT on page 43

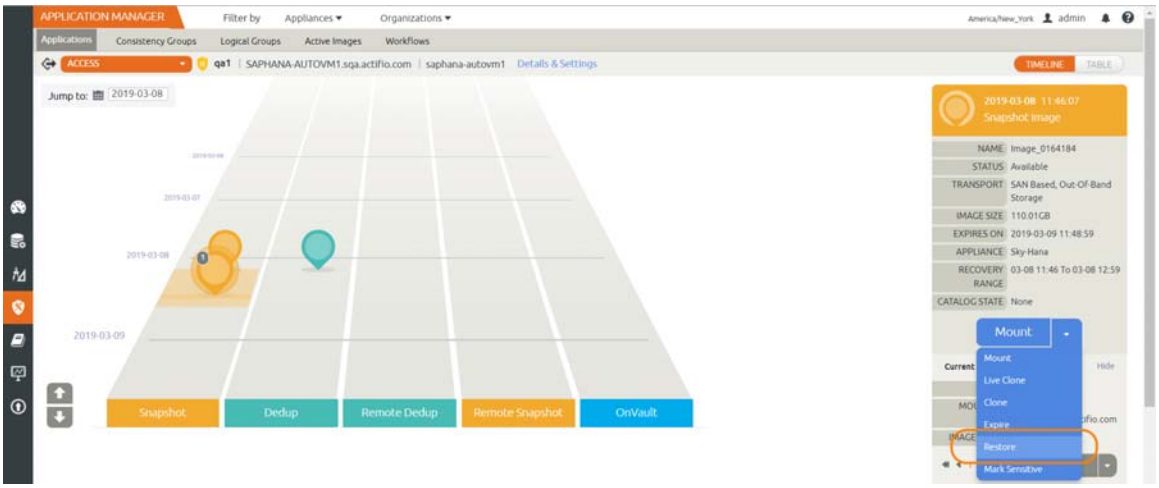
Recovering from a File-Based Backup with NFS on page 44

Recovering from Block-Based LVM Snapshot with CBT

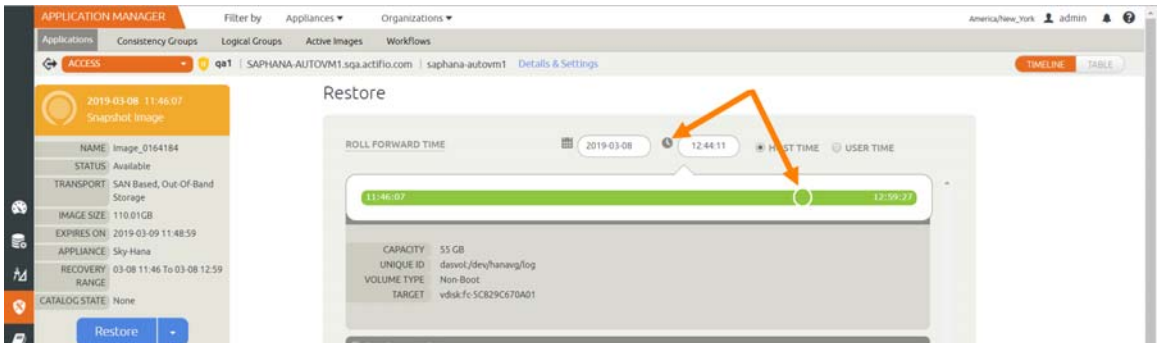
Use this procedure to restore and recover the source HANA database. This procedure uses physical recovery of the source data area.

To recover back to the source:

1. From the Application Manager > Protected Application > Access, from the latest snapshot to recover, choose Restore.



2. On the Restore page choose point in time on the slider bar for database protected with log to recover to desired point in time.



3. Click Submit.

Recovering from a File-Based Backup with NFS

You have two options:

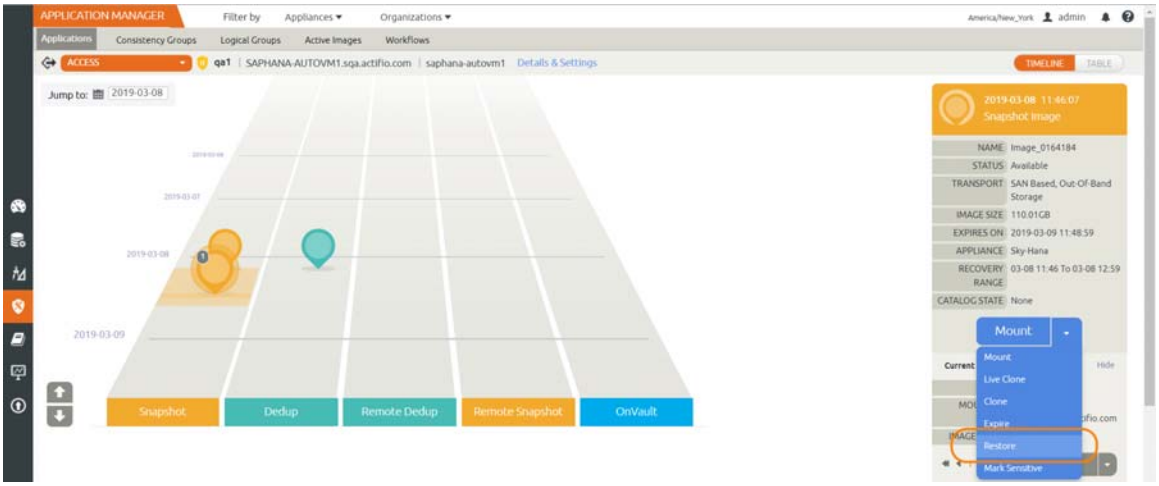
Recovering Back to the Source: Use this procedure to restore and recover the source HANA database. This procedure overwrites the source data.

Recovering to a New Target: Use this procedure to restore and recover to a new target server.

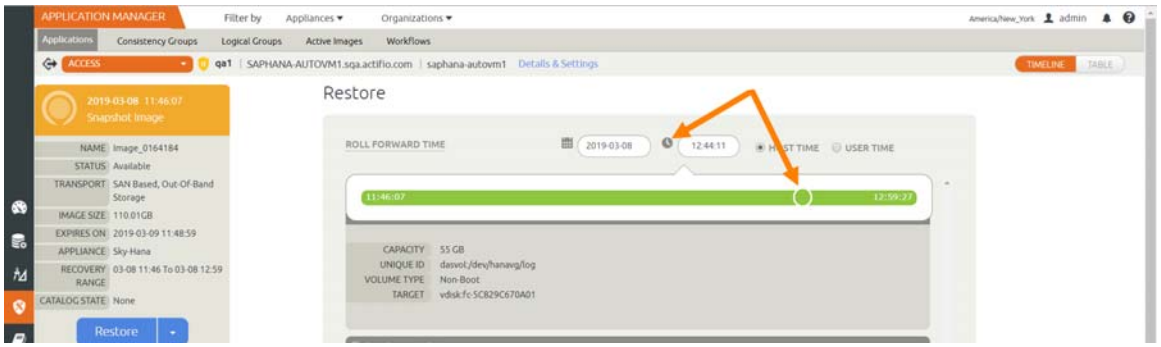
When you are finished, you must bring up the database, as detailed in Bringing up the HANA Database on page 46.

Recovering Back to the Source

1. From Application Manager > Protected Application > Access.
2. Select the latest snapshot to recover, and choose Restore.



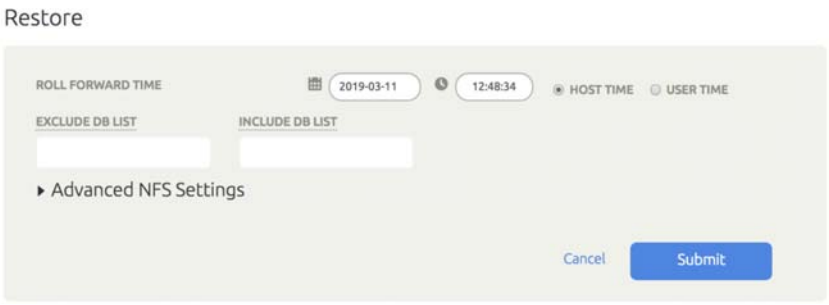
3. For a database protected with logs, on the Restore page, choose a date and then a point in time on the slider.



Notes

- HANA 1.0: EXCLUDE and INCLUDE db list do not apply
- HANA 2.0
  - Only one out of EXCLUDE and INCLUDE is applicable at a time.
  - Complete HANA recovery leave EXCLUDE AND INCLUDE empty
  - INCLUDE LIST: For recovering one or more database out of n database: provide comma separated list of database under INCLUDE

- o EXCLUDE LIST: For excluding one or more database during recovery out of n database: provide comma separated list of database under EXCLUDE



4. Click Submit. This will start the source database physical recovery using HANA recover commands.

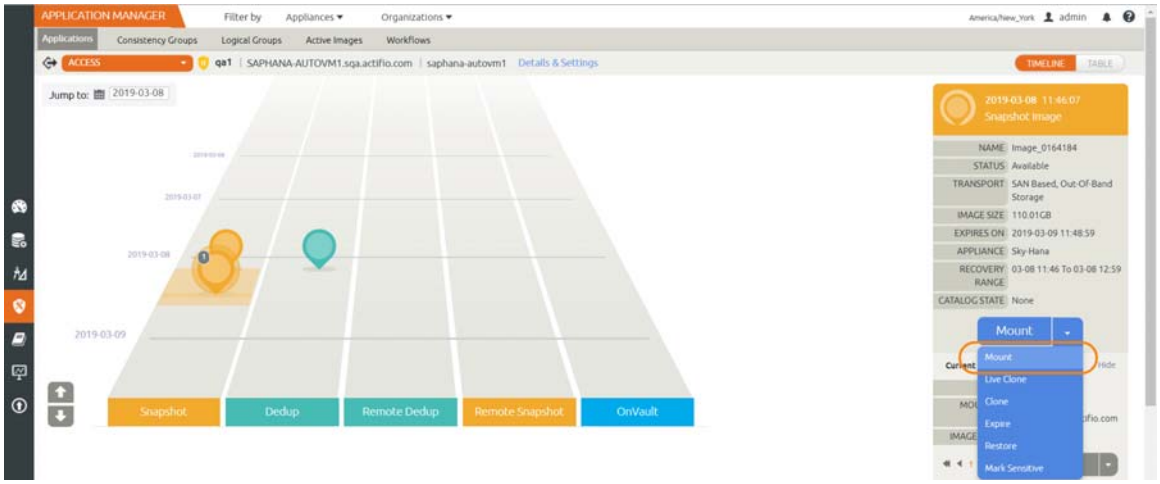
Recovering to a New Target

Before You Begin:

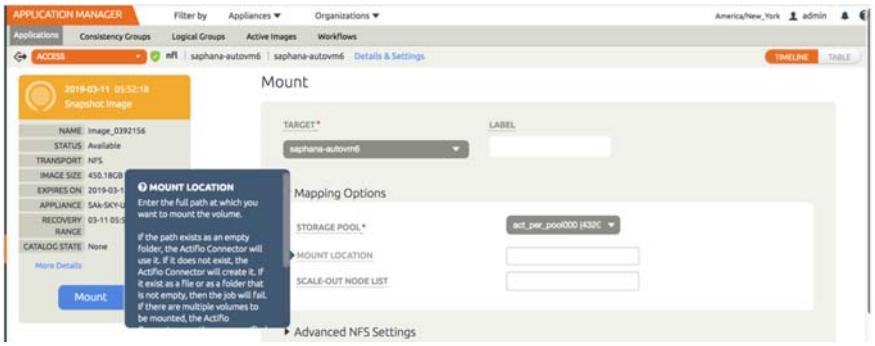
- Make sure target HANA server is set up as same as source HANA server (OS version, CPU and memory, HANA version)
- Make sure HANA database on target server is configured same as source i.e. global.ini, nameserver.ini

To recover:

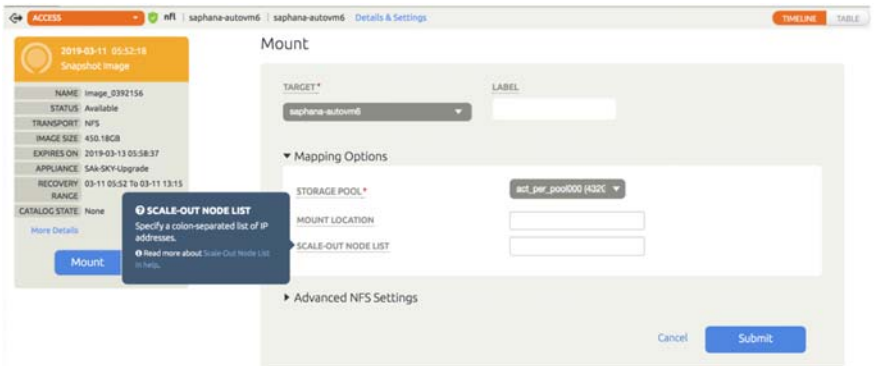
1. From Application Manager > Protected Application > Access, select the latest snapshot to recover, and choose Mount.



2. On the Mount page, specify a mount location to mount to new target.



3. Enter scale-out information:
    - For non-scale out HANA: leave SCALE-OUT NODE LIST empty
    - For scale out HANA environment: Provide colon-separated list of target HANA servers



4. Click Submit. This will mount the backup image to target server. In case of scale out, the image will be mounted to all nodes as NFS shared volume.

Bringing up the HANA Database

To bring up the HANA database from the mounted image, modify and configure this script:

1. Configure /act/custom_apps/saphana/dump/restoreDumpToNewTarget.conf parameter

```
DBSID=<source database sid>
DBPORT="HDB<instance #>" ex:for instane# 00 this will be "HDB00"
HANABACKUPPATH=<mount path from mount operation>
DBUSER=<userstore key or HANA 2.0: systemdb userstore key>
HANAVERSION="<HANA version: 1.0 or 2.0>"
# optional if rollforward is required
LOGMOUNTPATH="<mounted log backup mount point>"
RECOVERYTIME="2019-03-04 03:11:36"
# do not change below
EXCLUDE_DB_LIST="null"
INCLUDE_DB_LIST="null"
```

For example:

```
DBSID=ipl
DBPORT="HDB01"
HANABACKUPPATH=/iplmnt
DBUSER=ACTBACKUP
HANAVERSION="2.0"
# optional if rollforward is required
LOGMOUNTPATH="/iplmnt_archivelog"
RECOVERYTIME="2019-03-04 03:11:36"
# do not change below
EXCLUDE_DB_LIST="null"
INCLUDE_DB_LIST="null"
```

2. `cd /act/custom_apps/saphana/dump/`

3. Run ACT_HANADB_newtargetdumprestore.sh:

```
./ACT_HANADB_newtargetdumprestore.sh
```

or

```
/act/custom_apps/saphana/dump/ACT_HANADB_newtargetdumprestore.sh
```

9 HANA Database Management Using actHANADBM

DBAs and developers can use actHANADBM.pl to perform database access tasks using the command line interface. ActHANADBM is a set of Perl scripts that let you automate all essential tasks with a simple language that needs no SSH keys, doesn't store passwords in the clear and takes almost no effort to learn. ActHANADBM.pl is installed on the database server automatically along with the VDP Connector.

This section includes:

Installing and Configuring actHANADBM.pl

There are four steps to installing and configuring actHANADBM.pl:

Installing actHANADBM.pl with the VDP Connector on page 48

Enabling and Verifying Port 443 on page 48

Installing actHANADBM.pl with the VDP Connector

The actHANADBM script library is automatically installed on the host when you install the VDP Connector. It is available on the host under `/act/custom_apps/saphana/acthanadbm`. To install the VDP Connector, see ***Connecting Hosts to IBM InfoSphere VDP Appliances*** in your IBM InfoSphere Documentation Library.

Enabling and Verifying Port 443

actHANADBM uses https port 443 for communication between the host and the appliance. Port 443 should be enabled for the host where the actHANADBM tool is configured. To test whether the port 443 is enabled, run telnet from the actHANADBM configured host:

```
telnet <Appliance IP address> 443
```

If port 443 is enabled then the sample output looks like this:

```
[root@zoravmn4 ~]# telnet <Actifio CDS IP> 443
Trying 172.16.15.200...
Connected to 172.16.15.200.
```

Note: *The escape character is '^]'.*

Running actHANADBM.pl

To run the actHANADBM tool, CD to /act/custom_apps/saphana/acthanadbm folder and invoke ./actHANADBM.pl.

To run the script from any other directory, include the script directory in the Perl library path by using the -I switch in the command line argument: perl -I /act/custom_apps/saphana/acthanadbm/ /act/custom_apps/saphana/acthanadbm/actHANADBM.pl

Usage of actHANADBM.pl

When you run actHANADBM.pl, you must use the --type parameter and a type option such as backup:

```
actdbm.pl -type backup
```

The type options for actHANADBM.pl are:

Usage: actHANADBM

--type

<agmconfig>
<createTemplate>
<hostDiscovery>
<protectApp>
<backup>
<listImageDetails>
<mount>
<unmountdelete>
<restore>
<runwf>

actHANADBM Commands

The actHANADBM commands are:

agmconfig

Storing the Login Credentials for an IBM InfoSphere VDP - Global Manager (agmconfig)

This is one time setup to create and store the IBM InfoSphere username and password (encrypted). This configuration file is used to access the IVGM for invoking different operations using the API.

Example

```
perl actHANADBM.pl --type agmconfig
 --username <AGM username>
 --password <AGM password>
 --AGM <AGM IP>
```

agmconfig Parameters

Parameter	Use
--username	AGM username to access the appliance. This is a required parameter.
--password	Password to access the appliance. This is a required parameter.
--AGM	The name or IP address of the AGM

createTemplate

To create SLA template, use --type createTemplate

Example

```
perl actHANADBM.pl --type createTemplate
 --appliancename <appliance name>
 --templatename <template name>
 [--snappolicyname <Snapshot policy name>]
 [--snapRPO <snapshot RPO, default 24 hours>]
 --logbackupenable <true|false>
 [--logbackupfrequency <Log Backup frequency RPO in minutes>]
 [--logbackupretention <Log Backup Retention period in Days>]
 [--onVaultPolicyname <onVault policy name>]
 [--onVaultRPO <onVault RPO, default 24 hours>]
 --profileName <profile name>
 --AGM <AGM name|ip>
```

createTemplate Parameters

Parameter	Use
--appliancename	VDP Appliance name or IP address. This is a required parameter.
--templatename	Name of the SLA template. This is a required parameter.
--snappolicyname	Name of the Snapshot Policy. this is optional parameter.
--snapRPO	Snapshot Interval. This is optional parameter. Default value 24 hrs.
--logbackupenable	Enable log backup. This is a required parameter. Input value must be true or false.
--logbackupfrequency	Log backup frequency in minutes. This is optional parameter.
--logbackupretention	Logbackup retention period (in Days) in IBM InfoSphere staging disk. This is optional parameter.
--onVaultPolicyname	OnVault policy name. This is optional parameter.
--onVaultRPO	OnVault interval, default 24 hrs. This is optional parameter.
--profileName	Profile name to create the template. This is a required parameter.
--AGM	AGM name or IP address. This is a required parameter.

hostDiscovery

To discover SAP HANA database host, use --type hostDiscovery

Example

```
perl actHANADBM --type hostDiscovery
 --appliancename <appliance name>
 --hostname <source hostname>
 --hostip <source host ip>
 --stagingDiskpreference <Type of disk for backup: Block|NFS>
 --AGM <AGM name|ip>
```

hostdiscovery Parameters

Parameter	Use
--appliancename	Name of the appliance. This is a required parameter.
--hostname	Source database hostname. This is a required parameter.
--hostip	Source database host IP. This is a required parameter.
--stagingDiskpreference	Staging disk type for backup, Block or NFS. This is a required parameter.
--AGM	AGM name or IP address. This is a required parameter.

protectApp

To protect the application, use -type protectApp.

Example

```
perl actHANADBM.pl --type protectApp
 --appname <application name>
 --hostname <source hostname>
 --templatename <Template Name>
 --profilename <Profile Name>
 --backupType <CBT|filesystemDump>
 --hanaSystemDbKey <Hana SystemDB HDB userstore Key Name>
 [--hanaTenantDbkeyPrefix <Prefix for Hana Tenant DB Key Name>]
 [--volumegroupreservespace <volume group snap reserve space in percentage: default 20%>]
 [--forcefulldbdump <true|false>]
 [--productionlogretention <production log purging retention in days>]
 --AGM <AGM name|ip>
```

protectApp Parameters

Parameters	Use
--appname	Name of the application to be protected. This is a required parameter.
--hostname	Name of the source host. This is a required parameter.
--templatename	SLA template name to be applied. This is a required parameter.
--profilename	Resource Profile name. This is a required parameter.
--backupType	Type of the backup. CBT or Filesystem Dump. This is a required parameter.
--hanaSystemDbKey	HANA SYSTEM database user store key name. This is a required parameter.
--hanaTenantDbkeyPrefix	Tenant database user store key prefix. This is optional parameter.
--volumegroupreservespace	Volume group snap reserve space. If not specified, default value is 20%. This is optional parameter.
--forcefulldbdump	Force full database dump backup. Input values are true/false. This is optional parameter.
--productionlogretention	Production log retention period in number of days. This is optional parameter.
--AGM	AGM name or IP address. This is a required parameter.

backup

To create a database backup, use --type backup, backuptype <db|log|dblog>.

Use this for:

- db backup
- log backup
- dblog backup

Example

```
actHANADBM --type backup
 --appname <application name>
 [--hostname <hostname>]
 [--backuptype <db|log|dblog>]
 [--jobpriority <low|medium|high>]
 --AGM <AGM name|ip>
 [--wait <yes|no>]
```

backup Parameters

Parameters	Use
--appname	Name of the application. This is a required parameter.
--hostname	Name of the application host. If not specified, host where script is running will be used.
--backuptype	Type of backup operation. This is optional parameter. If not specified, the default type is database backup (db)
--jobpriority	The priority for the job. This is optional parameter. Valid inputs are low, medium or high.
--AGM	AGM name or IP address. This is a required parameter.
--wait	Wait until the job completed. This is optional parameter, if not specified default value is yes.

listImageDetails

To return a list of snapshot images with recovery range for a protected database, use --type listImageDetails

Example

```
perl actHANADBM .pl--type listImageDetails
 --appname <application name>
 --hostname <source hostname>
 --AGM <AGM name|ip>
```

listImageDetails Parameters

Parameters	Use
--appname	Name of the application. This is a required parameter.
--hostname	Name of the source host. This is a required parameter.
--AGM	AGM name of IP address. This is a required parameter.

mount

To mount a backup image or to perform app aware mount, use --type mount.

Example

```
perl actHANADBM.pl --type mount
 --appName <Source Database Name or Source File System Mount Point>
 [--image <Image name>]
 --sourceHost <source Host Name>
 --targetHost <Target Host name>
 [--scaleoutnodelist <Scaleout node list seperated by colon>]
 [--mountpoint <mount location '/act/mnt'>]
 [--appawaremount <true|false default: false>]
 [--targetdbuser <Target database Database user store key>]
 [--targetdbsid <Target Database SID]
 [--recoverytime <'yyyy-mm-dd hh24:mi:ss'>]
 --AGM <AGM name|ip>
 [--wait <yes|no>]
```

mount Parameters

Parameters	Use
--appname	Source application name or Source file system mount point. This is a required parameter.
--image	Name of the image to be mounted. This is optional parameter. If not specified, latest image will be used.
--sourceHost	Name of the source host. This is a required parameter.
--targetHost	Name of the target host. This is a required parameter.
--scaleoutnodelist	In case of cluster, specify the other nodes separated by colon. This is an optional parameter; if not specified, mount will be done only on target node.
--mountpoint	Target mount point name where backup image will be mounted. If not specified, IBM InfoSphere naming convention will be used.
--appawaremount	Mount and Recover the application on target node. This is optional parameter, if not specified, default value is false.
--targetdbuser	Target database user store key required for recovery. This is optional parameter, required only when --appawaremount is true.
--targetdbsid	Target database SID. This is optional parameter, required only when --appawaremount is true.
--recoverytime	Recovery range to roll forward the logs. Must be specified in the format 'yyyy-mm-dd hh24:mi:ss'. This is optional parameter. If not specified, all available logs will be applied.
--AGM	AGM name or IP address. This is a required parameter.
--wait	Wait until the job completed. This is optional parameter; if not specified default is yes.

unmountdelete

To perform an unmount and delete operation on an image, use --type cleanup. This operation will stop and remove any copy of a database running out of a mounted image and remove the filesystem mount as part of the cleanup

Example

```
actHANADBM --type unmountdelete
 --appName <Source Database Name or Source File System Mount Point>
 --sourceHost <source host name>
 --targetHost <target host name>
 [--imageName <Mounted Image Name>]
 [--targetAppName <Target Cloned Database Name or Target Mounted File System MountPoint>]
 --AGM <AGM name|ip>
 [--wait <yes|no>]
```

unmountdelete Parameters

Parameters	Use
--appname	Source application name or Source file system mount point. This is a required parameter.
--sourceHost	Name of the source host. This is a required parameter.
--targetHost	Name of the target host. This is a required parameter.
--image	Name of the image to be mounted. This is optional parameter. If not specified, latest image will be used.
--targetAppName	Target application name or Target mounted file system mountpoint.
--AGM	AGM name or IP address. This is a required parameter.
--wait	Wait until the job has completed. This is optional parameter; if not specified default value is yes.

restore

To restore back to source server, use the option --type restore.

Example

```
perl actHANADBM --type restore
 --appName <Source Database Name or Source File System Mount Point>
 [--image <Image name>]
 --sourceHost <source Host Name>
 --targetHost <Target Host name>
 [--recoverytime <'yyyy-mm-dd hh24:mi:ss'>]
 [--excludedblist <Exclude DB list name seperated by name>]
 [--includedblist <Include DB list name seperated by comma>]
 --AGM <AGM name|ip>
 [--wait <yes|no>]
```

restore Parameters

Parameters	Use
--appname	Source application name or Source file system mount point. This is a required parameter.
--image	Name of the image to be mounted. This is optional parameter. If not specified, latest image will be used.
--sourceHost	Name of the source host. This is a required parameter.
--targetHost	Name of the target host. This is a required parameter.
--recoverytime	Recovery range to roll forward the logs. Must be specified in the format 'yyyy-mm-dd hh24:mi:ss'. This is optional parameter. If not specified, all the available logs will be applied.
--excludedblist	Specify the list of databases separated by comma to exclude during the restore operation. This is optional parameter, if not specified all the tenant databases will be restored.
--includedblist	Specify the list of databases separated by comma to include during the restore operation. This is optional parameter, if not specified all the tenant databases will be restored.
--AGM	AGM name or IP address. This is a required parameter.
--wait	Wait until the job completed. This is optional parameter; if not specified, the default is yes.

runwf

Run Workflow creates a new database copy or refreshes an existing database copy based on the re-provision option. To run a workflow, use --type runwf,

Example

```
actHANADBM.pl --type runwf
--appName <source database name>
 --hostname <sourcehostname>
 --wfname <workflow name>
 --reprovision <yes|no>
 [--image <Image name>]
 --AGM <AGM name|ip>
 [--wait <yes|no>]
```

directmount Parameters

Parameters	Use
--appname	Source application name or Source file system mount point. This is a required parameter.
--sourceHost	Name of the source host. This is a required parameter.
--wfname	Name of the workflow. This is a required parameter
--reprovision	Reprovision flag to indicate new application aware mount or reprovision application aware mount.
-image	Image name to use for provision the database. This is an optional parameter. If not specified, the latest image will be used for database provision.
--AGM	AGM name or IP address. This is a required parameter.
--wait	Wait until the job completed. This is optional parameter; if not specified default value is yes.