
MySQL DBA's Guide to Actifio Copy Data Management

Updated August 24, 2022



actifio

Actifio VDP 10.0

Copyright, Trademarks, and other Legal Matter

Copyright © 2022 Google LLC. All rights reserved.

Actifio™, OnVault™, and VDP™ are trademarks of Google LLC.

All other brands, product names, goods and/or services mentioned herein are trademarks or property of their respective owners.

Contents

Preface	vii
The ActifioNOW Customer Portal.....	vii
Chapter 1 - Introducing Actifio Copy Data Management for MySQL Databases	1
Chapter 2 - Adding a MySQL Database Host and Discovering the Database	3
Adding the Host.....	4
Discovering the MySQL Instance from the App Manager.....	6
Finding the Discovered Instances and Databases in the App Manager.....	7
Chapter 3 - Configuring the MySQL Backup Method	9
Ensuring that the Backup Capture Method is Set Correctly.....	11
Ensuring that the Staging Disk Format on the Host is Set Correctly.....	13
Staging Disk Format: File-Based Traditional Backup and Recovery in NFS/Block.....	13
Staging Disk Format: LVM Snapshot with Change Block Tracking on Linux.....	14
Chapter 4 - Protecting a MySQL Instance	15
Protecting a MySQL Instance.....	15
Protecting MySQL Database Logs.....	17
Chapter 5 - Restoring, Accessing, and Recovering a MySQL Instance	21
Mount and Refresh from Block-Based Volume Snapshot to a Target MySQL Instance as a Virtual Application....	21
Restoring and Recovering a MySQL Instance.....	24
Recovering from a Volume-Based Snapshot.....	24
Recovering from a Full+Incremental Backup.....	26

Preface

The information presented in this guide is intended for users who are familiar with basic Actifio processes and procedures as described in **Getting Started with Actifio Copy Data Management** and who are qualified to administer MariaDB databases.

The ActifioNOW Customer Portal

During the configuration and initialization of your Actifio appliance your Actifio representative provided you with a user name and password for the ActifioNOW customer portal.

From the customer portal you can obtain detailed reports about your Actifio appliance as well as search the portal's knowledge base for answers to specific questions.

To log into the ActifioNOW customer portal:

1. Go to: <https://now.actifio.com>
2. When prompted, enter the user name and password provided by your Actifio representative.

1 Introducing Actifio Copy Data Management for MySQL Databases

An Actifio 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.

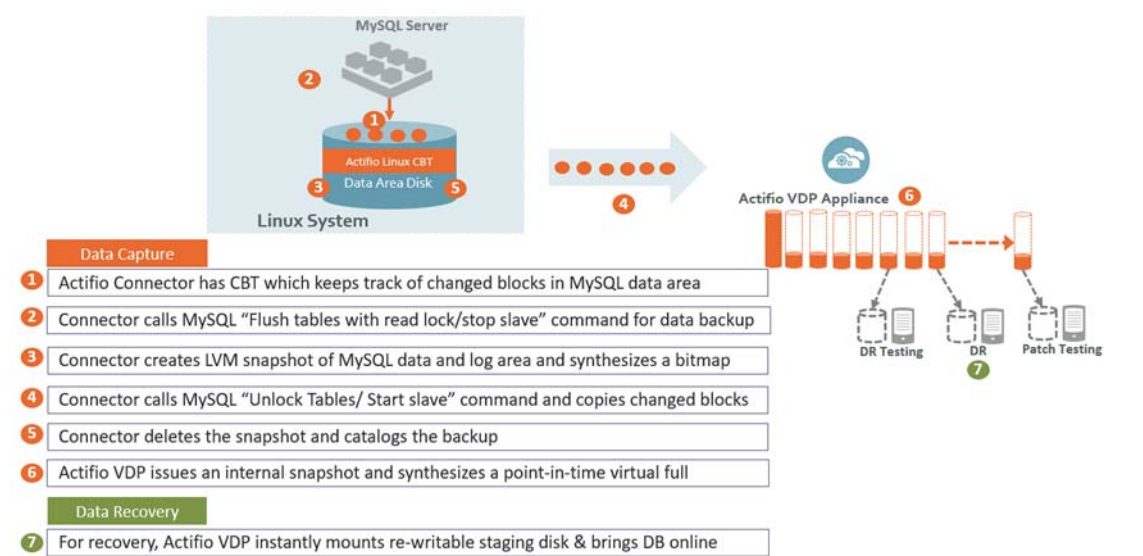
MySQL is the world's most popular open source database, used by high profile web properties including Facebook, Twitter, YouTube, and many more. This DBA guide explains how to protect MySQL application consistent database data with Actifio VDP in a Linux environment.

MySQL Backup API used by Actifio VDP

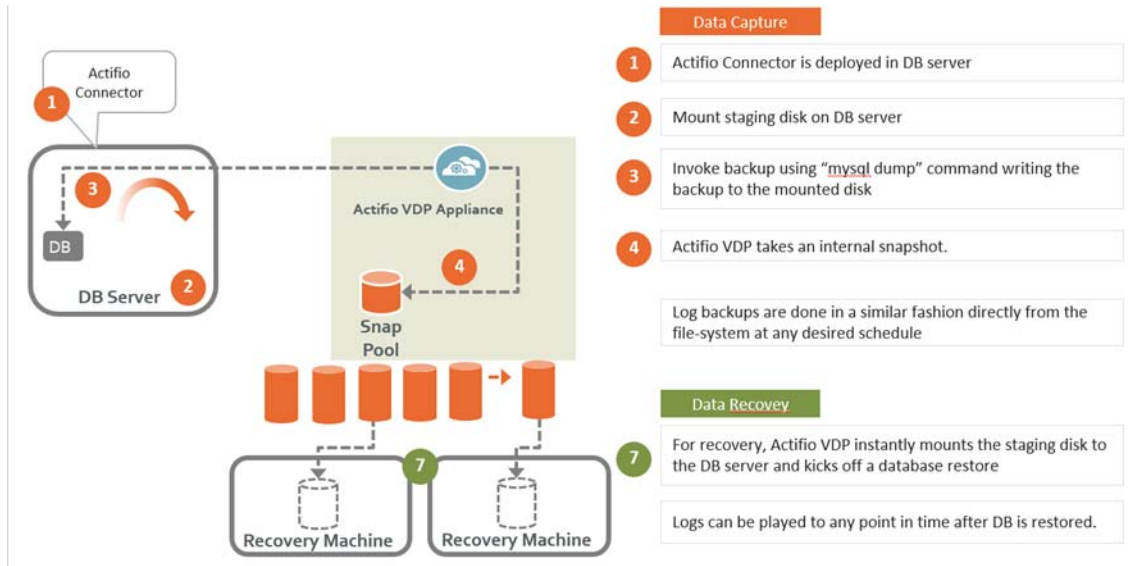
Linux CBT and LVM snapshot: MySQL "FLUSH TABLES WITH READ LOCK" and "UNLOCK TABLES" API

File-based backups: MySQL "mysqldump" API. This provides the full backup of the database in backup format. On recovery, the restore db API recovers the database by physically overwriting the data area.

MySQL log backup: During a log backup, VDP physically copies all the MySQL binary logs. The MySQL "purge binary logs BEFORE" API is used to purge the binary logs.



How It Works: MySQL with Linux CBT and LVM Snapshot



How It Works: MySQL with File-Based Traditional Backup

2 Adding a MySQL Database Host and Discovering the Database

Prerequisites

- The MySQL database must be residing under LVM and it must not be the boot volume. Run (mysql -e "select @@datadir") to get the database data path.
- For best results, the LVM volume from which the MySQL volumes are provisioned should have at least 20% free space.
- Install the Actifio Connector on the MySQL server host (see **Network Administrator's Guide to Actifio VDP**.)
- Create a backup user with the privileges RELOAD, SELECT, LOCK TABLES, and SUPER (or) REPLICATION CLIENT.

To create the backup user:

```
create user actuser identified by 'actpasswd';
GRANT SELECT on *.* TO actuser;
GRANT RELOAD on *.* TO actuser;
GRANT LOCK TABLES on *.* TO actuser;
GRANT SUPER on *.* TO actuser;
GRANT REPLICATION CLIENT on *.* to actuser;
SHOW GRANTS FOR CURRENT_USER;
```

The backup username/password must be configured with host configuration. If there are multiple MySQL instances running on a server, then the backup username/password must be common for all MySQL instances running on that server.

- MySQL binary logging (log_bin) must be on to take log backup. To configure the binary log option, shut down the MySQL server and edit the config file (my.cnf or my.ini). Within the [mysqld] section of the configuration file, add the log-bin option.

```
[mysqld]
log_bin = /log1/mysql13306/mysql13306-bin.0000
```

Adding a MySQL Database Host and Discovering the Database

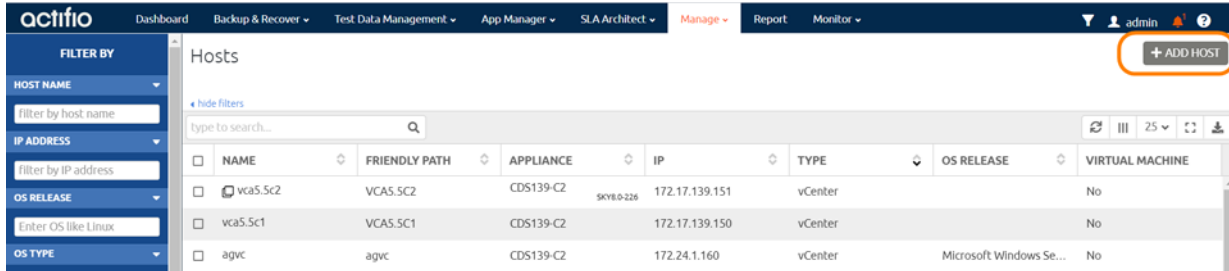
Before you can protect a MySQL database, you must add the host and discover the database. This requires:

1. [Adding the Host](#) on page 4
2. [Discovering the MySQL Instance from the App Manager](#) on page 6
3. [Finding the Discovered Instances and Databases in the App Manager](#) on page 7

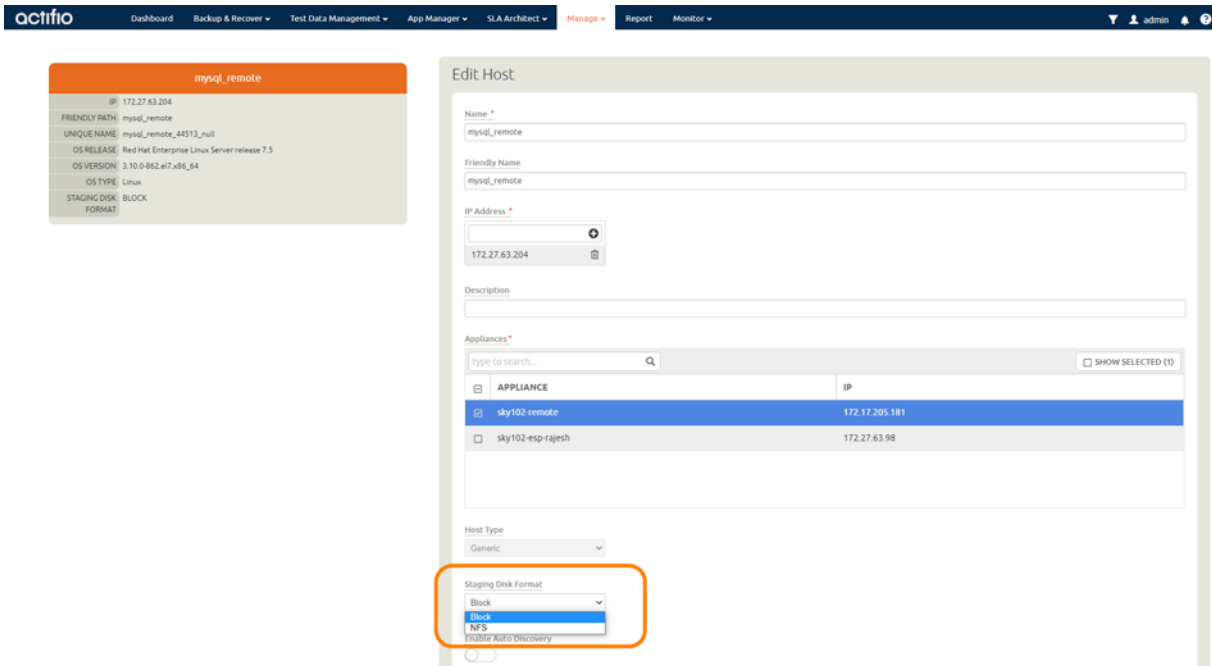
Adding the Host

Add the host to AGM. If the host is already added then edit the host and make sure to set all the configurations correctly.

1. From the AGM Manage, Hosts list, click **+Add Host**.



2. On the Add Host page:
 - o **Name:** Provide the database server name.
 - o **IP Address:** Provide the database server IP and click the + sign on the right corner.
 - o **Appliances:** Select the check box for the appliance.
 - o **Host Type:** Make sure this is Generic.
3. Click **Add** at bottom right to add the host.
The Host is added.
4. Right-click the host and select **Edit**.
5. On the Edit Host page: Select the **Staging Disk Format:**
 - o For block-based backup with CBT or GPFS: select **Block**
 - o For file-based backup with Full+Incremental file system backup: select **Block or NFS**



- In Application Discovery Credentials, enter the username/password that you set up in [Prerequisites](#) on page 3.

Host Type
Generic

Staging Disk Format
Block

Enable Auto Discovery

Use Oracle Database Authentication

Must be enabled for hosts running Microsoft Windows.

Ports

Application Discovery Credentials

User Name
actuser

Password

Password Filepath

Connector Settings

Discovered Applications

Organizations

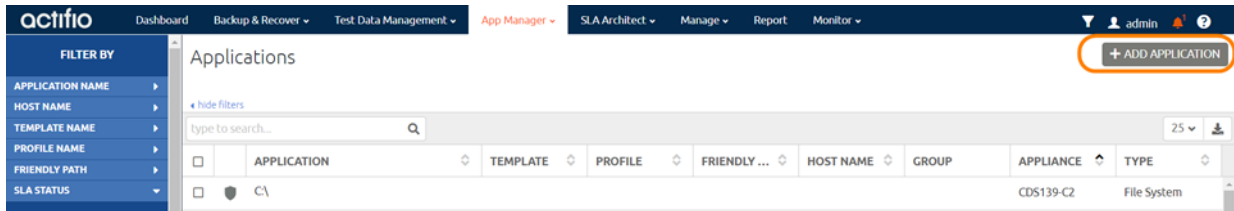
Cancel Save

- Select **Save** at the bottom of Edit Host page.

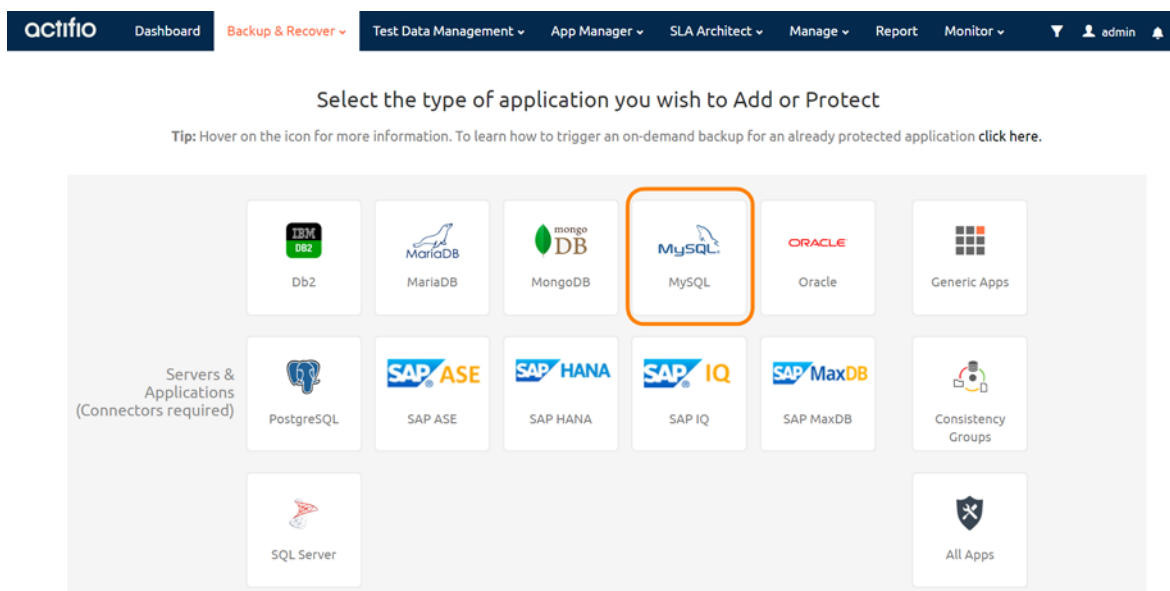
Discovering the MySQL Instance from the App Manager

To discover the MySQL instance:

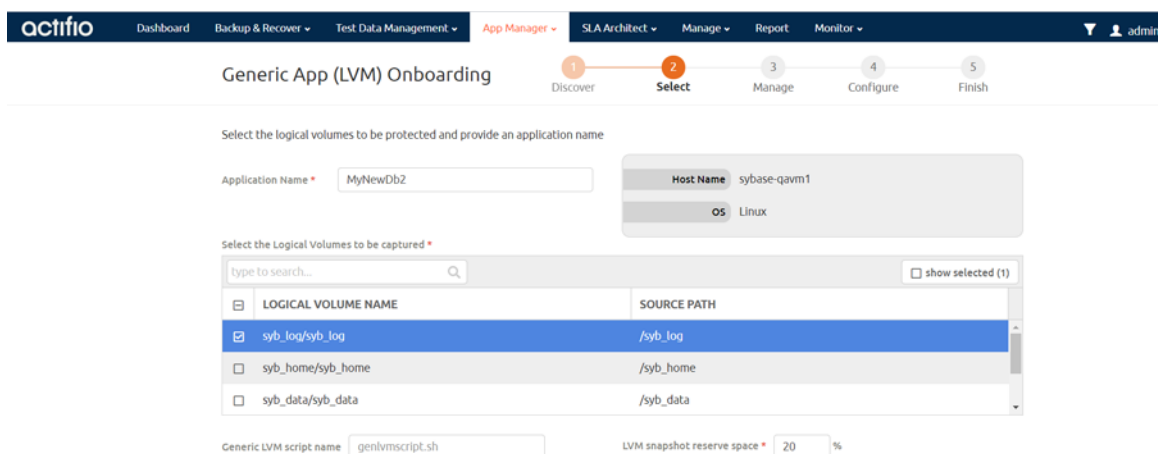
1. From the App Manager, Applications list, select **Add Application** in the upper right corner.



2. On the Add Application page, select **MySQL**, then select the MySQL 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 Actifio Appliance.



3. Select the host and click **Next** in the bottom right corner. This will run the discovery on the MySQL host and will discover all MySQL instances and databases running on it.



Finding the Discovered Instances and Databases in the App Manager

To find the newly-discovered database, go to the App Manager Applications list. All applications known to the AGM of all types are listed. Use the Type application filter on the left pane to show only MySQL database instances. The new MySQL instances and databases will appear in the list as unmanaged (the red shield icon).

	APPLICATION	ID	TEMPLATE	PROFILE	FRIENDLY P...	HOST NAME	APPLIANCE	TYPE	APPLIANCE A...
<input type="checkbox"/>	LVMNT2	1782897			maria_2	maria_2	sky9_caf_auto	MariaDB Datab...	1444878
<input type="checkbox"/>	BUG1	1772546			maria-1	maria-1	sky9_caf_auto	MariaDB Datab...	1417057
<input type="checkbox"/>	DIR333	1677033			maria_2	maria_2	sky9_caf_auto	MariaDB Datab...	1258410
<input type="checkbox"/>	DB99	1879781			j-maria-1	j-maria-1	caf-source	MariaDB Datab...	419465
<input type="checkbox"/>	CGDB32	1879757	onvault_slt_325...	onval_autoprofi...	j-maria-1	j-maria-1	caf-source	MariaDB Datab...	327947
<input type="checkbox"/>	CGDB12	1879755	onvault_slt_325...	onval_autoprofi...	j-maria-1	j-maria-1	caf-source	MariaDB Datab...	327945
<input type="checkbox"/>	FMO2	1682621			maria-1	maria-1	sky9_caf_auto	MariaDB Datab...	1262606
<input type="checkbox"/>	DIR222	1677168			maria_2	maria_2	sky9_caf_auto	MariaDB Datab...	1258508
<input type="checkbox"/>	DIR222	1664892	Maria_CBT	LocalProfile	maria-1	maria-1	sky9_caf_auto	MariaDB Datab...	1246958
<input type="checkbox"/>	AUTODB2	1880661					caf-source	MariaDB Datab...	211912
<input type="checkbox"/>	LVMNT1	1782855			maria_2	maria_2	sky9_caf_auto	MariaDB Datab...	1444641

3 Configuring the MySQL Backup Method

After the database is prepared and discovered as explained in [Chapter 2, Adding a MySQL Database Host and Discovering the Database](#), you can configure a VDP backup method SLA for the database.

The procedures for developing SLAs are detailed in the AGM online help. This chapter provides additional information of value to the MySQL DBA.

Protection is set for the entire MySQL Instance. You can include/exclude specific databases during the process by using a Database Inclusion Rule from the Manage SLA page.

Whichever method you select involves these steps:

- [Application Details & Settings](#) on page 10

- [Ensuring that the Backup Capture Method is Set Correctly](#) on page 11

- [Ensuring that the Staging Disk Format on the Host is Set Correctly](#) on page 13

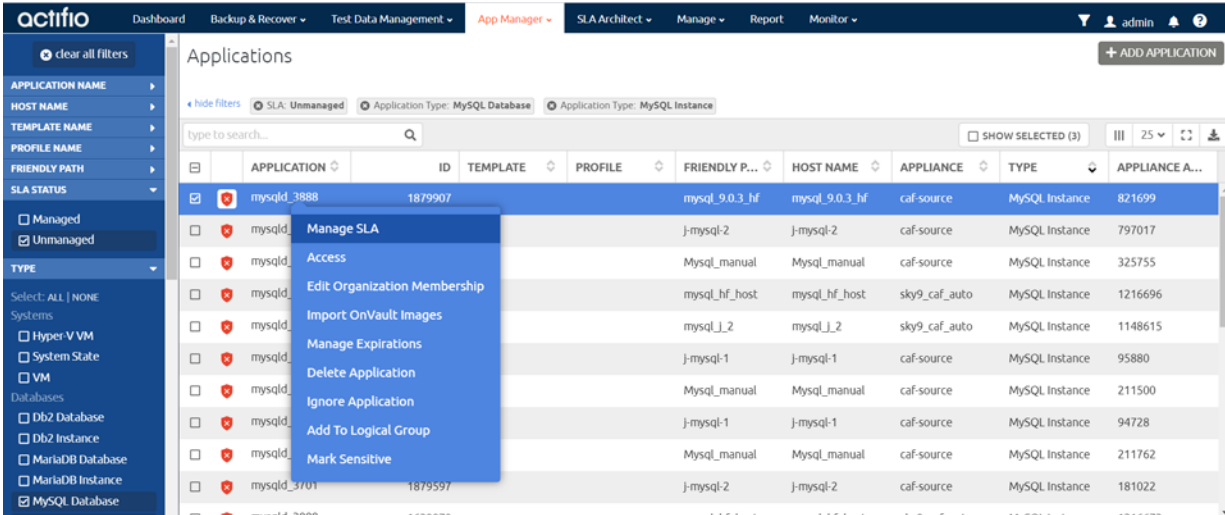
Table 1: Application Details & Settings

Setting	Block-Based LVM Snapshot with CBT on Linux	File-Based Backup and Recovery, Block or NFS
Use Staging Disk Granularity as Minimum Staging Disk Size	For applications that are under the size of granularity setting that tend to periodically grow this new option is useful to avoid frequent costly FULL backups. Because the staging disk is thin provisioned, there is no initial cost to use a staging disk that is larger than required for immediate use. The values are 0 for No and the Staging Disk Granularity setting for Yes.	
Staging Disk Granularity	Maximum size of each staging disk when multiple staging disks are used for an application. The default value is 1000GB.	
Last Staging Disk Minimum Size	Minimum size of the last staging disk created for an application with multiple staging disks. This value is also used for additional disks allocated to accommodate growth. The default value is 250GB.	
Connector Options	Use this only under the direction of Actifio Support.	
Percentage of Reserve Space in Volume Group	20% is recommended for LVM snapshot temporary space. Not applicable for protecting virtual databases.	Not applicable
Backup Capture Method	Use volume level backup	Use full+incremental filesystem backup
Database Filesystem Staging Disk Size in GB	Not applicable	Use the default calculation: (database size * 1.5)+ 10%. Disks will grow dynamically.
Log Backup Staging Disk Size in GB	By default Actifio 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 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.	
Script Timeout	The timeout value is applied to internal backup and recovery scripts called by connector. The default value is recommended.	

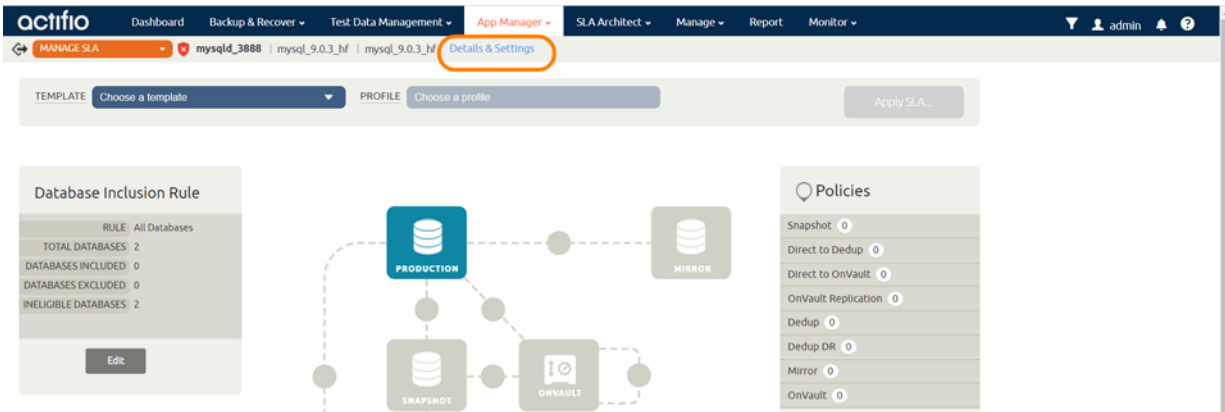
Ensuring that the Backup Capture Method is Set Correctly

Backup capture settings depend upon the backup capture method that you need. Be certain that you have set the right backup method for your needs:

1. In the App Manager, Applications list, right-click the database and select **Manage SLA**.



2. At the top of the Manage SLA page, select the **Details & Settings** link:



This opens the specific details and settings for this database. Check the Backup Capture Method:

- o Traditional Backup and Recovery API “file-based” backups: **Use full+incremental backup**
- o LVM Snapshot with Change Block Tracking: **Use volume level backup**

Note: System databases on a root partition can be backed up as LVM Snapshots and later mounted as virtual databases, but they cannot be used in a traditional Restore operation as the root partition cannot be unmounted. This will need manual restore and recovery from a simple mount back to the same host.

Application Details & Settings [Settings Help](#)

Application Name: Mysqlid_5467

APPLICATION TYPE	MySQLInstance
HOST	Mysql_jenkins
HOST IP ADDRESS	172.17.204.123
PATH	Mysql_jenkins
OPERATING SYSTEM	Linux
APPLIANCE	DB2 Local
APPLIANCE IP ADDRESS	172.16.201.174

Settings [Reset All to Default](#)

CONNECTOR OPTIONS

PERCENTAGE OF RESERVE SPACE IN VOLUME GROUP

BACKUP CAPTURE METHOD [Reset to Default](#)

- Use volume-level backup
- Use full+incremental backup

[Cancel](#) [Save Changes](#)

3. Click **Save** at the bottom of the page if you had to change anything.

Ensuring that the Staging Disk Format on the Host is Set Correctly

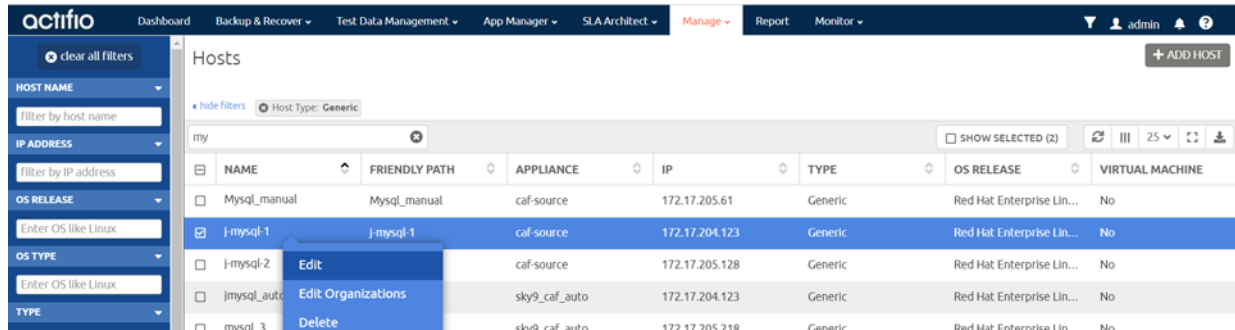
Choose between:

- [Staging Disk Format: File-Based Traditional Backup and Recovery in NFS/Block on page 13](#)
- [Staging Disk Format: LVM Snapshot with Change Block Tracking on Linux on page 14](#)

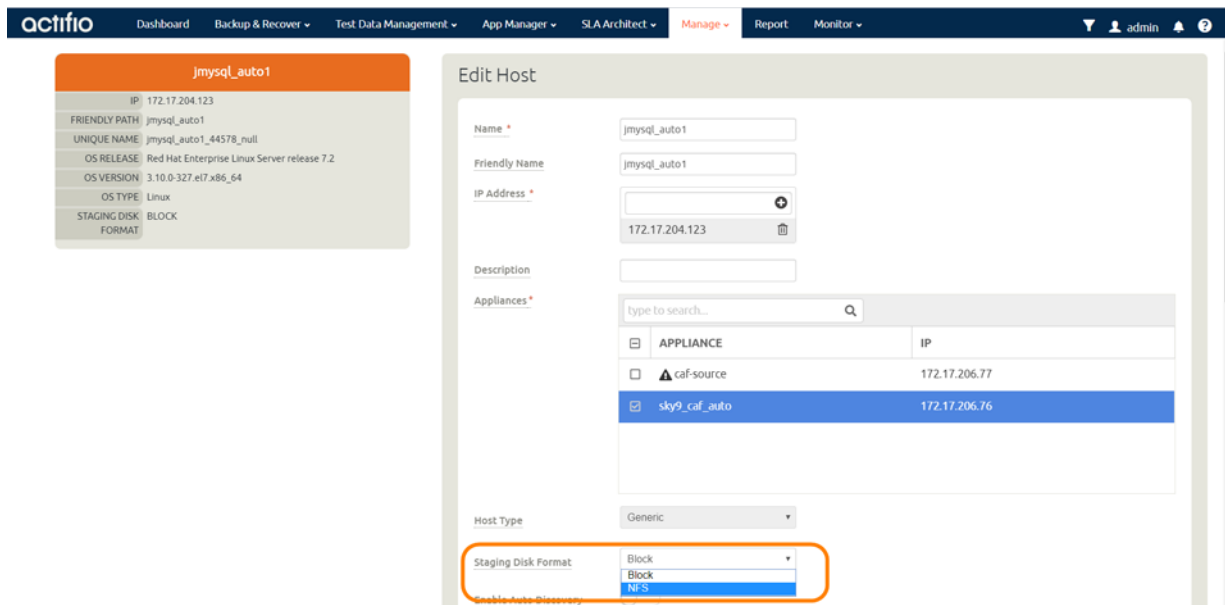
Staging Disk Format: File-Based Traditional Backup and Recovery in NFS/Block

To set staging disk format for storage snapshots:

1. From AGM Manage, Hosts page, right-click the host and select **Edit**.



2. Set Staging Disk Format to **NFS** or to **Block**.

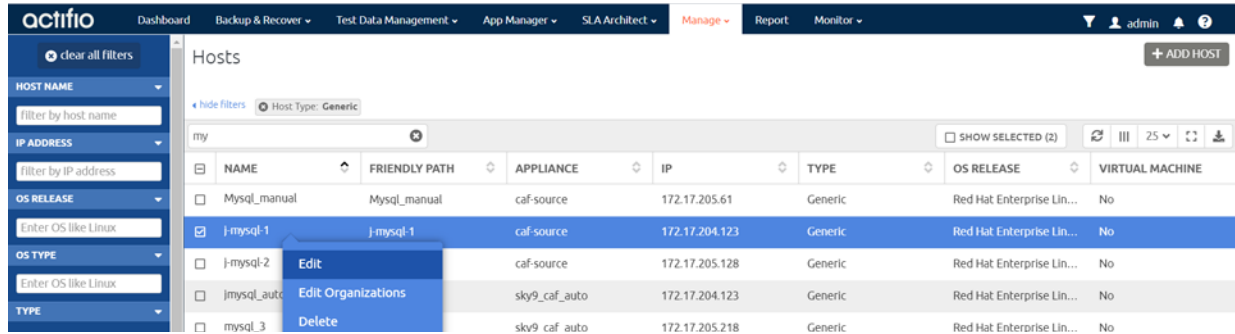


3. Then click **Save** at the bottom of the page.

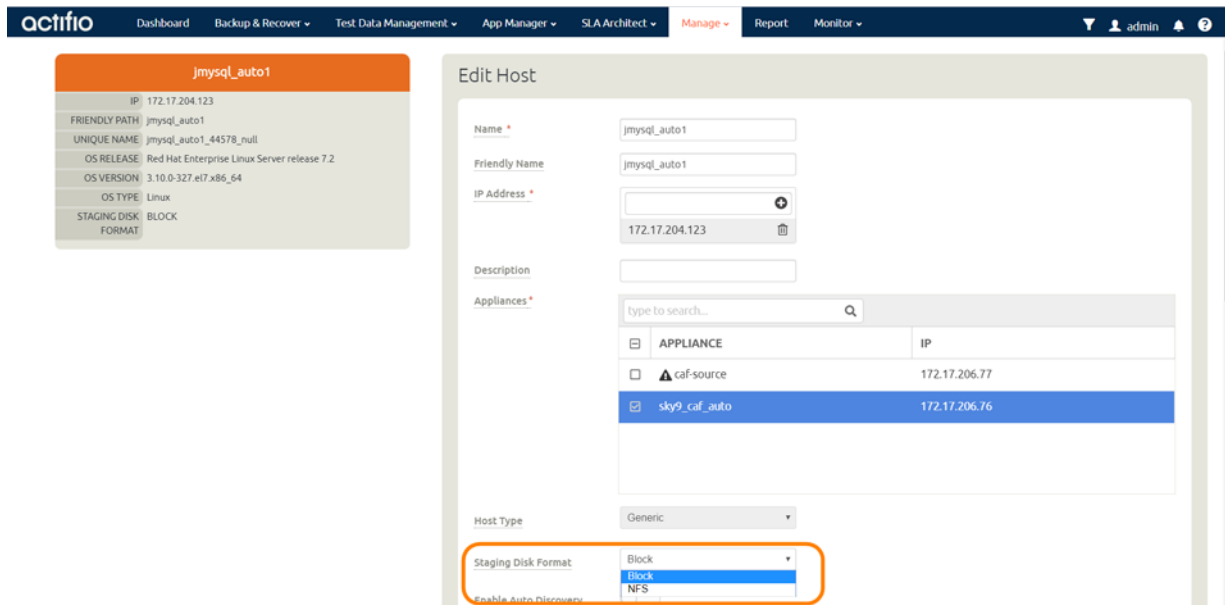
Staging Disk Format: LVM Snapshot with Change Block Tracking on Linux

To set staging disk format for storage snapshots:

1. From the Manage, Hosts list, right-click the host and select **Edit**.



2. Set Disk Preference to **Block**.



3. Then click **Save** at the bottom of the page.

4 Protecting a MySQL Instance

After the SLA is configured as detailed in [Chapter 3, Configuring the MySQL Backup Method](#), you can configure a VDP backup method for the database.

This chapter includes:

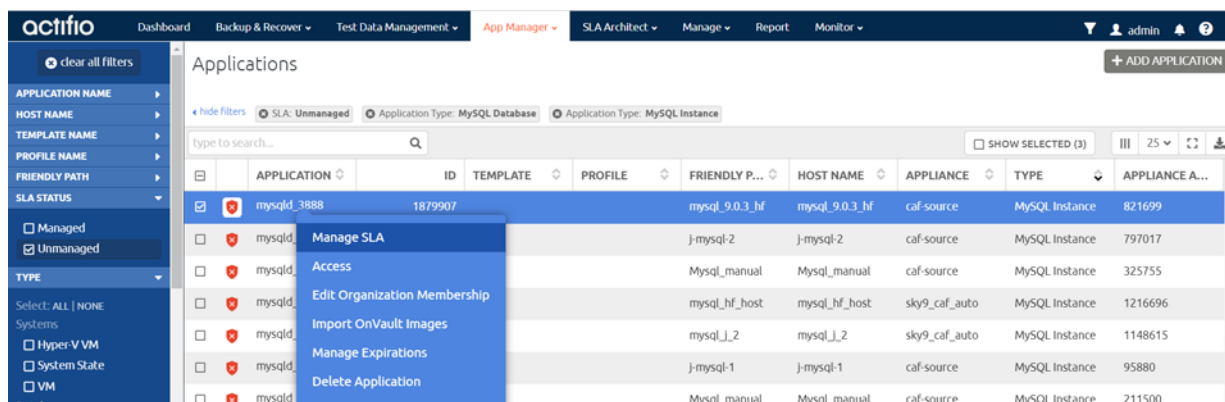
[Protecting a MySQL Instance](#) on page 15

[Protecting MySQL Database Logs](#) on page 17

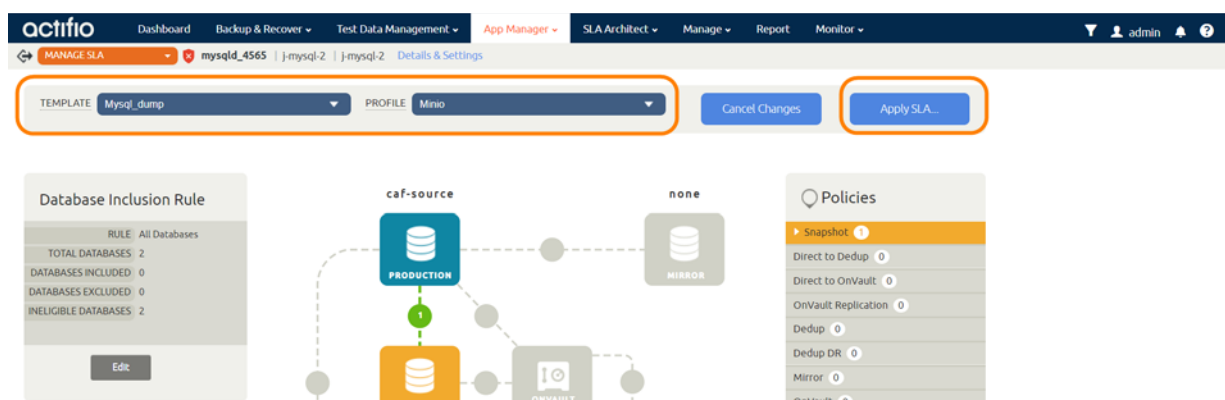
Protecting a MySQL Instance

To protect the MySQL instance and its databases:

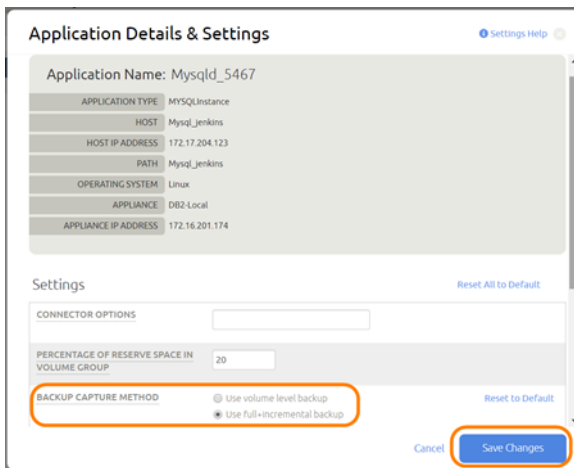
1. From the AGM App Manager, Applications list, right-click the database and select **Manage SLA**.



2. On the Manage SLA page, select a template and a resource profile, then click **Apply SLA**.

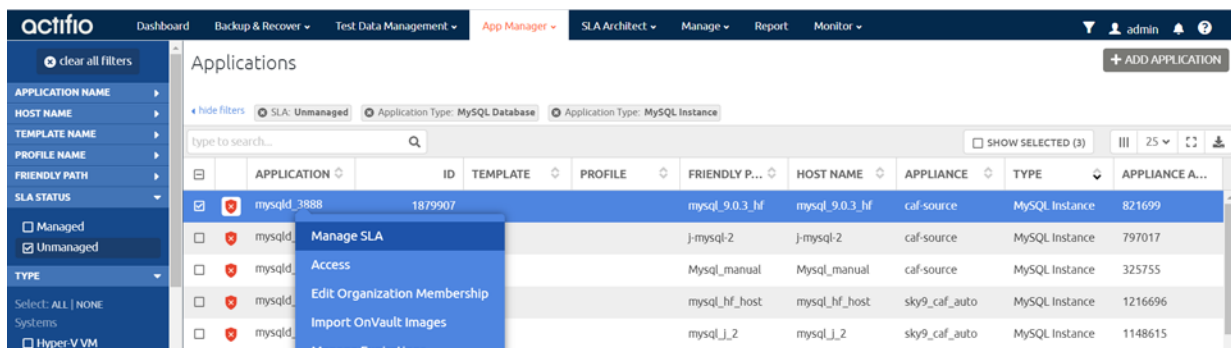


- On the Apply SLA page, make sure the backup capture method matches the type of backup set in Chapter 3, Configuring the MySQL Backup Method. Click **Apply SLA** or **Save Changes**.

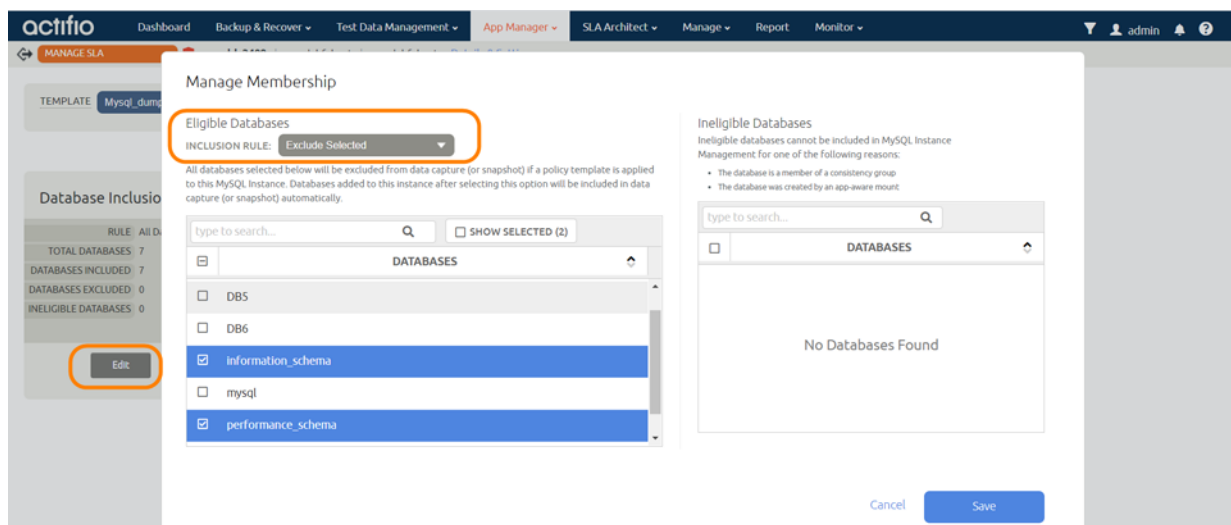


The instance will be protected when the snapshot job runs according to the schedule in the template. After the first successful snapshot job the database appears in the Application Manager with a green shield icon.

- You can include or exclude specific databases during backup. From the App Manager, select the MySQL Instance. Select **Manage SLA**.



- Under Database Inclusion Rule, click **Edit**. If you do not see the Database Inclusion Rule, you have selected a database, not the instance.

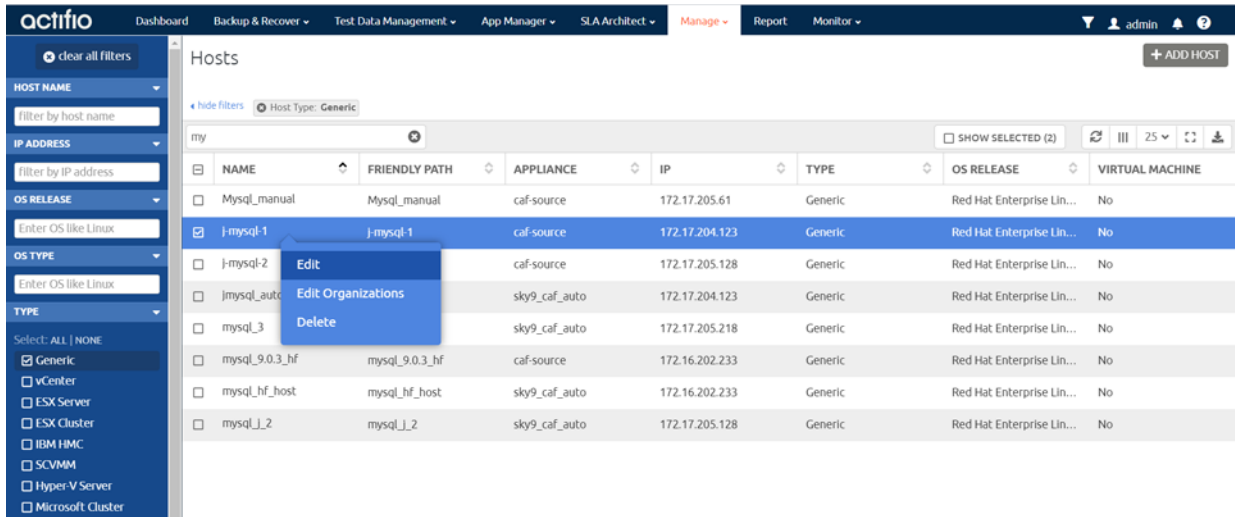


- Select an Inclusion Rule (Include All, Include Selected, or Exclude Selected) and then select the databases to include or exclude, then click **Save**.

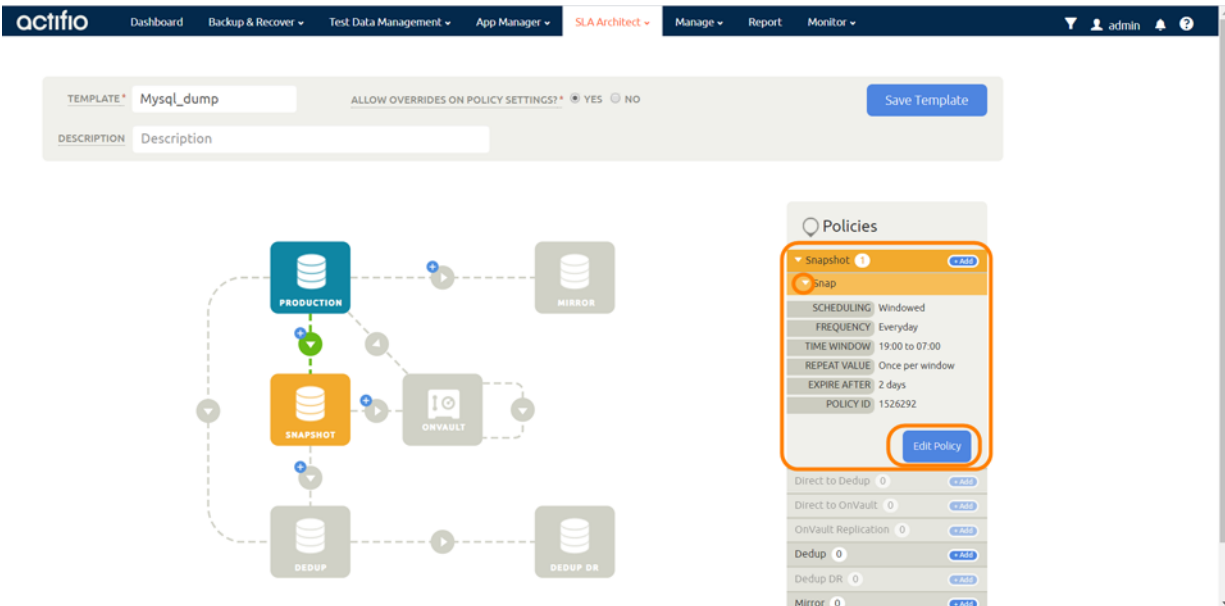
Protecting MySQL Database Logs

To enable and set up the MySQL database log backup:

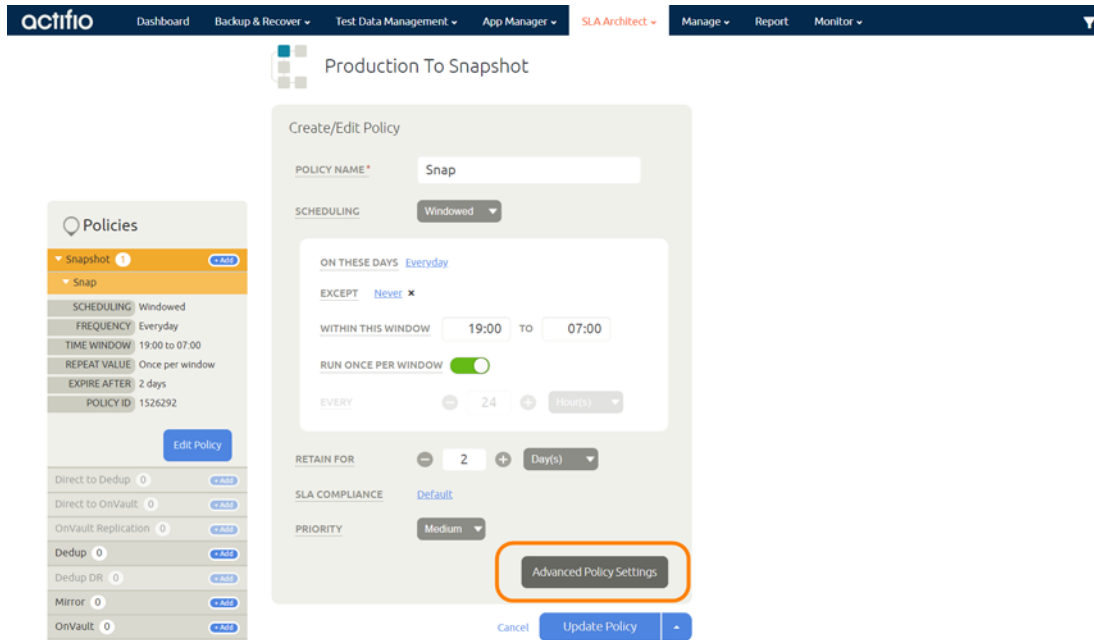
1. From the SLA Architect templates list, right-click the template for MySQL database protection and click **Edit**.



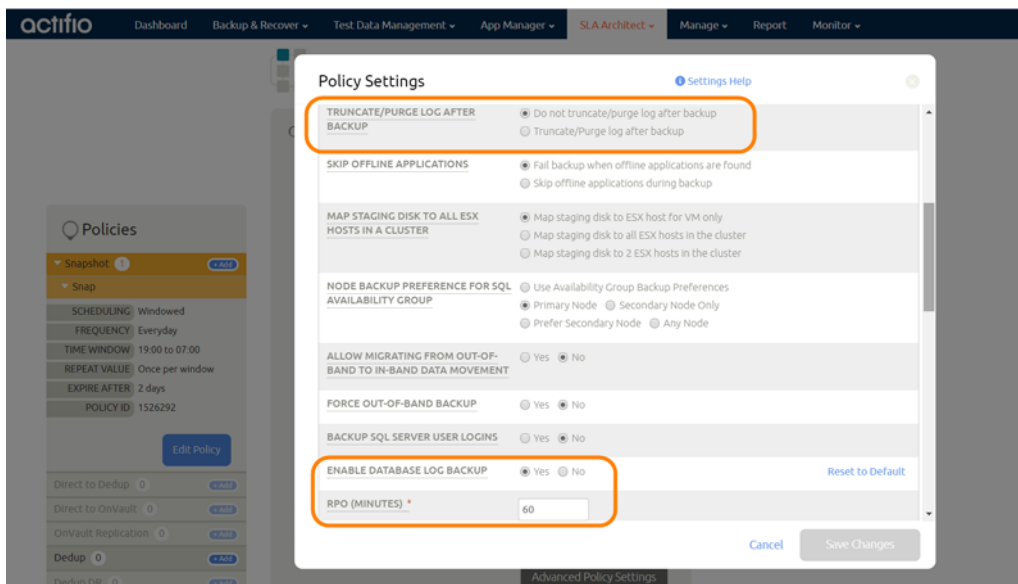
2. Click the arrow beside the Snapshot policy to open up the details, then click **Edit Policy**.



3. Near the bottom of the Create/Edit Policy page, select **Advanced Policy Settings**.



4. Set the log policy options (you will have to scroll to see them all):
 - o Enable **Truncate/Purge log after backup**.
 - o Set **Enable Database Log Backup** to **Yes**.
 - o For **RPO (Minutes)**, enter the desired frequency of log backup.
 - o Set **Log Backup Retention Period (in Days)** for point in time recovery.
 - o Set **Replicate Logs (Uses StreamSnap Technology)** to **Yes** if you want to enable StreamSnap replication of log backup to a DR site.



5. Click **Save Changes**.
6. From App Manager Applications list, select the MySQL Instance. You can use the MySQL Instance checkbox to filter the list. Right-click it and select **Manage SLA**.

The screenshot shows the Actifio App Manager interface. The top navigation bar includes 'Dashboard', 'Backup & Recover', 'Test Data Management', 'App Manager', 'SLA Architect', 'Manage', 'Report', and 'Monitor'. The user is logged in as 'admin'. The main content area is titled 'Applications' and shows a list of MySQL instances. The first instance, 'mysql_3888' with ID '1879907', is selected. A context menu is open over this instance, with 'Manage SLA' highlighted. Other instances in the list include 'mysql', 'j-mysql-2', 'Mysql_manual', 'mysql_hf_host', and 'mysql_j_2'.

APPLICATION	ID	TEMPLATE	PROFILE	FRIENDLY P...	HOST NAME	APPLIANCE	TYPE	APPLIANCE A...
mysql_3888	1879907			mysql_9.0.3_hf	mysql_9.0.3_hf	caf-source	MySQL Instance	821699
mysql				j-mysql-2	j-mysql-2	caf-source	MySQL Instance	797017
mysql				Mysql_manual	Mysql_manual	caf-source	MySQL Instance	325755
mysql				mysql_hf_host	mysql_hf_host	sky9_caf_auto	MySQL Instance	1216696
mysql				mysql_j_2	mysql_j_2	sky9_caf_auto	MySQL Instance	1148615

7. At the top of the screen, select **Details & Settings**.
8. Set the **Retention of Production DB Logs** in days. This value is used to purge the MySQL logs from the production destination. Based on this setting the log will be purged older than the # of days specified. Default value is 0 days. With the default value, all logs prior to last log backups are purged.
9. Click **Save**.

5 Restoring, Accessing, and Recovering a MySQL Instance

This section describes:

[Mount and Refresh from Block-Based Volume Snapshot to a Target MySQL Instance as a Virtual Application on page 21](#)

[Restoring and Recovering a MySQL Instance on page 24](#)

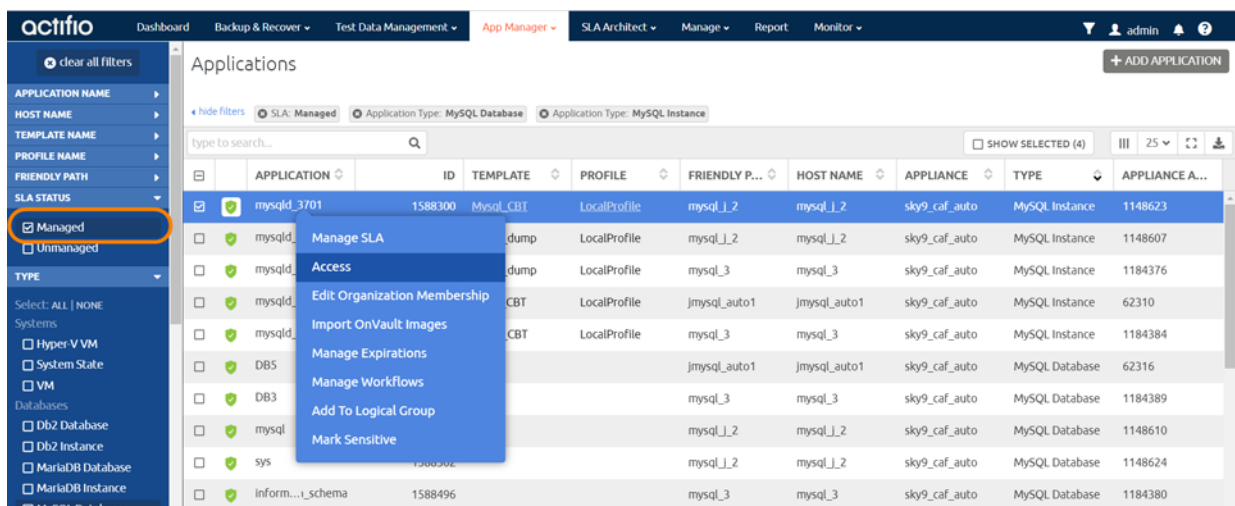
- o [Recovering from a Volume-Based Snapshot on page 24](#)
- o [Recovering from a Full+Incremental Backup on page 26](#)

Mount and Refresh from Block-Based Volume Snapshot to a Target MySQL Instance as a Virtual Application

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

1. From the AGM App Manager Applications list, right-click the protected instance and select **Access**.

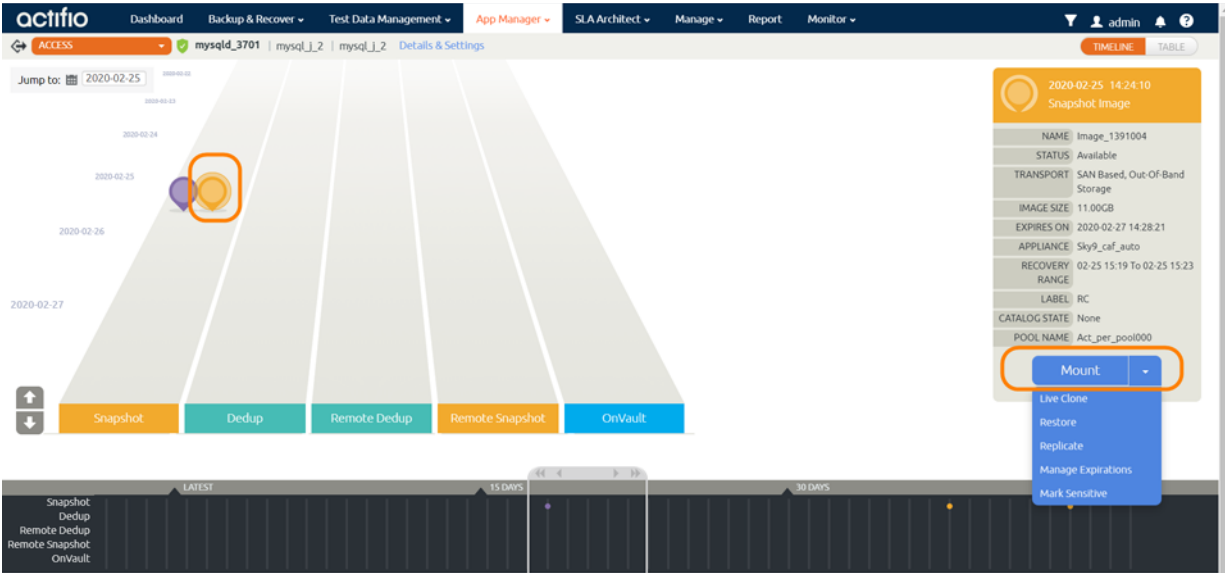
Note: You can use the Managed SLA Status filter to show only protected instances.



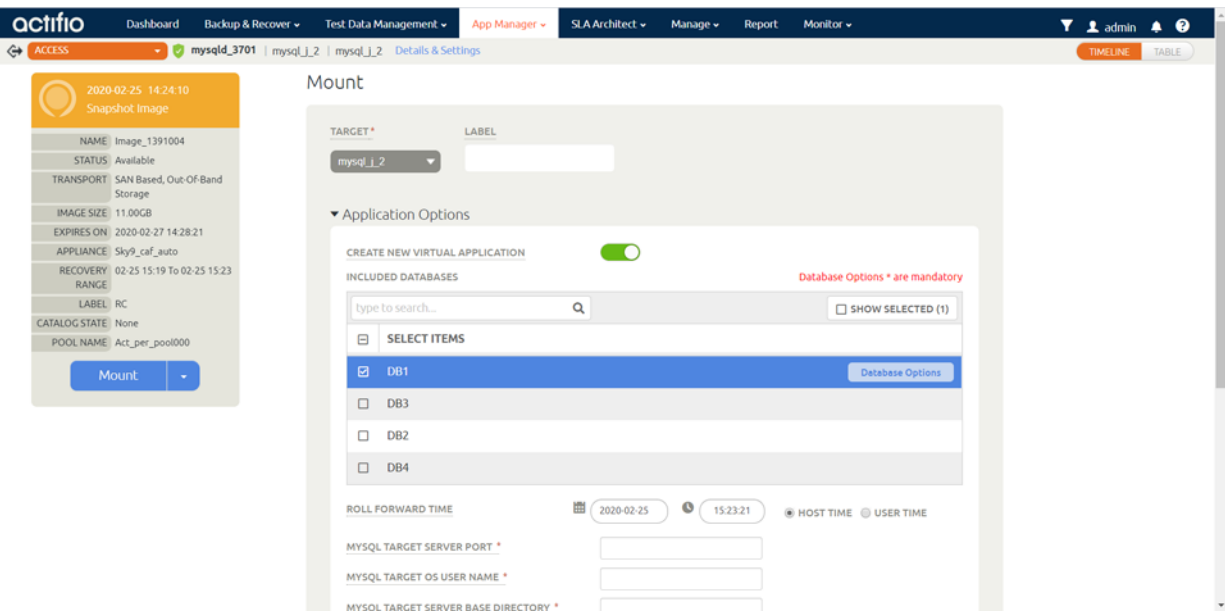
The screenshot shows the Actifio App Manager interface. The 'Applications' list is displayed with columns: APPLICATION, ID, TEMPLATE, PROFILE, FRIENDLY P..., HOST NAME, APPLIANCE, TYPE, and APPLIANCE A... The 'mysql_3701' instance is selected, and a context menu is open over it, showing options: Manage SLA, Access, Edit Organization Membership, Import OnVault Images, Manage Expirations, Manage Workflows, Add To Logical Group, and Mark Sensitive. The 'Access' option is highlighted. The left sidebar shows filters for SLA STATUS (Managed, Unmanaged) and TYPE (Systems, VM, Databases).

APPLICATION	ID	TEMPLATE	PROFILE	FRIENDLY P...	HOST NAME	APPLIANCE	TYPE	APPLIANCE A...
mysql_3701	1588300	Mysql_CBT	LocalProfile	mysql_j_2	mysql_j_2	sky9_caf_auto	MySQL Instance	1148623
mysql_...		dump	LocalProfile	mysql_j_2	mysql_j_2	sky9_caf_auto	MySQL Instance	1148607
mysql_...		dump	LocalProfile	mysql_3	mysql_3	sky9_caf_auto	MySQL Instance	1184376
mysql_...		CBT	LocalProfile	jmysql_auto1	jmysql_auto1	sky9_caf_auto	MySQL Instance	62310
mysql_...		CBT	LocalProfile	mysql_3	mysql_3	sky9_caf_auto	MySQL Instance	1184384
DB5				jmysql_auto1	jmysql_auto1	sky9_caf_auto	MySQL Database	62316
DB3				mysql_3	mysql_3	sky9_caf_auto	MySQL Database	1184389
mysql_...				mysql_j_2	mysql_j_2	sky9_caf_auto	MySQL Database	1148610
sys				mysql_j_2	mysql_j_2	sky9_caf_auto	MySQL Database	1148624
Inform..._schema	1588496			mysql_3	mysql_3	sky9_caf_auto	MySQL Database	1184380

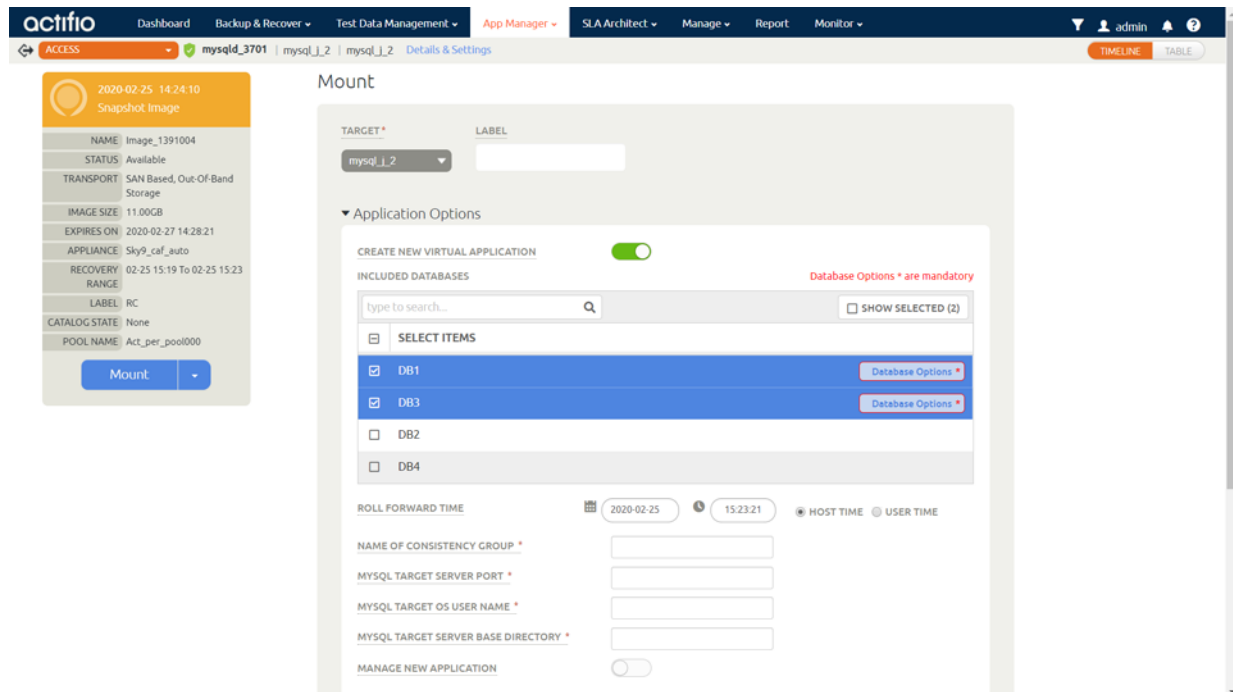
2. Select a snapshot image and choose **Mount**.



3. On the Mount page, from Target, choose the desired target MySQL server from the dropdown.
4. Under Application Options, enable **Create New Virtual Application**.
5. At Included Databases, Select Items, choose one or more databases to virtualize:
 - o A single database will be managed as standalone virtual copy
 - o Multiple databases will be managed as a consistency group



- Click each selected database to specify the target database details for the new virtual copy.



- Choose a target point in time for a database protected with log roll-forward.
NAME OF CONSISTENCY GROUP: This option will appear if more than one database is selected. Provide a unique name to manage the selected databases as a virtual copy.
MySQL TARGET SERVER PORT: Enter the port number on the target server where a new MySQL Instance will get created for the new child databases.
MySQL TARGET OS USER NAME: Enter the name of the operating system user on the target server where a new MySQL Instance will get created.
MySQL TARGET SERVER BASE DIRECTORY: Enter the path to the base directory where the configuration files for MySQL Instance on the target server are stored.
Manage New Application:
 - To protect the new virtual database, click and enable Manage New Application.
 - Choose a template and a resource profile to protect the database.
- (Optional) Under Advanced Options, enter login credentials (username and password) for the target MySQL Instance that will be created. If you do not specify anything, empty database credentials will be used. For the directory path, enter the path to the messages directory for the MySQL Instance on the target server.
- (Optional) Snatch Port by Stopping Existing Instance specifies whether to stop the existing instance and snatch the port if the target port is already in use by an existing instance.
- Under Mapping Options, Mount Location, select a storage pool and specify a target mount point to mount the new virtual database to.
- Click **Submit**.

Restoring and Recovering a MySQL Instance

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

[Recovering from a Volume-Based Snapshot](#) on page 24

[Recovering from a Full+Incremental Backup](#) on page 26

Recovering from a Volume-Based Snapshot

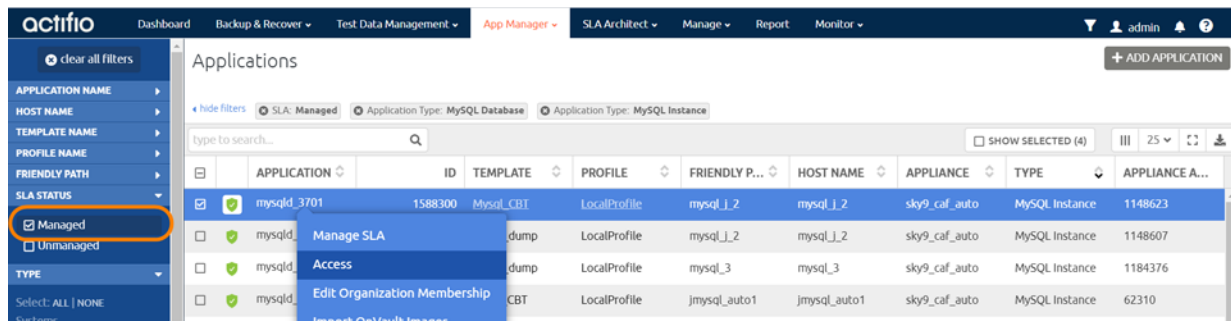
Use this procedure to restore and recover the source MySQL database. This procedure uses physical recovery of the source data area.

Note: System databases on a root partition backed up as LVM Snapshots can be mounted as virtual databases, but they cannot be used in a traditional Restore operation as the root partition cannot be unmounted. This will need manual restore and recovery from a simple mount back to the same host.

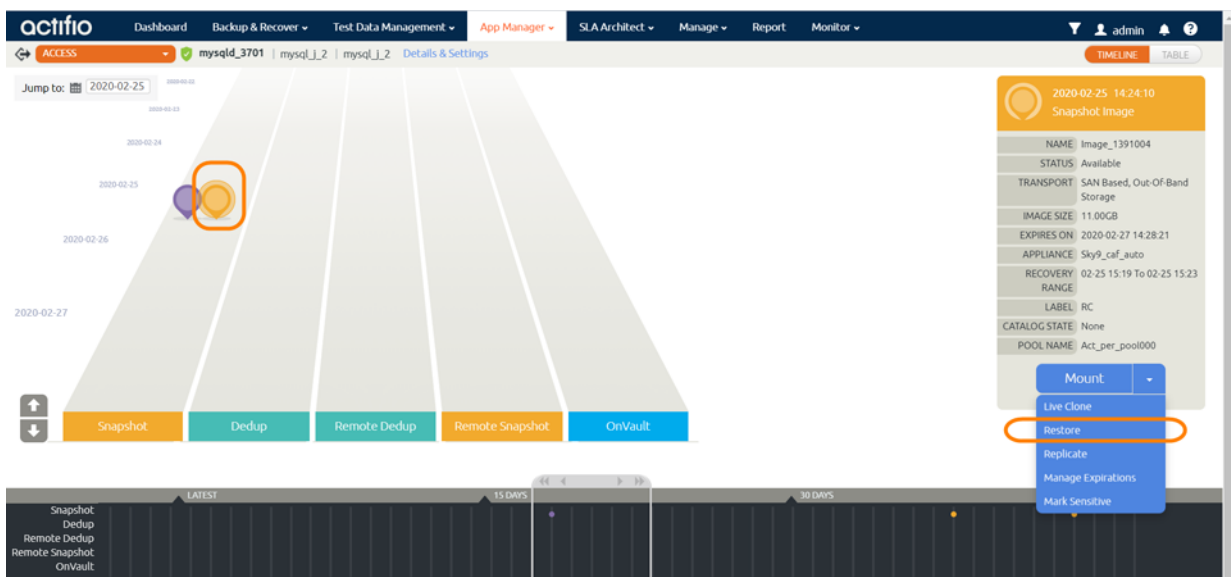
To recover back to the source:

1. From the AGM App Manager Applications list, right-click the protected instance and select **Access**.

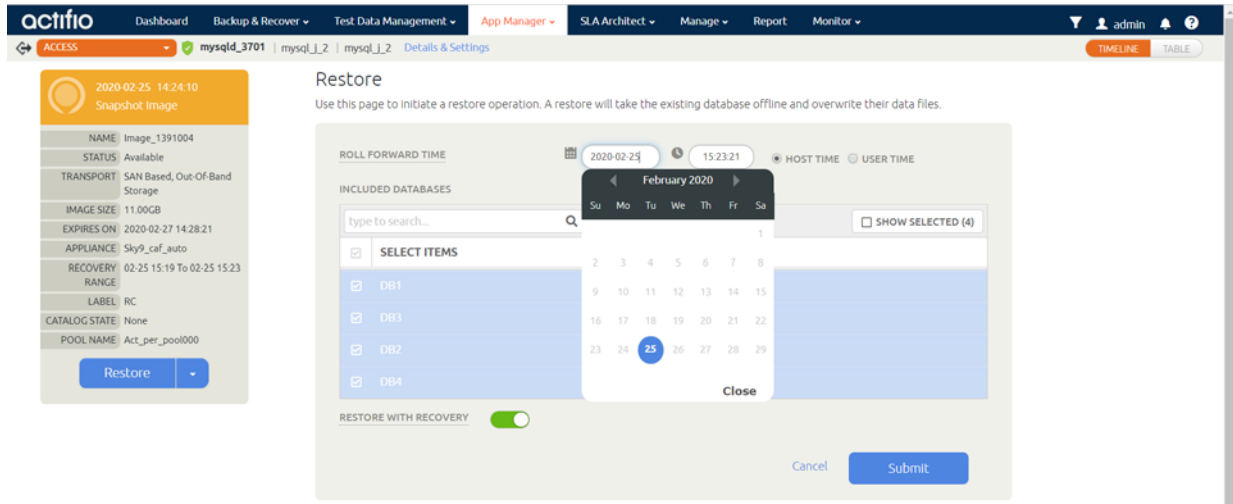
Note: You can use the Managed SLA Status filter to show only protected instances.



2. Select a snapshot image and choose **Restore**.



3. On the Restore page choose a point in time for the protected instance to recover to.

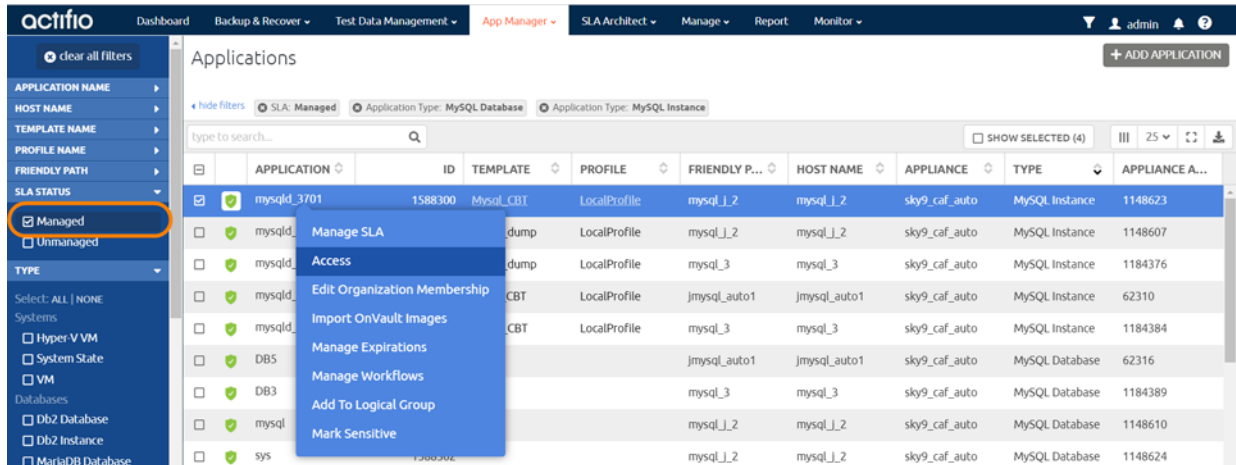


4. Enable **Restore With Recovery** to apply recovered logs.
5. Click **Submit**.

Recovering from a Full+Incremental Backup

Use this procedure to restore and recover the source MySQL database. This procedure overwrites the source data.

1. From the AGM App Manager, Applications list, right-click the protected database and select **Access**. You can use the Managed SLA Status filter to show only protected databases.



2. Select a snapshot image and choose **Restore**.



3. For a database protected with logs, on the Restore page, choose a date and then a point in time.
4. Use **Select Items** to choose one or more databases to restore.
5. Click **Submit**. This will start the source database physical recovery using MySQL recover commands.