Integrating Dell PowerStore with AppSync

July 2024

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White Paper

Abstract

This document provides guidelines for integrating a Dell PowerStore block-storage appliance with Dell AppSync for copy management.

Contents

Executive summary

Overview

This document outlines technical concepts and provides guidance regarding copy management for Dell PowerStore storage appliances using Dell AppSync. This guidance includes identifying known environment caveats that should be considered.

Audience

This white paper is intended for storage administrators, application owners, and database administrators who are managing AppSync in their environment. It is also targeted at Dell internal field personnel, and partners who assist with deploying AppSync.

Revisions

Date	Part number/ revision	Description
July 2020	H18378	Initial release
July 2024	H18378.1	Updated for PowerStoreOS 4.0 and AppSync 4.6 releases, new template

We value your feedback

Dell Technologies and the authors of this document welcome your feedback on this document. Contact the Dell Technologies team by email.

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Note: For links to other documentation for this topic, see the AppSync Info Hub and PowerStore Info Hub.

Introduction

Dell AppSync enables integrated copy data management (iCDM) with Dell primary storage systems. AppSync simplifies and automates the process of generating and consuming copies of production data. By abstracting the underlying storage and replication technologies using deep application integration, AppSync empowers application owners to satisfy copy demands for operational recovery and data repurposing. In turn, storage administrators must only be concerned with initial setup and policy definition management, resulting in an agile, frictionless environment. AppSync automatically discovers the application, analyzes the layout structure, and maps it through the virtualization layer to the underlying storage device. AppSync orchestrates all the activities required from copy creation and validation, to mounting at the target host, and launching or recovering the application copy. The supported workflows also include refresh, expire, and restore to production.

About PowerStore

PowerStore achieves new levels of operational simplicity and agility. It uses a container-based microservices architecture, advanced storage technologies, and integrated machine learning to unlock the power of your data. PowerStore is a versatile platform with a performance-centric design that delivers multidimensional scale, always-on data reduction, and support for next-generation media.

PowerStore brings the simplicity of public cloud to on-premises infrastructure, streamlining operations with an integrated machine-learning engine and seamless automation. It also offers predictive analytics to easily monitor, analyze, and troubleshoot the environment. PowerStore is highly adaptable, providing the flexibility to host specialized workloads directly on the appliance and modernize infrastructure without disruption. It also offers investment protection through flexible payment solutions and data-in-place upgrades.

Data migration with PowerStore

PowerStore appliances are independent of each other but are managed and maintained under a single cluster. In the modern data center, administrators must be quick and agile to support mission-critical applications. PowerStore data migration allows end users to easily move volumes, volume groups, and VMware virtual volumes from one appliance in the cluster to another, without disrupting host I/O. When you migrate a volume or volume group, all associated snapshots and thin clones are also migrated simultaneously with the underlying storage resource.

Note: To perform a rescan at the beginning of a migration (recommended), use rescan-scsi-bus.sh for a Linux host or the equivalent for a UNIX or Microsoft Windows operating system.

AppSync is unaware and unaffected by a PowerStore migration. We recommend planning the migration to occur when a service plan or workflow repurposing is not in progress. Users can also use the maintenance mode functionality in AppSync to prevent workflows from running. After the migration is complete, rediscover the PowerStore appliances in AppSync to update the records. All data will remain intact and the associated service plans and repurposing workflows will work normally.

Write order consistency with PowerStore

The volume group (VG) feature of PowerStore is similar to the consistency group feature in other storage systems. Volume groups are implemented in a unique fashion; they can

be created without write order consistency (WOC). This feature can be used to manage and monitor a set of resources that are under a container or folder.

End users should design their storage layout to achieve and maintain consistency across multiple volumes that are contained in an application. If WOC is not enabled on a VG, the crash consistency feature that is provided by the PowerStore appliance cannot be used. AppSync provides a warning if a service plan or repurposing workflow is used with a VG that is configured without WOC.

Using these guidelines

The information in this white paper is supplemental and should be used with the core AppSync documentation on dell.com/support/home. This documentation includes the AppSync User and Administration Guide, the AppSync Installation and Configuration Guide, and the AppSync Release Notes. The latest AppSync Support Matrix is also useful when validating specific environments and features for different versions of AppSync. The terms used in this document are equivalent to the terms used in the user interface (UI).

Terms and definitions

The following **AppSync** terms are used in this document:

- **Service plan**: A copy-management workflow template used for protecting applications. There are three integrated types in AppSync as mentioned below.

- **Bronze Service plan**: Creates copies of the protected application database on the local storage where production is located.

- **Silver Service plan**: Creates copies of the protected application database on the remote storage.

- **Gold Service plan**: Creates copies of the protected application database on the local and remote storage appliances. Two copies are created.

- **Repurposing workflow**: A copy-management workflow process, similar to the service plan workflow, that provides a multigeneration copy process.

- **Application (object)**: Any database, file system, application, or datastore that AppSync manages. Access control lists (ACLs) are applied to these items. Objects are either subscribed to service plans or are repurposed individually.

- **Mount host**: The host where the copy is presented or where the mounted copy resides. This can be an alternate host or the same host as the source.

- **Mount point**: A location used by the mount operation which uses an existing mounted file system as a directory tree for the copied volume-mount location. This is the default AppSync mount location.

- **Recover**: A workflow extending the copy and mount operation. This process can start the application once it is mounted, such as bringing a SQL or Oracle database online on a mount host.

- **Restore**: A workflow of overwriting the source volume with the contents of a copy created previously.

- **PowerStore Snapshot**: A read-only and point-in-time copy of a volume or volume group. A snapshot cannot be presented to a host directly, a clone must be created from it and then presented to the host.

- **PowerStore Secure Snapshot**: Secure snapshots are snapshots that prevent accidental or intentional deletion of snapshots. Secure snapshots cannot be manually deleted while the retention period is in effect. This capability is available with AppSync 4.6 and higher and PowerStoreOS 3.5.0 and higher.

- **PowerStoreThin Clone**: A read/write and point-in-time copy of a volume or volume group. On creation of a thin clone, the data is available to be presented to a host as needed. Any changed data on the thin clone does not affect the base resource and conversely any changes to the thin clone do not affect the snapshot source.

- **Expire**: A workflow of removing copies from the AppSync UI and removing the copy on the PowerStore appliance.

- **Recovery point objective (RPO)**: The acceptable amount of data, measured in units of time, which may be lost due to a failure. For example, if a storage resource has an RPO of one hour, any data written to the storage resource within the most recent hour may be lost when the replication session is failed over to the destination storage resource.

The following **PowerStore** terms are used in this document:

- **Appliance**: The solution containing the base enclosure and any attached expansion enclosures.

- **Cluster**: One or more appliances in a single grouping and management interface. Clusters are expandable by adding more appliances to the existing cluster, up to the allowed amount for a cluster.

- **Fibre Channel protocol (FC)**: A protocol used to perform Internet Protocol (IP) and SCSI commands over a Fibre Channel network.

- **Internet SCSI (iSCSI)**: Provides a mechanism for accessing block-level data storage over network connections.

- **Snapshot**: A point-in-time view of data stored on a storage resource. A user can recover files from a snapshot or restore a storage resource from a snapshot.

- **Storage resource**: The top-level object a user can provision, associated with a specific quantity of storage. All host access and data protection activities are performed at this level. In this document, storage resource refers to resources which can support replication: volumes or volume groups.

- **Volume**: A block-based storage resource that a user can provision. It represents a logical storage area.

- **Volume group**: A single point of management for multiple storage resources (volumes) that work together as a unit.

- **Migration**: Nondisruptive migration of a volume, volume group, or VMware vSphere Virtual Volume (vVol) between appliances within a cluster.

- **Asynchronous replication**: A replication method which allows you to replicate data over long distances and maintain a replica at a destination site. Updates to the destination image can be issued manually, or automatically based on a customizable RPO.

- **Replication session**: A relationship configured between two storage resources of the same type, on the same or different systems, to automatically or manually synchronize the data from one resource to another.

- **Snapshot shipping**: Asynchronous replication that supports the replication of read-only block snapshots locally or to a remote site along with the storage resource data. Snapshot replication can be enabled by default on all resources that support asynchronous replication including volumes, thin clones, and volume groups.

AppSync architecture and requirements

The architecture of AppSync has three major components:

- **AppSync server**: This is deployed on a Windows server system, either physical or virtual. It controls all workflow activities, manages the alerting and monitoring aspects, and persists internal data in a PostgreSQL database.

- **AppSync host plug-ins**: These are installed on all source and mount hosts. They integrate with the operating systems and applications that are installed on the hosts. These applications include Microsoft Exchange, Microsoft SQL Server, Oracle, SAP HANA, and VMware datastores or file systems. With VMware datastores, there is no host plug-in because AppSync communicates directly with the VMware vCenter server.

- **AppSync user interface**: This is an HTML5 web-based UI for AppSync copy-management features. AppSync can also be managed using the REST API or command-line interface (CLI).

Note: For more information about each component, see the AppSync Installation and Configuration Guide and the AppSync User and Administration Guide on https://www.dell.com/support/home. To validate supported versions and features, see the latest AppSync Support Matrix.

AppSync and PowerStore prerequisites

The following prerequisites are required for AppSync and PowerStore:

- The AppSync server and host plug-in software are installed and configured, the host applications are discovered, and the vCenter server or servers are configured (if applicable), according to the AppSync Installation and Configuration Guide.

- Please check the AppSync support matrix for the latest PowerStore and AppSync support as items may change over time.

- To support PowerStore replication, a minimum of two single appliance clusters of PowerStore is required. Both the local and remote PowerStore appliances must be registered within one instance of AppSync.

- An Advanced AppSync license is required for each PowerStore appliance when they will be performing replication use cases. Advanced licenses allow AppSync to manage more than one appliance, array, or cluster, in one instance of AppSync. See the AppSync documentation and licensing guide for further details.

- The PowerStore appliance or appliances are added to AppSync, ensuring the AppSync user has the Resource Administrator role.

Note: See the AppSync User and Administration Guide for more details about the supported functions for each type of application. The "Service plan overview" section depicts the latest support for each PowerStore replication type.

Registering PowerStore

On a PowerStore cluster, an admin can create users with different privileges. The AppSync Administrator or Storage Administrator roles support all AppSync operations and are required to ensure that AppSync has the correct privileges in PowerStore for automation. For example, you can create a username called AppSync and assign it an Administrator role in PowerStore instead of using the default admin username. Using other PowerStore roles with fewer privileges can result in certain AppSync tasks failing.

To add a PowerStore appliance, go to **Settings > Infrastructure Resources > STORAGE SYSTEMS > ADD SYSTEMS**, and select the PowerStore radio button, as shown in Figure 1. Click Next, enter the PowerStore credentials, and the system will be added to AppSync.

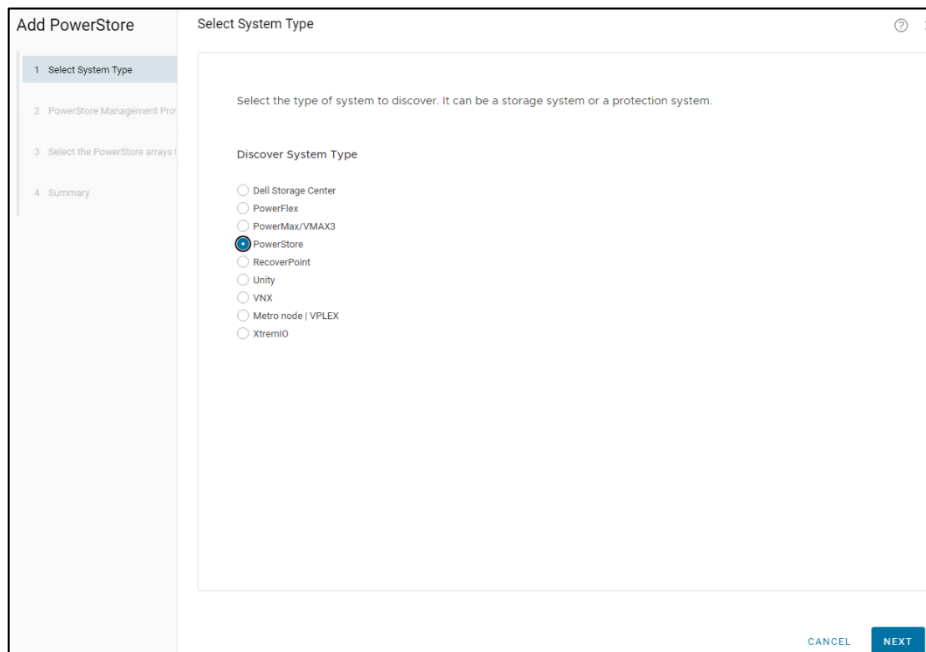**Figure 1. Adding PowerStore to AppSync**

Licensing the PowerStore appliance in AppSync

To apply the necessary license file, go to **Settings** > **License** and click **OBTAIN LICENSE ONLINE** to generate the licensing file (LAC and sales order number required). Alternately, if you have already obtained a license file (**.lic** file extension), click **UPLOAD** as shown in Figure 2. This applies to all licensing models. To validate that your license is applied correctly, check the columns shown in the figure to ensure that they display a green checkmark and that the other various details are valid. Without a license applied, AppSync will run in a trial mode for 90 days.

Figure 2.   Applying the PowerStore license

Protecting an application using AppSync

AppSync protects Microsoft Exchange, Microsoft SQL Server, Oracle, VMware datastores, SAP, and Windows and UNIX file systems.

When performing service plans and repurposing workflows, AppSync performs three main phases: application discovery, application storage mapping, and the application protection or copy phase.

Application discovery: AppSync identifies the application, checks if the application is in a good state for protection, and continues to the mapping phase.

Application storage mapping: AppSync maps the application to the storage system to identify the volume, LUN, or device details, such as WWNs and their storage-layout information. AppSync checks if the storage configurations, such as the replication session, are in a good state for protection. If not, an appropriate error is displayed.

Application protection: AppSync offers different ways of protecting applications. AppSync can place the application in a state to create an application-consistent copy on the array, and resume the application. It can also do nothing with the application and create a crash-consistent copy.

With block storage, AppSync creates **local** copies using the **bronze** service plan or a local repurposing workflow.

With block storage and asynchronous replication sessions configured:

- AppSync creates **remote** copies using the **silver** service plan or a remote repurpose workflow.

- AppSync creates **simultaneous local** and **remote** copies using the **Gold** service plan. (**repurposing workflows** do not support simultaneous local and remote copies)

Note: See the "Repurposing" section in the *AppSync User and Administration Guide* for more details about repurposing copies on PowerStore. This section includes details about how AppSync manages PowerStore thin clone technology.

Figure 3 shows the events during a typical **bronze service plan** that are involved in protecting an Oracle database on a PowerStore appliance.
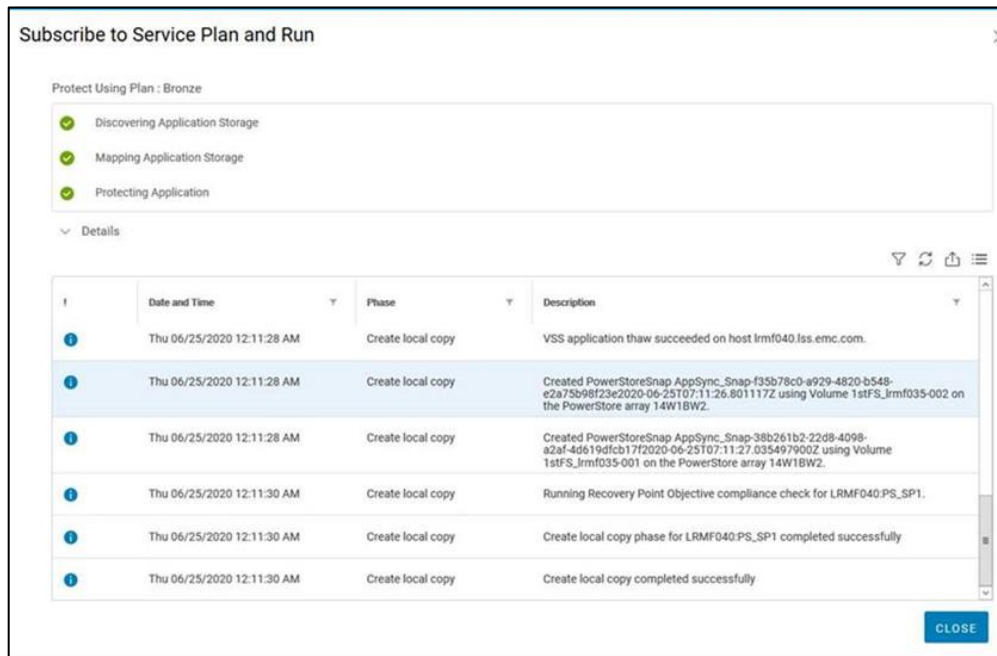
Figure 3.   Oracle bronze service plan event dialog

Figure 4 shows the events during a typical **silver service plan**. This example contains an Oracle database on a PowerStore appliance using **asynchronous native replication.** This allows replication between two PowerStore appliances for additional protection.
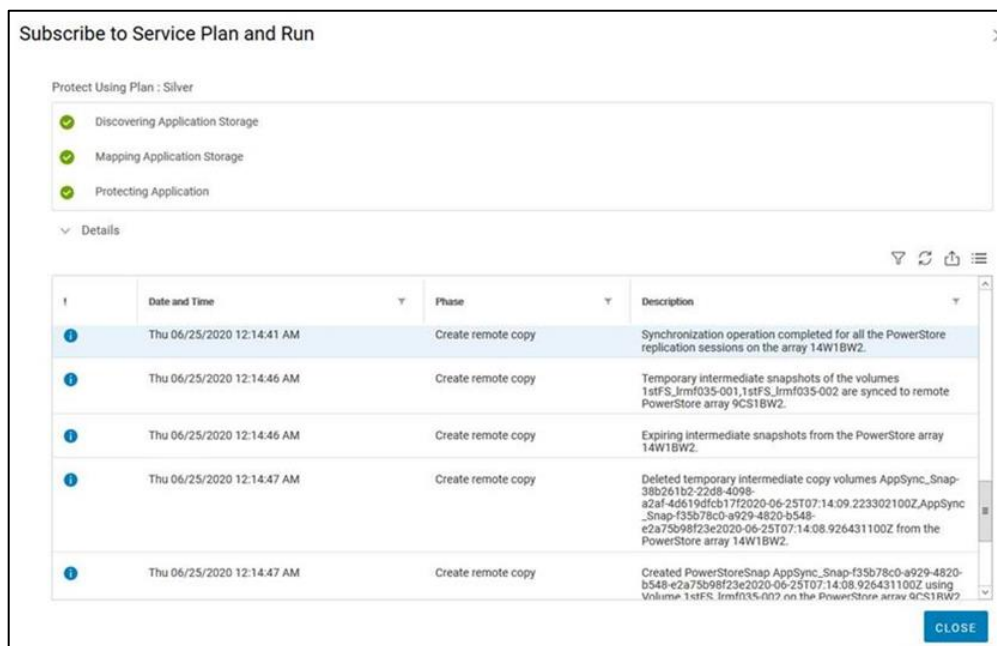

Figure 4.   Oracle silver service plan event dialog

Figure 5 shows the events of a typical **gold service plan.** The Oracle database on a PowerStore appliance is snapped locally for local protection and remotely using **asynchronous native replication** to another PowerStore appliance**.** The gold service plan combines the bronze and silver service plans to achieve a consistent point in time

with two copies being created at once. This provides the end user with improved redundancy and recoverability.
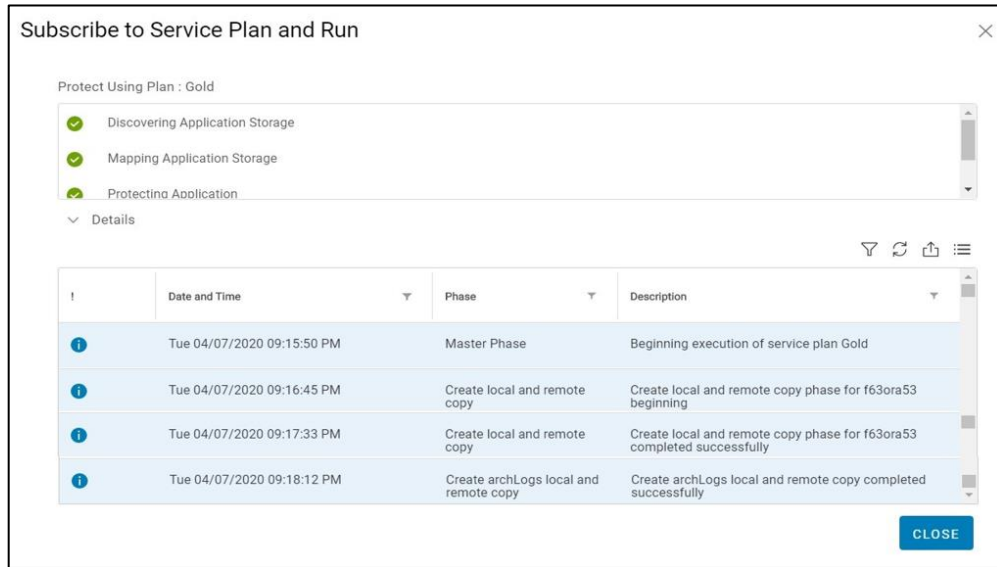
Figure 5.   Oracle gold service plan event dialog

Remote protection with native replication

Asynchronous replication session

When using PowerStore's native **asynchronous** replication, AppSync creates a snapshot on the local appliance. A **sync** operation is issued on the replication session to synchronize the data. When the remote snapshot is created, the local snapshot is removed.

It is important to understand how AppSync responds to different states of replication with PowerStore. If a replication session is already synchronizing and AppSync issues a sync call, it waits for the operation to complete and then creates a copy. If a session is still in the initializing state, AppSync copy creation fails at the validation stage. PowerStore recognizes that synchronization is allowed when a replication session is in one of the following states: **OK** or **System_Paused**. Copy creation can fail in AppSync if the replication session is in a **System_Paused** state due to any hardware or back-end issues on the appliance. In this case, check the appliance for messages. AppSync allows **OK**, **System_Paused**, and **Synchronizing** as valid states for copy creation. Any other state results in validation failure. Service plans and repurposing workflows also fail.

Displaying copies

To view copies created by the service plan workflow, go to **Copy Management > Copies** or **Service Plans** tabs. Click the **Copies** tab to show the copies that exist for a specific instance and database that are selected (see Figure 6).

Figure 6.   Copy Management > Copies tab

Click **Service Plan** to show the copies that are related to the specific service plan and application that are selected (see Figure 7).

Figure 7.   Service Plan > Copies tab

Mounting and recovering copies

During mounting operations, users can select a local or remote copy (if configured) for mounting, and if they want to recover the application (optional). The details are defined by the user within the AppSync service plans or repurposing workflows. AppSync attaches the copy to the selected mount host by creating a thin clone from the snapshot and mounting it. If the copy is unmounted, the thin clone is unmapped from the mount host but remains on the PowerStore appliance. This allows AppSync to quickly remount this copy if it is needed again, ensuring optimal performance. The copy is only deleted from the PowerStore appliance if it is expired in AppSync. This results in the thin clone and snapshot both being deleted. If the copy is using a thin clone, no additional thin clone is created during a mount operation. This is because thin clones can be mounted and snapshots cannot.

Figure 8 depicts the event dialog during a typical **mount and recover copy** operation for a Microsoft SQL database using a **bronze service plan.**
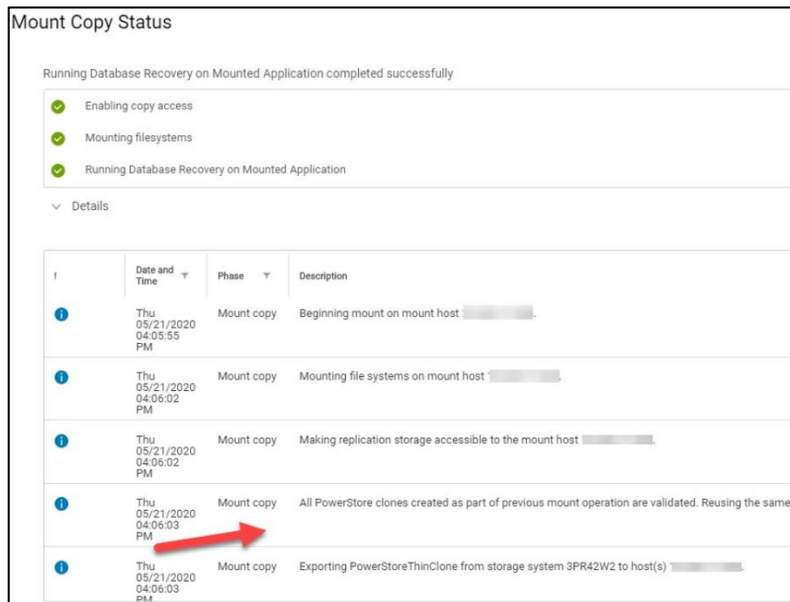
Figure 8.   Mounting and recovering a Microsoft SQL database

Restoring local and remote copies

AppSync can restore local and remote copies in asynchronous replication session scenarios. **AppSync does not support synchronous replication with PowerStore currently**. It may be supported in the future, so check the *AppSync Support Matrix.*

When restoring a **local** copy with **asynchronous** replication sessions, AppSync performs the following:

- Pauses the replication session at the source storage appliance

- Restores the snapshot on the source storage resource

- Resumes the replication session at the source storage appliance

When restoring a **remote** copy (remote gold service plan copy, silver service plan copy, or first-generation remote repurposed copy) with **asynchronous** replication sessions, AppSync takes the following actions:

- The replication session or sessions are synchronized, and a failover is issued on the production PowerStore appliance.

- Once the failover is complete, the data is restored to the target volume or volume group using the snapshot or thin clone present on the remote PowerStore appliance.

- Failback is initiated on the remote appliance, and the session is synchronized again.

The following events or similar events are displayed in the AppSync UI as the restore process runs:

Initiating sync and failover on PowerStore replication session of Volume: *<Volume Name>* on the array *<Service tag of the production appliance>*. (Figure 9 shows a volume group in this example)

Failover operation is completed for all the PowerStore replication sessions on the array *<Service tag of the production appliance>*.

Restored PowerStore volume *<Volume Name>* using copy volume **<AppSync_Snap-4425699d0d7d-4385-84fe-8ad207c32f512020-05-19T00:38:26.622784500Z>** successfully on the array *<Service tag of the remote appliance>***.**

Initiating sync and failback on PowerStore replication session of Volume: *<Volume Name>* on the array *<Service tag of the remote appliance>***.**

Failover operation is completed for all the PowerStore replication sessions on the array *<Service tag of the remote appliance>*.

Figure 9 shows the events during a typical SQL Server Restore operation of a remote Microsoft SQL database copy.

Figure 9.   Restoring a remote Microsoft SQL Server copy operation

If other databases share common storage with the production database that is being restored, and these are not protected together, AppSync displays a warning about them being **affected entities** (see Figure 10). Users must acknowledge this warning to continue with the restore operation. Acknowledging the affected entities warning allows the other objects that share common storage to also be restored. If those objects are processing I/O, such as an online database, the restore operation may fail. It is best to design your storage and database layout to avoid affected entities if possible. This often provides better performance for the database and gives you more flexibility when restoring.
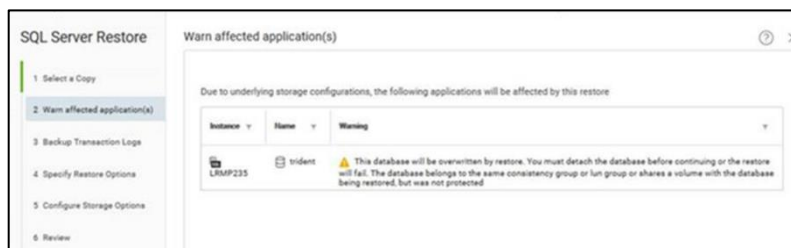

Figure 10.   SQL Server affected entities

Repurposing workflows

AppSync supports the creation of multigenerational PowerStore snapshots and thin clones, with a prefix of either **AppSyncSnap** or **AppSyncClone**, respectively.

AppSync repurposing supports several types of workflows, such as creating application-consistent local or remote copies, automating mounting and application recovery scenarios, and scheduling these operations.

Repurposing workflows focus on a single application at a time, and do not use a copy-count-rotation policy, which occurs with service plan workflows. Repurposing workflows are generally not used to protect the application and are not considered a backup solution. Repurposing is most often used to replicate production environments and use the copies for quality assurance testing, development, offloading reporting, and patch management.

Repurposing workflows offer multigeneration copies. A first-generation copy is one copy removed from the source, and it can be optionally copied to a second-generation copy, or a copy that is twice removed from the source. Figure 11 shows a repurposing overview with multigenerational copies.
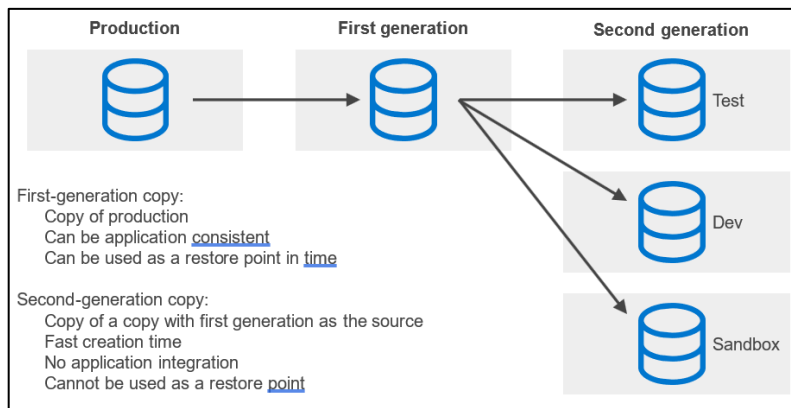

Figure 11.   Repurposing overview with multigenerational copies

Repurposing use cases

The following are typical repurposing use cases with AppSync. This is not an exhaustive list, but it can help you identify some possible workflows.

- **On-demand copies:** This is a copy of a single application that is used for an extended time and then discarded, maintaining copy retention. The discarded copy is not used for backup purposes to restore from. Copies can be used for performing patch management testing, performance tuning against non-production environments, or offloading reporting. This practice reduces the amount of I/O that is performed against a production environment.

- **Data masking:** A first-generation copy is created and mounted for sensitive data to be masked. When the sensitive data is masked, the copy is unmounted to create a second-generation copy. This second-generation copy, which has the sensitive data removed, can then be used.

- **Remote copy retention:** This provides long-term retention on a remote appliance, sometimes identified as a disaster recovery copy, which can be accomplished using

repurposing. Remote copies can be created using PowerStore native replication sessions.

- **Copy-of-copy:** This is similar to a data-masking requirement. Repurposing supports creating a first-generation, application-consistent copy of a single application, which is used as the source for multiple second-generation copies. These second-generation copies can be used for purposes such as the following:

  - Providing multiple copies of the same point-in-time (PIT) to developers; these are identical copies for training purposes or as a baseline for collaboration efforts

  - Alleviating the need to quiesce the production environment unnecessarily for many copies.

  - Refreshing the second-generation copy while not having to change the PIT unless you want to also refresh the first-generation

Repurposing considerations

The following are typical repurposing considerations to make with AppSync:

- Repurposed copies are used primarily for testing or development for extended periods of time, and are discarded or expired when the process is complete.

- Repurposed copies do not figure into RPO calculations (refer to the *AppSync User and Administration Guide* for more details regarding RPO alerts).

- **Restores are supported from the first-generation copies only.**

- Second-generation copies share the same consistency as the source. There is no application discovery, mapping, or application integration such as freeze and thaw of a database for second-generation copies. Callout scripts are supported for unmounting only. See the *AppSync User and Administration Guide* for more details about callout scripts.

  - We do not recommend creating second-generation copies when a first-generation copy is mounted, though it is technically possible to do this with AppSync. This is because recovery cannot be guaranteed.

- A second-generation copy is considered **application consistent** if the first-generation copy has not been mounted or been altered by the time the second-generation copy is taken.

  - The second-generation copy is identical to the first-generation copy at the time of creation.

  - A mounted or altered first-generation copy should be unmounted before creating the second-generation copy to ensure consistency.

Table 1 outlines the applications that are supported with PowerStore for repurposing and shows the underlying appliance technology that is used.

Table 1.   AppSync repurposing support

Application	Repurposing supported	First generation	Second generation
Microsoft SQL Server	Yes	Snapshot or thin clone	Only thin clone

Application	Repurposing supported	First generation	Second generation
Oracle	Yes	Snapshot or thin clone	Only thin clone
File system	Yes	Snapshot or thin clone	Only thin clone
VMware datastores	No	Not applicable	Not applicable
Microsoft Exchange	No	Not applicable	Not applicable
SAP	Yes (local only)	Snapshot or thin clone	Only thin clone
Kubernetes	Yes (local only)	Snapshot or thin clone	Only thin clone

Repurposing details

See the following information regarding repurposing:

- First-generation copies can be PowerStore snapshots or thin clones.
- Second-generation copies can only be PowerStore thin clones. If you attempt to configure a second-generation copy as a snapshot, the repurposing workflow will fail.
- If a user tries to mount a PowerStore snapshot, AppSync creates a thin clone from it and performs the mount.

Repurposing file system copies

Repurposing file systems involves selecting multiple file systems that need to be copied together, which maintains consistency for a single application. Unlike SQL Server and Oracle databases, both Windows and UNIX file systems can be repurposed together.

If there is a requirement to refresh, mount, expire, or repurpose the copy, select and perform the operation on only one file system or mount point, and AppSync ensures the other file systems are managed together. AppSync ensures consistency and considers the group set that is being acted upon. Note the following points from the AppSync User and Administration Guide:

- File systems that are repurposed together are mounted together.
- File systems that are protected together are repurposed together for second-generation copies.
- AppSync supports file system use cases with PowerStore. NFS file is supported for local and repurposing workflows with PowerStore. vVols are not supported. See the support matrix for specifics.

Repurposing workflow configuration

Repurposing workflows enables creating first-generation copies and optionally second-generation copies, either locally or remotely. To initiate a repurposing workflow copy, go to **Copy Management > Copies**, select the application type, and click the particular object, such as a database or file system. When repurposing a file system, select all the

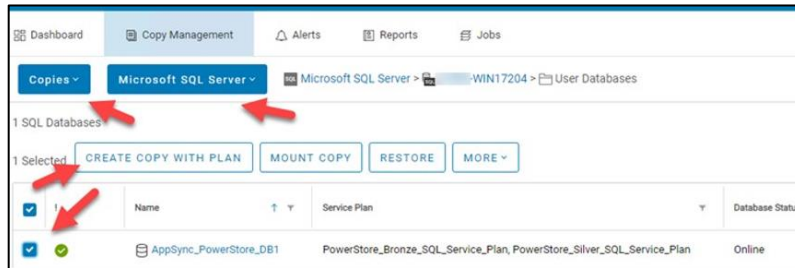file systems. Figure 12 shows the configuration of a repurposing workflow for a SQL Server database.

Figure 12. Create a repurposed copy (database)

Figure 13 shows the configuration of a repurposing workflow that contains two Windows file systems.
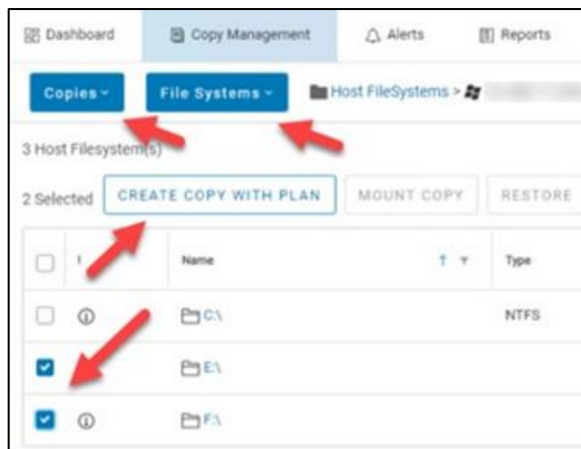

Figure 13. Create a repurposed copy (file systems)

After selecting the object or objects, click **Create Copy With Plan** to launch the repurposing wizard, as seen in Figure 14. Selecting **Data Repurposing** creates a repurposing workflow and selecting **Data Protection** creates a **Service Plan** workflow.
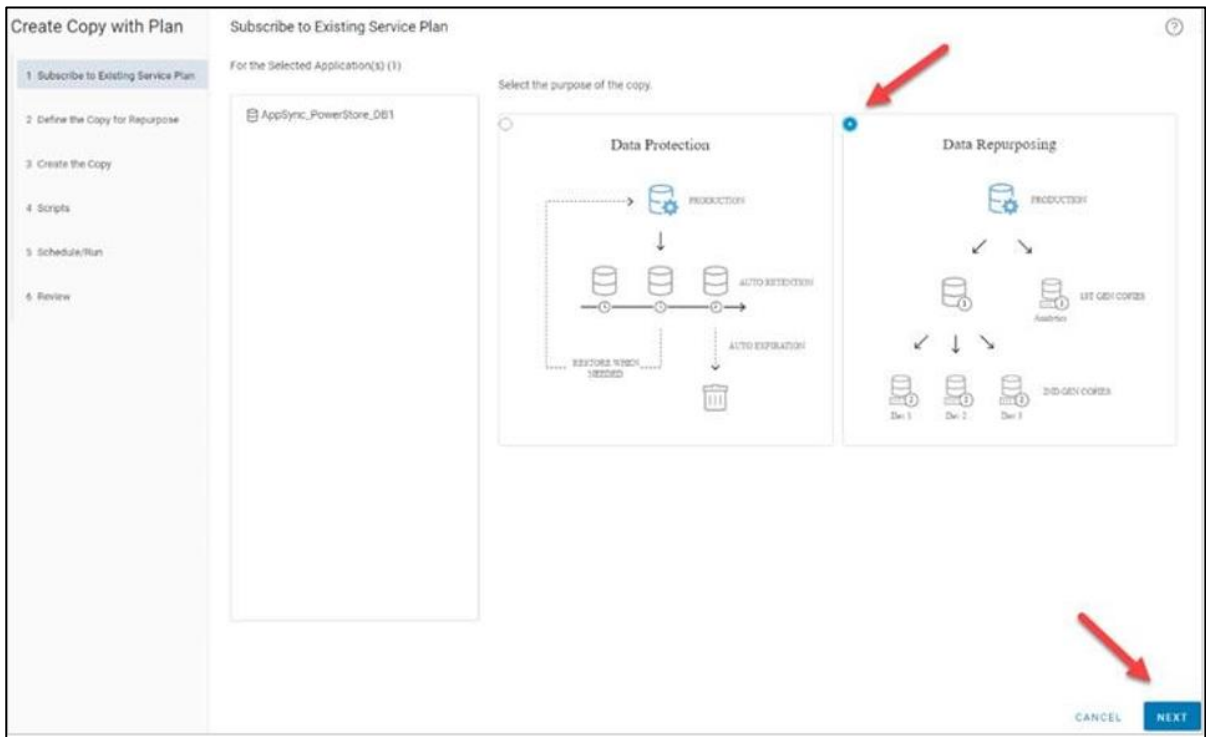
Figure 14.   Data repurposing workflow selection

Creating first-generation copies

Creating a repurposed copy originates with the creation of a first-generation copy. With PowerStore, this can be a snapshot or thin clone. When the first-generation copy is created, any number of second-generation copies can be created as thin clones. The initialization wizard provides the option to create a second-generation copy simultaneously to when the first-generation copy is created. This is for convenience and does not require the creation of the second-generation copy when the first-generation copy is created.

The steps in the following section outline how to create an initial first-generation copy and create a second-generation copy. This process clarifies how you can create multiple second-generation copies when a first-generation copy exists.

The initial wizard enables creating only one second-generation copy, but there may be cases when many additional second-generation copies are required. The process for creating multiple second-generation copies is as follows.

The following two sections depict options encountered when repurposing a specific type of application. See the AppSync User and Administration Guide for more details about each application's copy options.

Repurposing Microsoft SQL

The default copy type should be changed from **Full** to **Copy** because the repurposing wizard is being performed on a SQL Server database, for which there is already a protection service plan. Repurposing copies are not used for protection purposes, and no two workflows should use a SQL Server **full** copy type, since a **full backup** alters the transaction log sequence numbers, and disrupts a restore operation taken from another workflow process.

See the SQL Server section of the *AppSync User and Administration Guide* for more details about SQL Server settings and other application types being repurposed such as Oracle. Figure 15 shows the different options for the SQL Server backup type.

Figure 15.   SQL Server repurposing copy options

Repurposing file systems

There are a limited number of options when repurposing file systems, as compared to repurposing SQL Server or Oracle databases. File system repurposing workflows require a label to be configured, unlike other types of workflows where a default label exits. Figure 16 shows the different options available when configuring file system repurposing workflows.
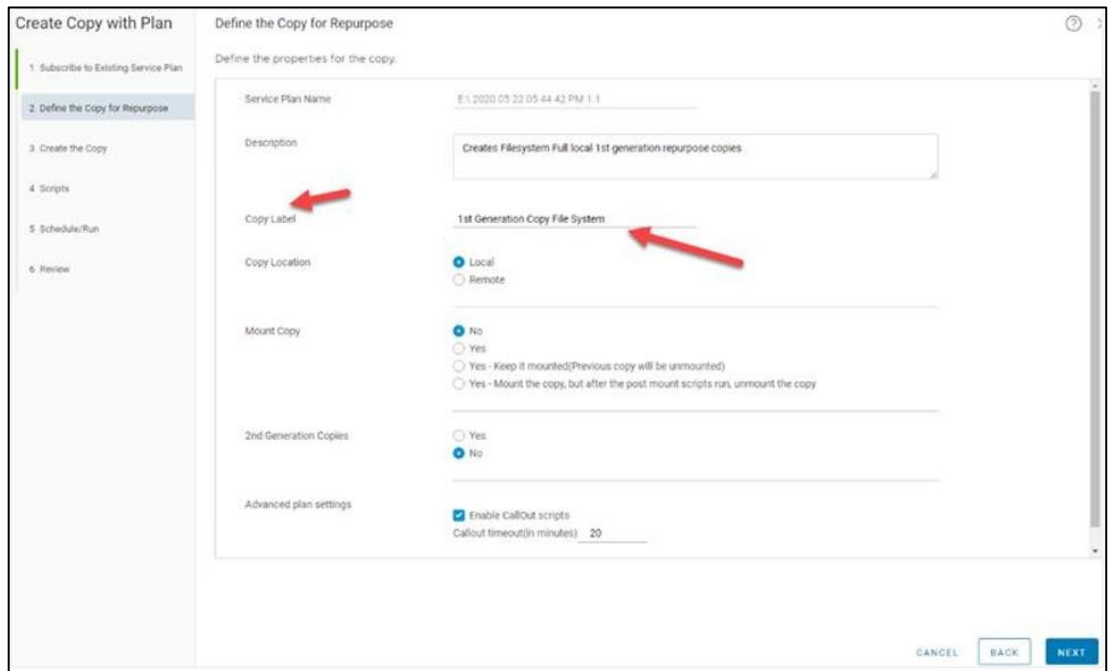
Figure 16.   File system repurposing copy options

Other repurposing copies settings

There are other settings which can be configured for first-generation copies only. These are described as follows:

The **Storage Preferences** settings are for managing storage configuration options. These settings are not discussed in this white paper. See the *AppSync User and Administration Guide* for more details.

The **Advanced Settings** only apply to Windows environments, and these settings are not available when repurposing Oracle databases. The configuration options shown, once clicked, enable retrying the Microsoft Volume Shadow Copy service (VSS), if a timeout occurs. The default setting is to retry three times, but this can be extended and an additional amount of time between each retry can be configured.

When the copy settings are configured, click **Next** and **Next** to configure the **Scripts and Schedule/Run settings**. To complete the wizard, click **Next** and **Finish** to initiate the creation of the first-generation copy.

Reviewing first-generation copies

When the repurposing workflow completes, the first-generation copy is visible. To view the copy, locate the object, click the **Repurposed Copies** button, locate the instance, and look under **Copy Management > Copies.** You can see the first-generation copy in Figure 17 and the Repurposed Copies button in Figure 18.
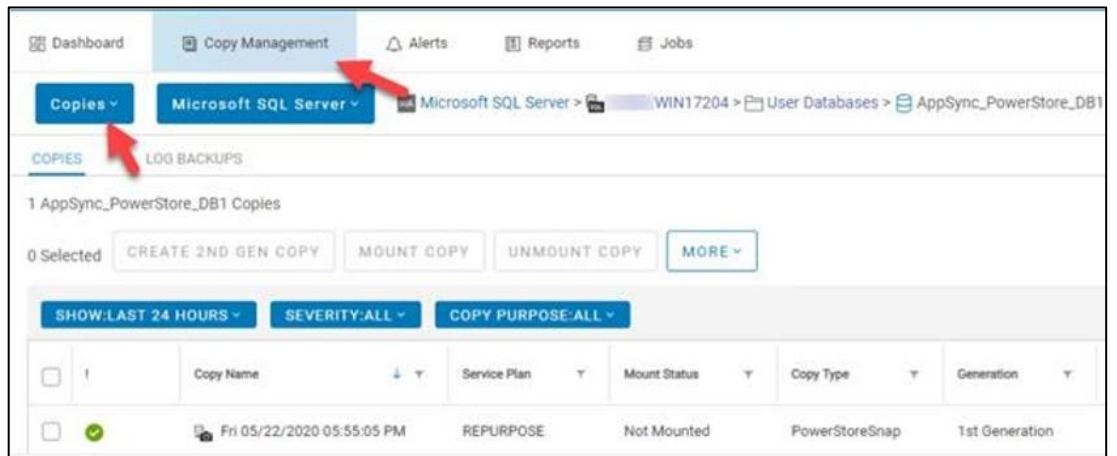
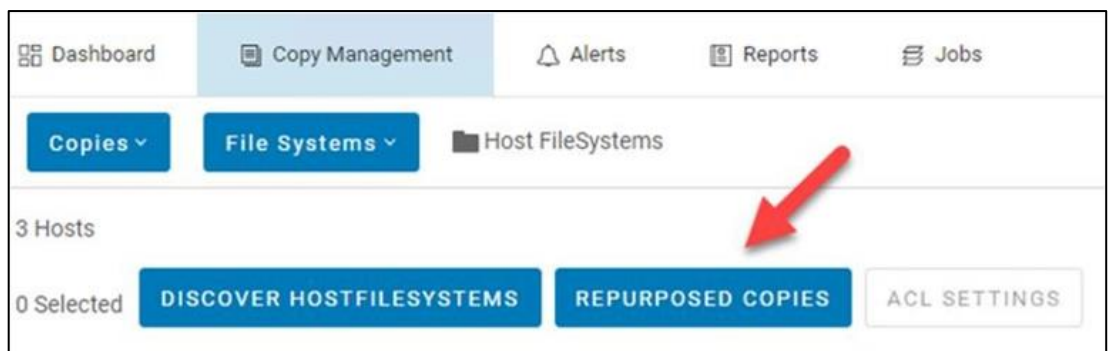**Figure 17.   Copy Management repurposed copies list**

Figure 18.   Repurposed Copies button

Creating second-generation copies

Once a first-generation copy is created, second-generation copies can be created. This action is considered to be repurposing a first-generation copy. Initiating a second-generation repurposing job is achieved by selecting the first-generation copy under Copy Management > Copies, and selecting CREATE 2ND GEN COPY as seen in Figure 19.
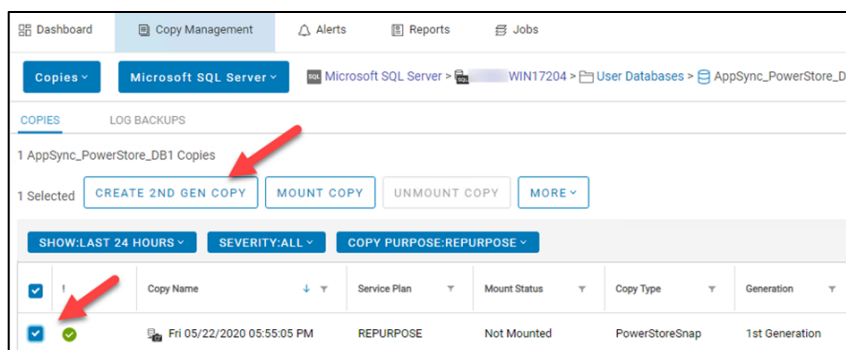

Figure 19.   Repurposing a SQL Server copy

File system repurposing is different than SQL Server and Oracle repurposing, especially when it comes to creating second-generation copies. To create second-generation copies of a set of file systems, go to one of the file systems to view its copies, select the copy, and click CREATE 2ND GEN COPY as seen in Figure 20.

Copies which have been repurposed together as first-generation copies are repurposed together as second-generation copies. This means that a second-generation copy incorporates all the file systems that the first-generation copy created.
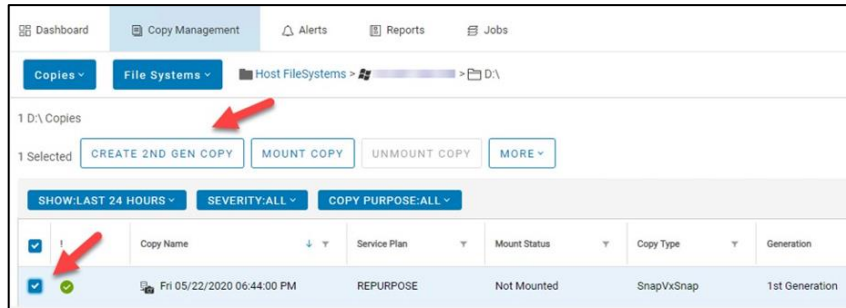

Figure 20.   Repurposing a file system copy

Repurpose copy mount options

Mounting options can also be configured for both first and second-generation copies. See the AppSync User and Administration Guide for mounting option details. Each application type has different mount options that are not covered within this white paper. However, the following notes should be considered:

- The first-generation copy is not typically mounted when planning on taking second-generation copies, unless using the repurposing workflow for data masking purposes. Specifically, this action applies to changing the data on the first-generation copy before creating the second-generation copy.

- The first-generation copy should never be mounted while creating the second-generation copy since there is no application integration with the second-generation copy, and it is an exact duplicate of the first-generation copy. If there is I/O on the first-generation copy when creating the second-generation copy, it is likely the second-generation copy will not be in a consistent state.

- Since first-generation copies are application-aware, in cases with SQL Server and Oracle, they can be recovered. However, since second-generation copies are not application-aware, they cannot be recovered in an automated fashion with AppSync. **Post-mount** scripts can be used for this purpose, and the **unmount callout script** must be used before refreshing the second-generation copy. See the AppSync User and Administration Guide for more details about unmounting callout scripts for second-generation copies.

Site settings: local and remote

A local copy is created on the same frame as the source being copied. A remote copy is created by using the array's native replication technology to create remote copies.

Refreshing file system, SQL Server, and Oracle repurposed copies

AppSync enables refreshing both first and second-generation copies in one of two ways.

- **Repurposed Copies:** Like the menu seen in Figure 18, clicking **Copy Management > Repurposed Copies** launches a holistic view of all repurposed copies. You must only select the copy, click **MORE**, and click **Refresh**.

- **Copy Management Copies:** Go to **Copy Management > Copies**, as seen in Figure 19, select the copy, and click **MORE > Refresh**.

AppSync uses two types of refresh policies for file system workflows:

- **Native array:** AppSync can use the native array's refresh technology policy. PowerStore appliances use a clone refresh operation which deletes the current contents of the clone, including any changes to that clone, and updates the clone with the contents of the source device. There should be no changes to the production volume or the volume group from the last refresh time up until the current attempt to refresh.

- **AppSync Method:** AppSync deletes the previous copy, and creates a copy; this process is hidden to the user. This process appears as if it is a native array refresh operation. However, AppSync uses its own method of refreshing for efficiency purposes. It is sometimes more efficient to delete the clone and create a new one, rather than update a series of tracks.

Conclusion

This document demonstrated how AppSync and PowerStore appliances can integrate to create copies of user or application data on local and remote storage. Coupled together, they simplify and automate the process of generating and consuming copies of production data. This ability can significantly improve overall efficiency in enterprise environments.

References

Dell Technologies documentation

The following Dell Technologies documentation provides other information related to this document. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell Technologies representative.

- AppSync Info Hub

- PowerStore Info Hub

- Data Protection Info Hub

- PowerStore: Introduction to the Platform

- PowerStore: Replication Technologies

- Dell.com/powerstoredocs provides detailed documentation about how to install, configure, and manage PowerStore systems.