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DELL EMC NETWORKER SNAPSHOT MANAGEMENT

ABSTRACT

This white paper describes the benefits of NetWorker Snapshot Management for both Dell EMC and 3rd Party storage systems and Dell EMC ProtectPoint backups. It also explains the value of using Dell EMC NetWorker for snapshots and backups of both block and file production data.

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EXECUTIVE SUMMARY

Big Data is driving customers to take a closer look at backup and recovery solutions that will meet their Recovery Time (RTO) and Recovery Point Objectives (RPO).

According to a Gartner study, by 2016 at least 10% of large enterprises will have given up on conventional backup/recovery software and will employ snapshot and replication techniques instead.

Dell EMC® NetWorker® Snapshot Management delivers industry leading management of snapshot backups and recoveries, as well as replication for both block and Network-Attached Storage (NAS). Unlike traditional snapshot technologies, NetWorker will provide policy-based protection along with integrated deduplication with Dell EMC Data Domain for cloning and off-site storage.

AUDIENCE

This white paper is intended for backup and storage administrators seeking a more in-depth look at Dell EMC NetWorker to manage snapshot based backups (both block and file based) of Dell EMC Arrays as well as 3rd party NAS systems and Dell EMC ProtectPoint®. This paper assumes the reader has a general understanding of NetWorker and Dell EMC array based snapshot technology.

AN INSIDE LOOK AT SNAPSHOTS AND SNAPSHOT BASED BACKUPS

Traditional backup solutions are not always capable of meeting the business Service Level Agreements (SLAs), RTO and RPOs, especially for very large data sets. In these instances, snapshot technology is the only way to ensure that the RPO and RTO requirements are met.

Before proceeding let's review some terminology that is used throughout this paper:

- **Snapshot/Snapshot Backup** – A snapshot of files on the application host or client is retained on the storage array only. Typically, a minimal number of these recent snapshots are kept on primary storage to provide the quickest restore if needed. NetWorker will catalog the snapshot as a backup and can perform a recovery from the snapshot.

- **Snapshot and Rollover** – A snapshot of files on the application host, or client, is rolled over (backed up) immediately to Data Domain protection storage or other conventional storage media such as VTL, generic disk, or tape. The snapshot is retained on the storage array. NetWorker will catalog both the snapshot and the rollover as a backup. The retention policies may differ based on the business needs. NetWorker can perform a restore from either the snapshot or the rollover.

- **Rollover Only** – A snapshot of files on the application host, or client, is rolled over immediately to Data Domain protection storage or other traditional storage media such as VTL, generic disk, or tape. NetWorker will catalog the rollover as a backup. Once the rollover is complete NetWorker Snapshot Management will delete the snapshot. This method provides storage savings on the primary array while allowing the NetWorker administrator to easily restore from the backup.

A snapshot is not the same as a backup and most businesses require that all mission critical data be included in the corporate backup methodology. The NetWorker Snapshot Management feature bridges the gap between snapshot and traditional backup.

A snapshot is a point in time copy of a production data volume or system and typically resides on a compatible array type, either local or local and remote.

The Storage Admin owns and allocates storage and as the owner of the storage, can create snapshots. These are typically crash consistent snapshots and as a function, they create snapshots more on an ad-hoc basis than on a scheduled basis. Example: create a copy for Test/Dev environment.

The DBA as the primary owner of the application and the data under management, creates multiple copies of the data using native application tools. Their focus is to avoid data corruption events and eliminate application down-time.

Backup Admins as a data protection service provider uses the backup agent on the application server to bring app consistency to the snapshot and copies the snapshot to a backup target to provide data protection and retention services.

It is important to note that no single role in the data center covers all business needs. It is critical that they all work together to ensure business is operating effectively.

The protection goal of a snapshot is data availability. An example of when to use a snapshot is when data and/or applications must be recovered to a specific point in time.

A snapshot-based backup is a copy of the snapshot and resides on another storage medium, such as Data Domain, disk or tape.

The protection goal of a snapshot-based backup includes broader data protection. The solution includes not only backup of a snapshot, but also disaster recovery and policy based management. Policy based management includes the ability to manage retention policies of the snapshots as well as the backup and clones (copies of the backup for disaster recovery).

Recovering individual items from a hardware-based snapshot can be tedious. Traditional array based snapshot management lacks the ability to track and index the various snaps.

Snapshot based backups provide easier recovery through robust cataloging and reporting, and are managed by the same backup software that is used for all mission critical data within the enterprise.

Adding snapshot backup to traditional backups is made easy through NetWorker because NetWorker Snapshot Management (NSM) for both Block and File is included within the NetWorker client software.

DELL EMC NETWORKER SHAPSHOT MANAGEMENT

Dell EMC NetWorker delivers an innovative solution for the end-to-end data protection and recovery for environments that require snapshot backup functionality. Dell EMC NetWorker provides Enterprise Management for SAN and NAS snapshots providing the following functionality:

- Discovery

- Centralized Catalog

- Snapshot Creation

- Snapshot Replication

- Rollover to Backup media

- Application Consistency for Oracle, SAP, DB2

NSM supports both Block and NAS storage-based snapshots for the industry leading device with a variety of management capabilities that are enhanced with the NetWorker management interface. At a high level we perform discovery of snaps on the primary storage device and storage device configuration, we can initiate snaps, catalog those snaps, replicate the snaps and when needed perform a backup of the snap in a synchronous or asynchronous fashion.

On the block side we support application consistent snaps that leverage the NetWorker client technology making it easy for existing NetWorker customers to deploy NSM.

And of course we support a variety of recovery options and again from a familiarity perspective, the solution is fully integrated with the NetWorker UI as illustrated below in Figure 1.
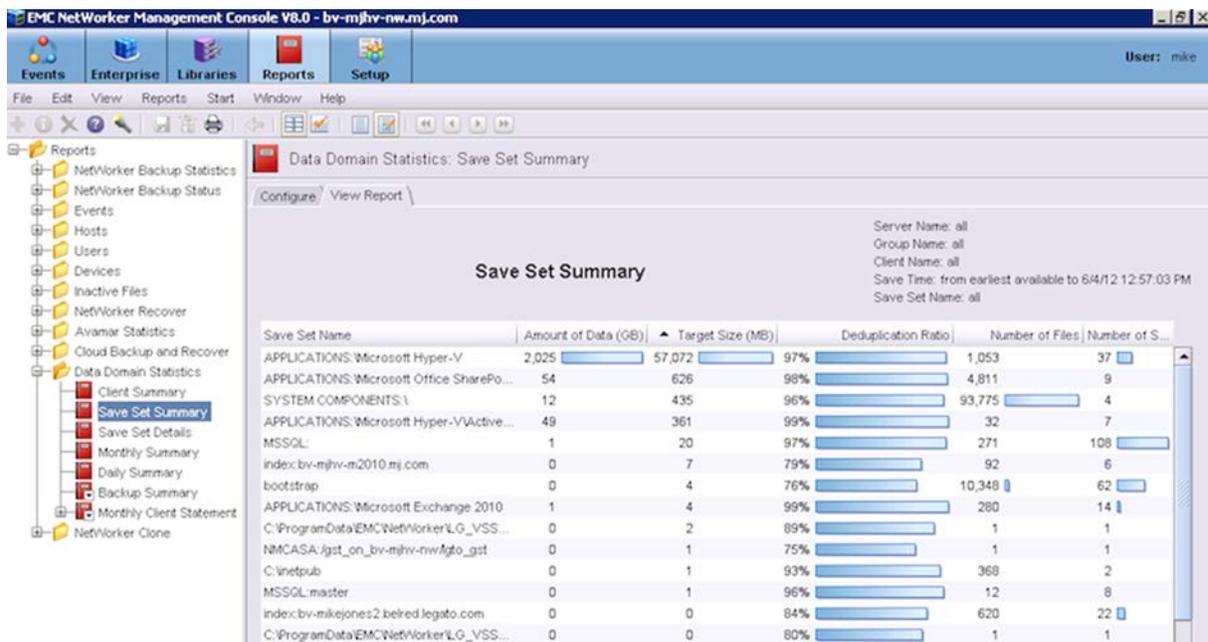
Figure 1: NetWorker Management Console UI

The NetWorker Snapshot Management feature works with mirror technologies on Dell EMC storage arrays as well as 3rd party arrays to create and manage snapshot copies of production data while ensuring there is minimal to no disruption to the production host processes.

Dell EMC NetWorker makes tracking and restoring snapshot backups simple by cataloging the snapshots from multiple arrays and array types. The backup medium of the snapshot includes all NetWorker supported backup targets such as Data Domain, disk, or tape.

NetWorker Snapshot Management provides support for the application host and/or NetWorker clients that write production data to volumes provisioned on supported Dell EMC VMAX® or Dell EMC VNX® Block storage arrays, Dell EMX XtremIO®, or a Dell EMC RecoverPoint™ appliance. Introduced in NetWorker 8.2, support is now included for snapshot management of Network-Attached Storage, and is integrated and supported with Dell EMC VNX, Dell EMC Isilon, and NetApp Systems.

NetWorker Snapshot Management supports the following:

Block Based Array Systems

- Dell EMC VMAX

- Dell EMC XtremIO

- Dell EMC VNX

- Dell EMC RecoverPoint

NAS Systems

- Dell EMC VNX

- Dell EMC Isilon

- NetApp

NetWorker Snapshot Management provides intelligent pairing for VMAX configurations. Intelligent pairing is a NetWorker Snapshot Management feature that automatically identifies an available mirror LUN to synchronize with a specified source LUN from the least to the most expensive synchronization operation. Intelligent Pairing selects only mirrors that are visible and usable by the snapshot mount

host, which may be separate from the application host. This feature eliminates the potential errors in manual configuration, which can have new LUNs masked only to the application host, while forgetting to have them masked? to the mount host.

Snapshot management for Dell EMC block arrays (VNX/VMAX/XtremIO), Dell EMC NAS Filers (VNX, Isilon), NetApp, and RecoverPoint is tightly integrated within the framework of NetWorker. The feature is delivered with the NetWorker Client making creation and management of snapshots readily available. The environment is auto-discovered and the NetWorker Configuration Wizards is used, eliminating the need for complex scripting. Integration goes beyond packaging and includes the ability to recover snapshots of file systems directly from the wizard-based NetWorker Management Console Recovery UI, which walks the administrator through the recovery process and enables them to schedule recoveries as well as perform multiple recoveries at once.

NetWorker software provides lifecycle policies for snapshot save sets. Snapshot policies specify the following:

- The interval between snapshots

- The maximum number of snapshots retained, above which the older snapshots are recycled

- Which snapshots will be backed up to traditional storage

NSM operations for each NetWorker client can be monitored through the reporting features in the NetWorker Management Console (NMC), NetWorker's central interface. Monitored operations cover snapshots that are successfully created or in progress, as well as snapshots that are mounted, in the process of being rolled over, and deleted. NMC also provides a detailed log of snapshot operations.

POLICY MANAGEMENT

NetWorker Snapshot Management retention policies manage the lifecycles of the snapshot savesets on the snapshot volumes, as well as the savesets that are stored on backup and cloned media.

NetWorker's snapshot management policies are shown in Figure 2. These policies are constructed and configured in the NetWorker Management Console.

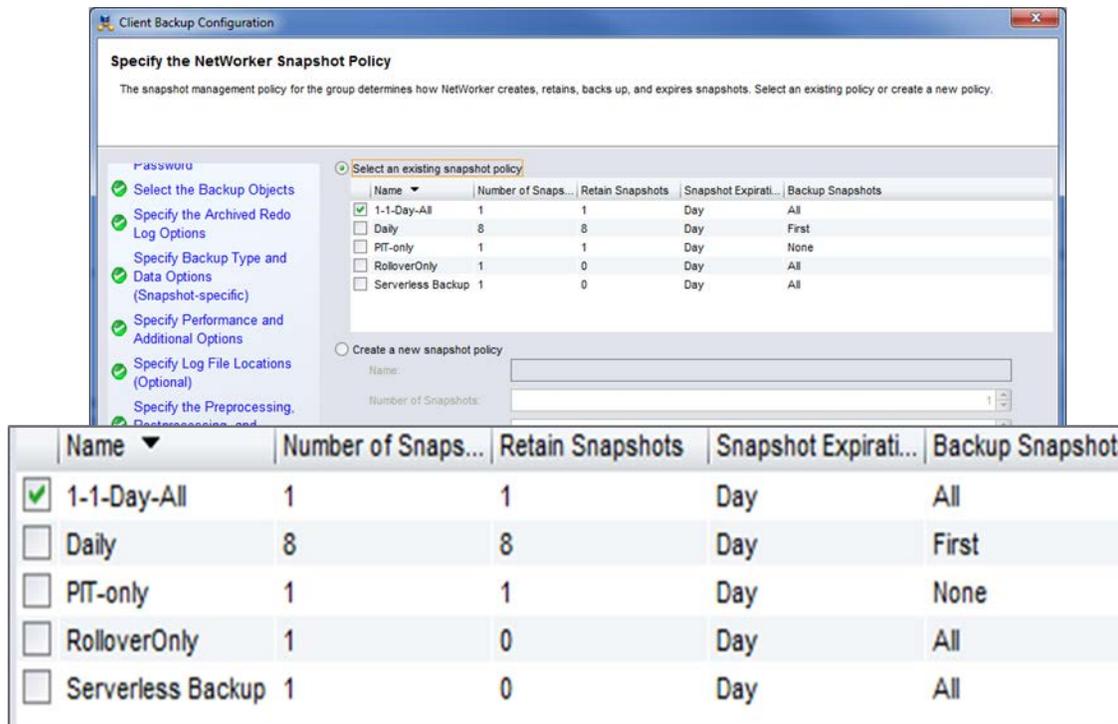| Name ▼	Number of Snaps...	Retain Snapshots	Snapshot Expirati...	Backup Snapshots
☑ 1-1-Day-All	1	1	Day	All
☐ Daily	8	8	Day	First
☐ PiT-only	1	1	Day	None
☐ RolloverOnly	1	0	Day	All
☐ Serverless Backup	1	0	Day	All

Figure 2: NetWorker Snapshot Policies

Here you orchestrate policies for how many snapshots are taken, the retention and expiration of snapshots, and the rules by which these replicas get backed up to secondary tape or disk.

Once defined, these policies can be applied to your clients that will leverage VSS within the NetWorker data zone.

The snapshot polices may include:

- The time interval between the snapshots. For example, a snapshot may be required at 6:00 AM, 1:00 PM and 11:00PM.

- The maximum number of snapshots that can be taken per day.

- The maximum number of snapshots that will be stored on the array, after which NetWorker Snapshot Management will automatically delete the oldest snapshots.

- Which copies to send to backup media as a Snapshot backup.

- The storage media to be used for the backup and/or clone. For example, using Data Domain as the storage target will allow NetWorker to take advantage of deduplication and will perform clone controlled replication to the Data Domain target.

CONFIGURATION AND BACKUP

Configuration of enterprise NAS snapshot environments can be pretty complex. But, with NetWorker, it's easily managed with a Wizard that discovers the environment and walks you through the operation step by step. This makes sure that all snapshot commands are executed properly, and that no manual scripting is needed. NetWorker is also able to manage all policies for snapshot retention and it has the ability to roll snapshots over to Data Domain systems and any other storage media that NetWorker supports.

NetWorker Snapshot Management provides end-to-end management of the snapshot and backup process. This includes the configuration, management, reporting, backup, replication, and recovery of snapshots created on all supported array types, all within a single pane of glass - the NetWorker Management Console.

NetWorker provides a client configuration wizard that will automatically detect the storage system(s) attached to the client. Based on the storage system type, the wizard will step the NetWorker administrator through the appropriate workflow to ensure that the client is properly configured. The NetWorker administrator does not need in-depth knowledge of the array snapshot management mechanisms that is being managed and backed up. The configuration wizard will automatically populate the snapshot types that are supported for the specified client.

The client configuration wizard within the NetWorker Management Console will generate the snapshot commands required to ensure that the snapshots are in their appropriate state and able to provide a consistent backup of the snapshots - no scripting is required. Command line configuration is also available.

NetWorker also delivers flexibility in the protection options supported with Snapshot Management. The supported protection types include the following which were each defined in more detail earlier in this paper:

- **Snapshot/Snapshot Backup**

- **Snapshot and Rollover**

- **Rollover Only**

An optional proxy server, also known as a mount host, can be configured as part of the workflow. The advantage of using a proxy server is to remove the backup load from the production server. The backup processes will run on the proxy while the production data is being rolled over to traditional backup storage.

For block-based data, NetWorker supports Oracle, DB2, & SAP w/Oracle application consistent snapshots that leverage the NetWorker client technology making it easy for existing NetWorker customers to deploy NSM. NetWorker can also manage local and remote snapshot replication.

CLONING AND OFF-SITE STORAGE

NetWorker cloning will create a copy of the snapshot backup. These copies are typically used for offsite storage. Cloning can be performed at the saveset level as well as at the volume level (i.e., a tape).

- **Saveset cloning** – Savesets can be cloned based on a schedule, immediately after a saveset backup is completed or on an ad-hoc basis.

- **Volume cloning** – Backup volumes can be cloned on-demand by manual selection.

When a Data Domain system is configured as the backup target NetWorker can control the replication to another Data Domain. This process is known as clone controlled replication and is configured and monitored within the NetWorker Management Console.

SIMPLIFIED RECOVERY

Fast and easy recovery is another benefit for NetWorker Snapshot Management. The process for both block and file volume snapshots is equally straightforward. The NetWorker Recovery User Interface steps the NetWorker administrator through the recovery from a snapshot backup, as well as other backup types. The recovery from NetWorker Snapshot Management includes the ability to perform a roll back, which will overwrite the original data, as well as mount the saveset for browse and recovery. When the saveset is mounted, granular level recovery of individual files is possible as illustrated in Figure 3 below. The NetWorker administrator can recover an entire saveset or individual items within the saveset. Mount for browse provides Granular Level Recovery, also known as item or file level recovery.

Figure 3: Browse a mounted snapshot then recover files

The three (3) supported NetWorker restore types include:

- **Snapshot Restore** – A snapshot saveset is mounted giving the administrator the ability to browse and select the directories or individual files to restore.

- **Restore from a Rollover** – A conventional NetWorker restore is performed from the backup storage media.

- **Rollback Restore (Block snapshots only)** – The snapshot is restored by using the storage array capabilities. This is typically called a "snapshot rollback" operation. A volume on the application host is unmounted and the rollback replaces the entire content of the unmounted volume.

MONITORING

The NetWorker Management Console, as shown in Figure 1, provides a single pane of glass for the NetWorker administrator. The administrator can monitor the progress of the Snapshot Management operation as well as the backup process. Detailed log files are also generated for the snapshot and backup operations. Monitored operations include snapshots that are successfully created or in progress, as well as snapshots that are mounted, in the process of being rolled over, and deleted. NMC also provides a detailed log of snapshot operations.

PREREQUISITES

NetWorker Snapshot Management leverages Dell EMC and 3rd party storage system APIs and requires that the hardware be properly configured to support the snapshots of choice. The storage system management tools/software must also be installed on the NetWorker client prior to configuring NetWorker Snapshot Management.

LICENSING

The NetWorker Snapshot Management feature is included with the NetWorker capacity licensing and is also sold under the traditional NetWorker license model.

# DELL EMC NETWORKER INTEGRATION WITH DELL EMC PROTECTPOINT

DELL EMC PROTECTPOINT OVERVIEW

Dell EMC ProtectPoint is a critical part of Dell EMC's strategy for storage integrated data protection providing direct backup from primary to industry-leading protection storage (Dell EMC Data Domain systems). ProtectPoint provides best of both worlds data protection with the performance of snapshots and the functionality of backups. The purpose of ProtectPoint is to provide best in class data protection for those cases where the original source data to be protected is on shared block storage. In its initial release, ProtectPoint specifically targets the VMAX3, VMAX All Flash, and XtremIO platforms which will hold the most critical customer ERP workloads (Oracle, SAP, DB2) with the tightest SLA requirements.

Figure 4 below illustrates how Dell EMC ProtectPoint works to backup directly from primary storage to a Data Domain system. After an initial configuration by the storage administrator, which makes a point in time copy of the LUN to be protected and seeds the initial blocks on the Data Domain system, the environment is ready for its first full backup via ProtectPoint.

Figure 4: NetWorker Management of ProtectPoint Backups
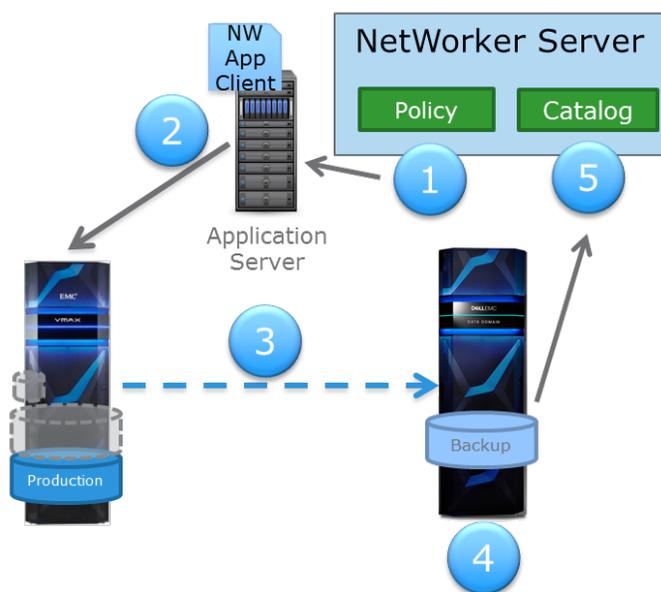
First, an application owner, like an Oracle DBA, triggers a backup at an application consistent checkpoint. This pauses the application momentarily simply to mark the point in time for that backup. This triggers the primary storage, leveraging new primary storage change block tracking, to send only the unique blocks (since the last backup/initial copy) directly to Data Domain over Fibre Channel.

Finally, the Data Domain system will ingest and deduplicate those blocks and use them to create and store an independent full backup in native format, which enables greatly simplified recovery.

With ProtectPoint, you do a full backup every time, but only send unique blocks, so daily full backup protection comes at the cost of an incremental backup.

Dell EMC ProtectPoint provides the following benefits:

- Functionality of full backups with the performance of snapshots, up to 20x faster than traditional fulls

- No impact to application server being protected

- Cost effective retention with Data Domain deduplication that reduces backup storage requirements by 10 to 30x

- Corruption protection via the Data Domain Data Invulnerability Architecture

- Recovery Point Objective (RPO) of minutes or hours

- Minimal Recovery Time Objective (RTO)

EMPOWERING NETWORKER ADMINS TO MANAGE PROTECTPOINT BACKUPS

Dell EMC NetWorker is tightly integrated with Dell EMC ProtectPoint enabling NetWorker administrators to centrally manage ProtectPoint backups using standard NetWorker workflows. Dell EMC NetWorker with Dell EMC ProtectPoint provides application consistent protection for Oracle, SAP, and DB2. Dell EMC NetWorker and Dell EMC ProtectPoint each provide tremendous customer value but when combined, provide unmatched data protection features and functionality, truly an example of 1+1=3. NetWorker integration with ProtectPoint adds value by allowing NetWorker admins to centralize and automate key elements of data protection not possible with ProtectPoint alone:

- Cataloging

- Scheduling

- Policy Management

- Replication Management

- Recovering

- Monitoring

- Reporting

CONCLUSION

Dell EMC NetWorker provides centralized end-to-end management of snapshot based backups for block and file volumes on Dell EMC and selected 3rd party storage systems. Dell EMC NetWorker is also tightly integrated with Dell EMC ProtectPoint empowering NetWorker administrators to centrally manage ProtectPoint backups along with their traditional backups. Configuration and recovery wizards simplify the configuration, backup, and recovery of both snapshot based backups and ProtectPoint backups. The NetWorker administrator can configure and manage the snapshot backup process without in-depth knowledge of the storage system management interface or snapshot processes. The policy management and cataloging within NetWorker manages the lifecycle of the snapshot backups and will ensure that the corporate retention policies are met, including disaster recovery requirements for short term RPOs. Integrated deduplication is possible when a Data Domain system is configured as the backup target.

Dell EMC NetWorker provides a single pane of glass approach for cradle-to-grave snapshot lifecycle management using consistent wizard based workflows with flexible protection and recovery options.