Database Backup and Recovery using NetVault™ Backup and PowerVault MD3260

A Dell Technical White Paper

Database Solutions Engineering
Dell Product Group
Umesh Sunnapu
Mayura Deshmukh
Robert Pound
Contents

Executive Summary ..................................................................................................... 4
Introduction .............................................................................................................. 4
Considerations for Selecting a Data Protection Solution ......................................................... 5
Dell NetVault Backup/PowerVault solution for data protection .................................................. 5
PowerVault MD3260 Storage Array ................................................................................... 6
- Storage Array Sizing and hardware setup ........................................................................ 6
- Storage Array Software Setup ....................................................................................... 7
NetVault Backup Software Install .................................................................................... 7
Backup Devices .......................................................................................................... 9
- NetVault Backup Virtual Tape Libraries ........................................................................ 9
Client Management ..................................................................................................... 9
NetVault Backup Database Plug-ins ................................................................................ 11
Backup and Recovery using NetVault Backup .................................................................... 12
- NetVault Backup Plug-in for SQL Server ......................................................................... 12
- NetVault Backup Plug-in for Oracle .............................................................................. 19
References ............................................................................................................. 27

Tables

Table 1. Drives and configuration ................................................................................. 7

Figures

Figure 1. Dell NetVault/PowerVault Solution ..................................................................... 6
Executive Summary

Organizations of every type and size know that security of data is critical to the continued success and operation of their business. Choosing the right data protection methodology and then implementing it using industry best practices and best-of-breed hardware and software ensures not only the security of valuable data, but also ready availability of the backed up data for fast recovery in the event of a loss or system failure. By utilizing the proven and dependable Dell NetVault Backup software, coupled with the Dell PowerVault™ MD3260 drive array, an administrator can create a high-performance disk-to-disk backup solution for all data backup and restore needs within their data center.

Administrators consider several key points when designing a data protection solution. These can include the ability to operate in a heterogeneous environment, the compression rate of data that can be expected, and the overall storage capacity that should be deployed to ensure the backup is successful. Although many solutions can provide answers to these questions, the determining factors are almost always related to ease of setup, ease of use, and ease of maintenance. Addressing these requirements ensures that a backup solution will be properly utilized.

The backup and recovery solution described in this paper meets all these criteria. This paper is intended to show the process used to backup and easily restore SQL Server and Oracle databases using a combination of Dell NetVault Backup software, the Dell PowerVault™ MD3260 storage array, and the Dell PowerEdge™ R620 rackmount server.

NetVault Backup offers online backups and recovery of various environments ranging from file systems in Windows®, UNIX® or Linux environments to databases such as Microsoft SQL Server® and Oracle Database running on Windows, Linux, and UNIX operating systems. NetVault includes a console for managing data protection operations. It allows the administrator to protect complete instances or individual databases, making it easier to perform restore operations both at the instance and database levels. The Dell PowerEdge R620 server and PowerVault MD3260 storage provide a robust platform to serve as the center of data protection operations. With up to 60 2.5" and 3.5" disks in a single 4U drawer, the PowerVault MD3260 storage array gives the data protection administrator tremendous storage capacity to back up their SQL Server and Oracle database systems.

Introduction

This paper describes a data protection solution for databases running SQL Server and Oracle using NetVault Backup software running on a Dell R620 server integrated with PowerVault MD3260 storage. The storage is added as a virtual tape library on the NetVault Backup Server and the backups and restores are done on the tape library. Options not covered in this paper include: adding the storage as a disk device using virtual standalone drives and leveraging NetVault SmartDisk for deduplication and compression.

Microsoft SQL Server and Oracle databases form the backbone of many businesses, housing data for many critical applications. As a business grows, the amount of data it stores also grows, often resulting in hundreds or thousands of databases spread across many servers. Because access to this data is critical for day to day business operations, service level agreements (SLAs) demand that databases remain online and available with little tolerance for downtime. The business demands the data is protected. Factors like unplanned outages, hardware failures, viruses and human errors can cause business units to cease operations for hours or even days, and other factors like theft and natural disaster may trigger a complete shutdown of the business. A robust data protection strategy helps to mitigate these potential problems by ensuring that critical information remains available and well protected.
Database Backup and Recovery using NetVault and PowerVault MD3260

Hardware redundancy is one way to address business continuity. Databases can be protected from hardware problems like power supply, network controller, and storage controller failures by including redundant hardware components in servers and storage arrays. Similarly, data loss from disk drive failure can be mitigated by storing SQL Server and Oracle DB data on RAID volumes. However, redundancy alone cannot protect an organization’s database deployment from every potential failure. That’s why it is critical to implement a backup strategy to protect business information from human error and disaster.

Considerations for Selecting a Data Protection Solution

Business environments differ widely, from small businesses running just a few servers to large data centers with complex server and storage architectures and everything in-between. Each organization must choose a data protection solution that fits its unique business environment.

Following are four considerations to examine when choosing a business continuity solution:

- **What are the Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO)?** RPO and RTO provide a baseline for how much data loss and how much downtime can be tolerated when recovering from an outage.

- **What are the backup retention policies?** If the backed up data exceeds the retention policies, it is possible to delete that data and reuse the media. Alternatively, data may be archived to different media and kept for long-term storage.

- **What are the overall goals?** Factors like performance, capacity, portability, and cost will determine the different storage media such as disk, tape, and optical drives, to include in a data backup and recovery solution.

- **Will the organization use data protection software?** If a solution includes data protection software, it is important to understand the value it adds. For example, does the software schedule regular backup and restore jobs? Does it require little to no monitoring? And, most important, how easy is the software to manage?

Dell NetVault Backup/PowerVault Solution for Data Protection

NetVault software integrated with PowerVault storage provides a complete data protection for servers running Microsoft SQL Server and Oracle databases.

Figure 1 illustrates the Dell NetVault/PowerVault solution that includes a Dell R620 server and PowerVault MD3260.
As shown in the above figure, the management server is an R620 running Windows Server operating system. NetVault Backup Server software is installed on this server. The connection between PowerVault and the management server is established using a SAS cable.

**PowerVault MD3260 Storage Array**

The PowerVault MD3260 is an easy to use versatile storage array that allows your datacenter to have a large amount of storage provisioned and ready for use in a very short time. In 4 units of rack space the storage array can hold 60 drives of 2.5", 3.5", SEDs, SSDs or a mixture of these drives which provides extensive storage in a small space.

**Storage Array Sizing and Hardware Setup**

For sizing considerations for your datacenter backup needs, refer to Table 1 below. For the hardware setup of the system, refer to the Getting Started Guide for the unit located at http://support.dell.com/support/edocs/systems/mdMD3260/. The unit will need to be racked in the same location as the management node for this architecture as it will utilize direct attach connection.
Table 1. Drives and Configuration

<table>
<thead>
<tr>
<th>Hard Disk Drives</th>
<th>Sixty (60) SAS, NL-SAS, SED, or SSD hot-pluggable hard disk drives. Minimum of 20 required with 4 in each drawer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Capacities</td>
<td>3.5” 7,200 RPM NL-SAS drives available in 500 GB, 1 TB, 2 TB, or 3 TB</td>
</tr>
<tr>
<td></td>
<td>2.5” 10K RPM SAS drives available in 146 GB, 300 GB, or 600 GB</td>
</tr>
<tr>
<td></td>
<td>2.5” 15K RPM SAS drives available in 73 GB, 146 GB</td>
</tr>
<tr>
<td></td>
<td>SSD is available in 150 GB or 300 GB</td>
</tr>
<tr>
<td>System Capacities</td>
<td>180TB using 60 3TB drives</td>
</tr>
</tbody>
</table>

Storage Array Software Setup

Once you start the PowerVault MD software on the management server, a connection to the MD3260 is automatically detected and the auto configuration screen is displayed. From here, the storage configuration can be performed and the required RAID level selected. The last step is to mount the disk to a mount point. The configuration is now completed on the management server side. Please refer to the Storage Getting Started Guide.

NetVault Backup Software Install

NetVault Backup is lightweight and is installed on the management server. Log in as system administrator and run the setup.exe file under <extracted dir>\netvault.

Specify the language and directories as per your requirement or leave it to defaults. Select the Server option during the installation.
Once the NetVault software is installed, you can open the NetVault Console using the shortcut in the desktop or using all Programs -> Quest Software -> NetVault Console. The figure below shows the NetVault Backup Console.
Backup Devices

NetVault Backup Virtual Tape Libraries

Virtual Tape Libraries are an emulation of tape libraries on disk, which enable disk-to-disk backup. Open the NetVault Backup console to create a NetVault Backup virtual tape libraries (VTL). Click Device Management in the console and select Add Library at the top. Then select Create Virtual Library.

For the library location, give the path to the new volume that is to be used for storing backups.

Note: NetVault Backup will not create any directories, so it is always recommended to include the path that already exists in the volume.

The Library name should be a unique name and the rest of the options can be left with default values. An option to compress the data is also available with VTL, using Microsoft Tape Format (MTF) in Windows and CPIO in Linux and UNIX.

Client Management

The clients in this document refer to SQL Server databases running in a Windows environment and Oracle database running on Red Hat Enterprise Linux. Any database that needs to be backed up and restored should already have the NetVault Client software running. Client software is available for several different platforms, such as Windows and Linux. The installation bits are same for both the NetVault Backup Server and NetVault Client; it is necessary to just select the Client option during the install as opposed to Server option for a NetVault Backup Server installation. Once the NetVault client software is installed on the client machines, open the NetVault Console.
Click **Client Management**. At the bottom-right corner, enter the IP address or hostname of the server where the client software is installed and click **Find**. NetVault Backup locates the client and adds the client machine information in the **Available NVBU Machines** list. Double-click on the machine name and enter the password that was given at the time of client installation. Once the password is entered, the server is added to the **Clients** list on the left.
**NetVault Backup Database Plug-ins**

The required NetVault Backup plug-ins need to be installed on the client machines using the NetVault Console. Adding a SQL Server/Oracle plug-in to the client then displays the database instances running. There are separate plug-ins for SQL Server for Oracle.

To install the plug-ins, first download the plug-in from Quest.com website to your desktop on the NetVault Backup Server. Open the NetVault Console, click **Client Management**, right-click on the client listed on the left-hand side, and select **Install Software**. Choose the location where the plugin is saved on your server and click **OK**. The example covers installing NetVault Backup Plug-in for SQL Server. Follow the same procedure to install the Oracle plug-in to the required clients.
Backup and Recovery using NetVault Backup

NetVault Backup offers various plug-in options to suit any environment. The plug-ins allow users to set up, configure, and define backup and restore policies. This section describes the backup and restore process using plug-ins for SQL server and Oracle.

NetVault Backup Plug-in for SQL Server

The plug-in for SQL Server supports online Virtual Device Integration (VDI), Online Named Pipe (SQL Server 2000 Only) and Volume Shadow Copy Service (VSS) backup methods which provide users with the flexibility to implement backup, without requiring them to learn SQL Server internals. The plug-in offers granular control, which allows users to restore complete databases, partial databases, or individual data files quickly and reliably, thereby minimizing downtime. For more information on these backup methods refer to the NetVault™ Backup Plug-in for SQL Server User Guide.

For our test case we are going to back up a database on the SQL Server instance using VDI (the default method), delete the database on the client machine, and perform a complete database restore.

Pre-Backup Configuration

Before initiating a backup, configure the plug-in’s authentication details, which include authentication mode, user name, and password.

1) From the NetVault Console on the NetVault Backup Server, open the NetVault Backup window (via either of the toolbar buttons or by clicking Operations -> Backup).
2) On the **Selections** tab, open the NetVault Client on which the plug-in is installed. To open any node on the **Selections** tab, do either of the following:
   - Double-click the node.
   - Right-click the node, and select **Open**.

3) In the list of plug-ins, right-click **Plug-in for SQL Server**, and select **Open**.

4) Right-click the **All Instances** node, and select **Configure**.

5) Based on the **Authentication Mode** set for the SQL Server, you can specify either a Windows Administrator or a SQL Server Administrator account details.

   **Note:** You can only select **SQL Server** if the SQL Server **Authentication Mode** is set to **Mixed Mode/SQL Authentication**.

6) Click **OK** to complete the configuration.
Backup

1) From the NetVault Console, open the NetVault Backup window.
2) On the Selections tab, open the NetVault Client on which the plug-in is installed.
3) Right-click Plug-in for SQL Server, and select Open.
4) Open the All Instances node to view the individual instances. With the instances visible, you can select the entire instance, individual databases, or specific files and filegroups.
5) Click on the Backup Options tab to select the backup method and the backup type. Default values were used for backup options, schedule, target and advanced options tabs.
6) Click **Submit** on the toolbar, or select **Accept** -> **Submit Backup**. You can monitor the job progress in the **NetVault Jobs** window and view the logs in the **NetVault Logs** window.

---

**Restore**

We deleted the database on the client machine and will now perform a complete database restore from the backup stored on the PowerVault MD3260 from the **Restore** window.

1) From the NetVault Console on the NetVault Backup Server, open the **Restore** window.

2) On the **Selections** tab, open the NetVault Client on which the plug-in is installed. Open the applicable backup Saveset. Each Saveset is labeled with its given job title followed by its backup type and the time that the backup was performed. Select the applicable instance or the database for inclusion in the restore procedure.
3) Default values were used for the options in the **Restore Options**, **Source**, **Schedule**, and **Advanced Options** tabs.
4) Select the client where the database is to be restored on the Target Clients tab.
5) Click **Submit** on the toolbar, or select **Accept -> Submit Restore**. You can monitor the job progress in the **Jobs** window and view the logs in the **Logs** window.
NetVault Backup Plug-in for Oracle

The NetVault Plug-in for Oracle supports implementing pure User Managed or a pure RMAN-based backup strategy; that is, your backup strategy should include either User Managed backups or RMAN backups, not a combination of the two. The plug-in supports RMAN Full and Incremental Backups. For more information on these backup methods and the backup types refer to the NetVault™ Backup Plug-in for Oracle User Guide.

For our test case we backed up the tablespace using a Full RMAN backup, deleted the tables in the tablespace on the client machine, and then performed a complete database restore to check if the tables were restored.

Pre-Backup Configuration

Before backing up you need to perform some steps. For detailed information regarding these steps refer to the NetVault™ Backup Plug-in for Oracle User Guide

- Ensure that the database is running in ARCHIVELOG mode.
- Determine the location for the RMAN repository.
  1) **Recovery Catalog** - You can also use a Recovery Catalog (that is, an external database) to store this information.
  2) **Control File** - The authoritative copy of the RMAN repository is always stored in the Control File of the target database. For our test case we used the control file.

When using the Control File to store the RMAN repository, Oracle highly recommends the following:

- Enable Oracle’s Control File Autobackup feature. This causes RMAN to back up the Control File automatically, and also lets RMAN restore the Control File Autobackup without access to a repository.
- Keep a record of your Oracle Database ID (DBID), which may be required to recover the database if the Control File is lost.
- Use a minimum of two multiplexed or mirrored Control Files on separate disks.
- Configure the NetVault Plug-in for Oracle
1) From the NetVault Console, open the Backup window. A list of machines added as NetVault Clients is displayed on the Selections tab.

2) Locate the NVBU Client that is configured as the Oracle Database Server, and open it to display a list of the plug-ins installed on the machine.

3) In the list of plug-ins, right-click Oracle APM, and select Configure. The Configure dialog appears. Set the appropriate values.

- Add the database - To begin using the plug-in for backup and restore, you must first add the target Oracle database to the Plug-in for Oracle.
  1) From the NetVault Console running on the NVBU Server, open the Backup window. Locate the NetVault Client that is configured as the Oracle Database Server, and open it to display a list of the plug-ins installed on the machine.
  2) In the list of plug-ins, open Oracle APM. Right-click the Oracle APM node, and select Add Database.
3) On the **Oracle Instance Details** tab, set all the parameters as they are mandatory for both RMAN and User Managed backup methods.
4) Check the Control File Autobackup option on the RMAN Details tab. Defaults are used for the fields on other tabs.
5) Click **OK** and ignore the informational message.

---

**Backup**

1) From the NetVault Console, open the Backup window.

2) On the **Selections** tab, open the NetVault Client on which the plug-in is installed.
3) In the list of plug-ins, open Oracle APM. The databases added to the Plug-in for Oracle are displayed.

4) Open the database that you want to back up select the data that you want to back up.

5) On the Backup Options tab, for Backup Method, select the RMAN option to perform RMAN backups. Important: For backups that use the RMAN backup method, do not select the Ensure this backup is the first on the media option on the Target tab of the Backup window. The RMAN backup method generates more than one data stream. If you select the Ensure this backup is the first on the media option for such backups, each data stream would target a separate piece of media in order to exist as the first backup on the media.
6) Default values were used for all the other tabs.

7) Click **Submit** on the toolbar, or select **Accept -> Submit Backup**. You can monitor the job progress via the Jobs window and view the logs via the Logs window.

---

**Restore**

A table in the tablespace on the client machine is deleted and we are performing a complete database restore from the backup stored on the PowerVault MD3260 from the Restore window.

1) From the NetVault Console on the NetVault Backup Server, open the **Restore** window

2) On the **Selections** tab, open the NetVault Client on which the plug-in is installed. Open the applicable backup saveset. Check the whole database option. With this option selected, you can perform the DBPITR based on SCN, LSN, or time to reconstruct the database up to the required point.

3) Select the following options on the **Restore Options** tab:
4) On the **Perform Recovery** tab, select the option **Perform Database Point in Time Recovery** and select **System Change Number Based**.
5) On the **Target Client** tab, select the client where the database is to be restored.

6) Default values are used for the fields on all the other tabs.

7) Click **Submit** on the toolbar, or select **Accept** -> **Submit Restore**. You can monitor the job progress via the **NVBU Jobs** window and view the logs via the **NVBU Logs** window.

---

**References**

- Dell Services  
  [www.dell.com/services](http://www.dell.com/services)

- Dell Support  
  [www.dell.com/support](http://www.dell.com/support)

- Dell NetVault™ Backup  
  [www.quest.com/netvault-backup](http://www.quest.com/netvault-backup)

- Dell PowerVault  
  [www.dell.com/PowerVault](http://www.dell.com/PowerVault)