Overview: Dell DR4000 Support for Symantec OpenStorage

A Dell Technical White Paper

Enterprise Storage Solutions Engineering
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# Table of Contents

1 Introduction ........................................................................................................................................................ 1
   1.1 Audience ...................................................................................................................................................... 1

2 About Dell DR4000 Support for Symantec OpenStorage Technology .................................................. 2
   2.1 Licensing ..................................................................................................................................................... 2
   2.2 Supported DR4000 Platform Configurations ...................................................................................... 2
   2.3 Solution Components .............................................................................................................................. 2
   2.4 OpenStorage Optimized Duplication .................................................................................................... 3

3 Sample Use Cases ............................................................................................................................................ 5
   3.1 Disaster Recovery Solution...................................................................................................................... 5
   3.2 Tape Consolidation with Disk-to-Disk-to-Tape OST Backup Solution ........................................... 7

4 Implementing OpenStorage Support on the Dell DR4000 ...................................................................... 9
   4.1 Implement OST on Dell DR4000 ........................................................................................................... 9
      4.1.1 Verify that Dell DR4000 is running System Software release 1.1 ............................................ 9
      4.1.2 Upgrade the DR4000 System Software ....................................................................................... 9
      4.1.3 Configure the logical storage unit ............................................................................................. 10
   4.2 Install Dell OST Plug-In to NetBackup ............................................................................................... 10
      4.2.1 Linux ................................................................................................................................................ 11
      4.2.2 Windows ........................................................................................................................................... 12
   4.3 Configure Dell DR4000 in NetBackup ................................................................................................. 12

5 Conclusion ........................................................................................................................................................ 17

Appendix A Additional Resources .......................................................................................................... 18
Appendix B Dell Labs Performance Test .................................................................................................... 19
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Feedback

We welcome your feedback on the quality and usefulness of this document. E-mail us at StorageSolutionsFeedback@Dell.com.
1 Introduction

This white paper describes the Symantec™ OpenStorage Technology and Dell™ DR4000 support for this initiative. The paper presents the advantages to customers, two sample use cases, and step-by-step guidance for implementing support for OpenStorage on the Dell DR4000 and in Symantec NetBackup™.

The Dell DR4000 is an advanced disk-based backup and disaster recovery appliance that integrates seamlessly with Symantec NetBackup and Backup Exec™ software applications. Even tighter integration is now available with Dell DR4000 support for Symantec OpenStorage Technology (OST).

OST is a Symantec initiative that enables application programming interface (API)-level support for intelligent disk storage appliances such as the Dell DR4000. This native support for disk-based storage appliances provides opportunities to optimize performance and eliminate protocol overhead associated with tape emulation devices.

Using the API, Dell has released an OST software plug-in — the Dell DR Rapid Data Access plug-in — that provides NetBackup and Backup Exec with details of the Dell DR4000 capabilities. NetBackup and Backup Exec use these capabilities to better control the backup process and delegate intensive data movement tasks to the DR4000 that take advantage of its advanced deduplication and compression technologies.

In addition, customers can be more efficient with NetBackup or Backup Exec automated workflows that leverage the DR4000 capabilities. This includes automating one of the most challenging IT use cases — disk-to-disk-to-tape backups. By automating disk-to-disk-to-tape backups, customers can consolidate tape backup systems from remote sites into the data center.

To summarize, the top advantages of the Dell DR4000 with OST support are:

- **Seamlessly integrated** backup and disaster recovery solution for small- to mid-size companies/organizations.
- **Optimized duplication and recovery** that combines the centralized control, monitoring, and cataloging of NetBackup/Backup Exec with the sophisticated deduplication, compression, and replication capabilities of the Dell DR4000.
- **Consolidated tape** backup operations.

1.1 Audience

This paper is intended for system/storage administrators, solution architects, IT managers, and storage network engineers who need to understand OST and how the Dell DR4000 can be integrated into OST environments. We expect the reader to have a working knowledge of Symantec NetBackup and/or Backup Exec software applications, the Dell DR4000 disk-based storage appliance, and related backup and disaster recovery operations.
About Dell DR4000 Support for Symantec OpenStorage Technology

OST is a Symantec initiative that enables tight integration between intelligent disk-based storage appliances such as the Dell DR4000 and Symantec’s NetBackup (version 6.5 and higher) and Backup Exec (version 2010 and higher) software applications.

OST consists of an API that Dell used to write the Dell OST plug-in — DR Rapid Data Access plug-in — for NetBackup and Backup Exec. The plug-in allows NetBackup and Backup Exec to retain end-to-end control over when backup images are created, duplicated, and deleted, while delegating to the DR4000 storage appliance control over how images are stored in and copied between storage appliances. In this way, NetBackup and Backup Exec can take advantage of the sophisticated deduplication and replication capabilities of the DR4000 to optimize performance and workflows.

2.1 Licensing

The Dell DR4000 licensing is all-inclusive, so no additional Dell licensing is required to use OST or the optimized duplication capability. However, Symantec NetBackup requires the purchase of an Symantec OpenStorage Disk Option license. Backup Exec requires the purchase of the Deduplication Option to enable the OpenStorage feature.

2.2 Supported DR4000 Platform Configurations

The Dell DR Rapid Data Access plug-in supports all currently available DR4000 platforms and all DR4000 CPU and RAM configurations. However, throughput and supported loads — backups, restores or optimized duplications — vary with the number of CPUs and amount of RAM. For optimal performance, Dell recommends at least 12 CPUs, 24 gigabytes (GB) of RAM, and a 10-gigabit Ethernet network interface card (NIC). This is also the minimum configuration required to run 32 simultaneous jobs — backup, restore, optimized duplication, or a mix.

2.3 Solution Components

Figure 1 shows the components of the integrated solution. The media server runs NetBackup or Backup Exec, the OpenStorage API, and the Dell DR Rapid Data Access software plug-in. The OpenStorage API, Dell DR Rapid Data Access software plug-in, and upgraded DR4000 firmware allow NetBackup and Backup Exec to interact natively with the Dell DR4000.
2.4 OpenStorage Optimized Duplication

Optimized duplication refers to the ability of NetBackup or Backup Exec to direct an OST storage device — in this case, the Dell DR4000 — to send a duplicate copy to a second DR4000. Optimized duplication takes advantage of the DR4000 advanced deduplication and compression algorithm technology, which can achieve data reduction levels ranging from 10:1 to 50:1. Data is copied in its deduplicated form, greatly reducing the amount of data being moved and network bandwidth required. Once the duplication task is complete, the NetBackup or Backup Exec catalog is automatically notified of the new copy. Figure 2 shows the optimized duplication process.

1. Local backups to DR4000 at Location A.
2. Duplicate backup job copies data from DR4000 at Location A to DR4000 at Location B.
3. Media server catalog updated for local backup and duplicate copy.

Figure 2. OST Optimized Duplication
Optimized duplication improves performance by:

- **Lowering media server hardware requirements.** The host media server hardware does not have to be sized (CPU, memory, etc.) to process backup image duplication.

- **Lowering transfer time and network bandwidth requirements.** The Dell DR4000 deduplicates the data prior to replicating it, which results in faster image transfers and lower network bandwidth requirements.

The following section presents two use cases that show how optimized duplication using the DR4000 with OST support can help solve real operational challenges in customer environments.
3 Sample Use Cases

OpenStorage optimized duplication can address some major problems in backup and disaster recovery solutions. Legacy duplication practices tend to be inefficient, largely manual, and subject to performance bottlenecks due to bandwidth restrictions related to the media agent at the backup client. In contrast, OST optimized duplication using the Dell DR4000 with OST support is more efficient, automated, and optimized for performance at the network and media agent levels. In addition, the OST solution complements existing tape infrastructures. NetBackup or Backup Exec can stage backup copies to the Dell DR4000 and, later, control offloading the copies to tape for long-term retention.

Two use cases show how NetBackup or Backup Exec can employ the Dell DR4000 with OST support to help solve some key disaster recovery and backup issues faced by IT organizations today:

- Disaster recovery
- Consolidating tape backup operations with backup-to-disk-to-tape

These are high-level use cases that assume standard best practices for disaster recovery and tape backup operations are being employed. (See “Additional Resources” in Appendix A for more information on these best practices.) The use cases are depicted with NetBackup, but could also be implemented under Backup Exec. Implementation details for each use case will vary, depending on the requirements, goals, and constraints of the deployment.

3.1 Disaster Recovery Solution

In this use case, OpenStorage optimized duplication controlled by NetBackup or Backup Exec provides an efficient solution for backing up and replicating data for disaster recovery purposes. As shown in Figure 3, this use case consists of a primary site at which production data is backed up by a NetBackup media server to the Dell DR4000. The media server directs the Dell DR4000 to create a backup copy on the DR4000 at the disaster recovery site. Using optimized duplication, the primary DR4000 copies the backup data image to the secondary Dell DR4000. The fast disk-to-disk transfer speed between the two DR4000 systems improves recovery point objective (RPO) and recovery time objective (RTO) metrics. These regular up-to-date backup image copies at the disaster recovery site are available for restores when needed.
Figure 3. Optimized Deduplication in a Disaster Recovery Use Case
3.2 Tape Consolidation with Disk-to-Disk-to-Tape OST Backup Solution

Figure 4 shows an example use case that consolidates tape operations from remote offices to a central data center tape server. Today, IT organizations are looking at disk-to-disk-to-tape backup as an alternative to purchasing and maintaining tape libraries for each branch office. These decentralized tape libraries are expensive and require IT staff on-site to remove tape cartridges and ship off-site, recycle expired cartridges for reuse in the tape library, and in some cases secure the backup with encryption software or hardware. Off-site tape storage can also delay recovery time.

With disk-to-disk-to-tape backup, remote office backup data is staged to an intelligent storage appliance such as the Dell DR4000. The DR4000 deduplicates and copies the data to another DR4000 in the data center. There, a media server controls the process of archiving the data to a centralized tape library. The issue with legacy disk-to-disk-to-tape duplication procedures is that they typically require multiple steps, each of which must be configured in the data management application (DMA) and run manually.

The solution depicted in Figure 4 reduces the overhead, IT staff time, and potential errors inherent in the legacy process by implementing an automated NetBackup Storage Lifecycle Policy1 workflow. (This workflow can also be implemented using the Backup Exec Duplicate Backup Sets template.) In this use case, each remote office is equipped with a Dell DR4000 storage appliance. In each remote office, a media server performs backups to a Dell DR4000. Using optimized duplication, the DR4000 copies the backup data image over a WAN to a Dell DR4000 in the central data center. There, a Symantec master server configured with the SLP automated workflow controls archiving the data to tape.

1 Learn more about NetBackup Storage Lifecycle Policies (SLPs) in the Dell white paper, “Dell DR4000 Support for Symantec OpenStorage: Disk-to-Disk-to-Tape Backup Using a Storage Lifecycle Policy.”
The following section provides guidance on how to implement Dell OST on the Dell DR4000 and in NetBackup.
4 Implementing OpenStorage Support on the Dell DR4000

This section describes how to implement Dell OST on the Dell DR4000 and in NetBackup.

4.1 Implement OST on Dell DR4000

Begin implementation of OST on the Dell DR4000 by ensuring that the Dell DR4000 is running system software release 1.1, which provides OST support. Once this is confirmed, set up the Dell DR4000 logical storage unit (LSU) (or “container”).

4.1.1 Verify that Dell DR4000 is running System Software release 1.1

From the Dell DR4000 system graphical user interface (GUI), use the **Software Upgrade** page to identify the current installed version of the system software in the Software Info pane, and apply updates to the system. There are two methods for displaying the **Software Upgrade** page:

1. From the **Support** page, click the **Software Upgrade** hyperlink.  
   - OR-  
   From the navigation panel, click **Support → Software Upgrade**.

2. On the **Software Upgrade** page, refer to the **Current Version** of the DR4000 system software in the **Software Info** pane. If the current version is earlier than software release 1.1, upgrade the Dell DR4000 system software as documented in the next section.

   **NOTE:** You can verify the version of the installed Dell DR4000 system software from the **Dashboard** page, the **Support** page, and the **Software Upgrade** page. The following procedure documents the process from the **Software Upgrade** page.

4.1.2 Upgrade the DR4000 System Software

To upgrade the system software:

2. Enter the Service Tag of the DR4000 system to display the available downloads. This information is located in **Support Information** pane on the **Support** page.
3. The Dell DR4000 system software upgrade file can be found under **Drivers & Downloads** in the **IDM** category, under the **Dell-Utility** section (**DR4000 Upgrade File**) in the following format:

   DR4000-x.x.x-xxxxx-x.tar.gz

4. Click **Download File**, click **For Single File Download via Browser**, and click **Download Now**. The **File Download** dialog is displayed.
5. Click **Save** to download the latest system software upgrade file to the system which is running the browser session started by the DR4000 administrator.

6. Using the DR4000 system GUI, select **Support** and click the **Software Upgrade** hyperlink (or select **Support → Software Upgrade**). The **Software Upgrade** page is displayed.

7. Type the path of the software upgrade file in the **Select the upgrade file from local disk** (or click **Browse** and navigate to the downloaded system software upgrade file).

8. Select the software upgrade file, and click **Open**.

9. Click **Start Upgrade**.

**NOTE:** During the Dell DR4000 system software upgrade, the upgrade status “starting” remains displayed during almost the entire duration of the software upgrade process. When the DR4000 system upgrade status changes to “almost done”, this signals that the system upgrade process has completed.

### 4.1.3 Configure the logical storage unit.

You can configure an LSU as an OST connection type container for data storage by using the DR4000 system GUI. To configure an LSU as an OST connection type container, log in to the DR4000 system and complete the following general tasks:

1. Navigate to the **Containers** page.
2. Create and name the OST container.
3. Set the container connection type to **OST**.
4. Set the capacity for the container.

**NOTE:** The capacity option in this command example sets the quota on the LSU. This is the maximum number of bytes (ignoring optimization) that can be written to an LSU and it is listed in gigabytes (GB). If the capacity option is not specified (or if 0 is specified for the capacity), the LSU will not have a quota. If this is the case, the amount of data that can be written to the LSU is limited only by the amount of free space on the DR4000 appliance.

### 4.2 Install Dell OST Plug-In to NetBackup

Install the Dell OST plug-in on the NetBackup media server. The 1.1 release of Dell OST supports Linux and Windows. You can download the Dell OST Plug-In Installer in two ways:


- From the Dell DR4000 system GUI:
  - Click **Storage → Clients**.
  - Click the **OST** tab in the **Clients** page, and click **Download Plug-In**.
  - On the **Download Plug-Ins** page, select the appropriate plug-in, and click **Download**.
4.2.1 Linux
This procedure describes how to install the Dell OST plug-in on a media server running the supported Red Hat Enterprise Linux and SUSE Linux server operating system software.

1. Ensure that you have downloaded the Dell OST plug-in installer into the following directory on the media server:

   /usr/openv/lib/ost-plug-ins

   The OST plug-in installer is saved as Dellostplugin-x86_64-xxxxx.bin.gz, where xxxxx represents its build number.

2. Unzip the OST plug-in installer file using the following command:

   $> /bin/gunzip Dellostplugin-x86_64-xxxxx.bin.gz

3. Configure the executable bit on the OST plug-in installer using the following command:

   $> /bin/chmod a+x Dellostplugin-x86_64-xxxxx.bin

4. Stop all NetBackup services and processes before using the -install option. The OST plug-in installer returns an error if any of the NetBackup services or processes are running when attempting to install the OST plug-in.

5. Run the OST plug-in installer using the -install option, and install the plug-in using the following command:

   $> ./Dellostplugin-x86_64-xxxxx.bin -install

   **NOTE:** You must stop all NetBackup services and processes, including the NetBackup Administrator Console, before installing the OST plug-in. You are also required to use the Dell OST plug-in installer to uninstall the plug-in. The location for installing the plug-in is not user-configurable.

6. Once the OST plug-in installer has stopped running, and the system prompt returns, verify that the plug-in has loaded properly by checking the output using the following NetBackup command on the Linux media server:

   $> /usr/openv/netbackup/bin/admincmd/bpstsinfo –plugininfo

   This NetBackup command lists the Dell OST plug-in details as shown:

<table>
<thead>
<tr>
<th>Plug-inName:</th>
<th>libstsplDellMT.so</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefix:</td>
<td>DELL</td>
</tr>
<tr>
<td>Label:</td>
<td>OST Plug-in that interfaces with DR4000 system</td>
</tr>
<tr>
<td>Build Version:</td>
<td>9</td>
</tr>
<tr>
<td>Build Version:</td>
<td>1</td>
</tr>
<tr>
<td>Minor:</td>
<td></td>
</tr>
<tr>
<td>Operating Version:</td>
<td>9</td>
</tr>
</tbody>
</table>
Vendor Version: Dell OST plug-in 10.1

7. Retain the OST plug-in installer on the media server in case it’s needed to uninstall the plug-in.

4.2.2 Windows
This procedure describes how to install the Dell OST plug-in on a media server running the supported Microsoft® Windows Server® operating system software. You can use SETUP to install the OST plug-in, and the OST plug-in.

Log in to the Windows media server and complete the following:

1. Stop the NetBackup services if they are running, by using the following command:

   $INSTALL_PATH\VERITAS\NetBackup\bin\bpdown.exe

   Verify that a previous version is not already installed. If so, uninstall it. If SETUP performs this check, there is no need to do it manually.

2. Run SETUP to install the OST plug-in.

3. Check that the plug-in is installed by using the following NetBackup command on the Windows media server:

   $INSTALL_PATH\VERITAS\NetBackup\bin\admincmd\bpstsinfo.exe -pi

   This NetBackup command lists the Dell OST plug-in details along with other plug-in details, as shown in the following example:

   | Plug-inName: | libstspiDellMT.dll |
   | Prefix: | DELL |
   | Label: | OST Plug-in that interfaces with DR4000 system |
   | Build Version: | 9 |
   | Build Version Minor: | 1 |
   | Operating Version: | 9 |
   | Vendor Version: | Dell OST plug-in 10.1 |

4. Start the NetBackup services by using the following command:

   $INSTALL_PATH\VERITAS\NetBackup\bin\bpup.exe

4.3 Configure Dell DR4000 in NetBackup
You can configure the DR4000 system information using the NetBackup media server CLI commands or the NetBackup GUI. Refer to the Dell DR4000 System Administrator Guide for configuration via the NetBackup CLI. Here, we present the process using the NetBackup GUI, which applies to both Linux and Windows media servers.

Log in to NetBackup and complete the following:
1. In the main window of the **NetBackup Administrator** console, click **Configure Disk Storage Servers** to launch the **Storage Server Configuration Wizard**. The Storage Server Configuration Wizard page is displayed, which is where you can add a storage server.

![NetBackup Administrator Console (Main Window)](image)

**Figure 5. NetBackup Administrator Console (Main Window)**

2. Select **OpenStorage** to choose the type of disk storage that you want to configure in this window, and click **Next**. The **Add Storage Server** page is displayed.
3. Provide the following values to configure a storage server:

- In **Storage** server type, enter DELL.
- In **Storage server name**, enter the DR4000 system name.
- In the **Select media server** drop-down list, select the media server on which you are configuring OST.
- Enter values for the credentials needed to authenticate with the DR4000 system:
  - **User name**
  - **Password**
  - **Confirm password**

The credentials should be the same as the credentials that are required for the DR4000 system.
4. Click Next. The **Storage Server Configuration Summary** page is displayed, which lists the values you configured.
5. Click Next. The storage server you configured and the corresponding credentials are displayed in the Storage Server Creation Status page.
6. Click Next and click Finish to close the Storage Server Configuration Wizard.
7. The Storage server <servername> successfully created page is displayed.
8. NetBackup is now configured for use with the DR4000 system.
5 Conclusion

The Dell DR4000 with OST support provides optimized duplication and recovery that combines the centralized control, monitoring, and cataloging of NetBackup and Backup Exec with the sophisticated and highly advanced deduplication, compression, and replication capabilities of the Dell DR4000. With this solution, small- to mid-size organizations can implement more efficient and faster backup and recovery processes. The enhanced capabilities and performance of the Dell DR4000 with OST support allow customers to reduce dependence on tape backups in their IT operations.
Appendix A  Additional Resources

Dell online support resources:

- Dell technical support site: http://support.dell.com
- Dell TechCenter is an online IT community where IT professionals connect with Dell customers and employees to share knowledge, best practices, and other information about Dell products and installations: http://DellTechCenter.com

Dell DR4000 resources:

- Dell DR4000 System Administrator Guide: http://support.dell.com
- Dell DR4000 Architecture Overview:
  http://en.community.dell.com/techcenter/extras/m/white_papers/20143939.aspx
- Dell DR4000 System Advanced Data Protection Overview:
  http://en.community.dell.com/techcenter/extras/m/white_papers/20143948.aspx
- Replication on the DR4000 Disk Backup System:
  http://en.community.dell.com/techcenter/extras/m/white_papers/20073229.aspx

Symantec resources:

- Symantec NetBackup 7.5 OpenStorage Solutions Guide for Disk:
  http://www.symantec.com/business/support/index?page=content&id=DOC5188
- “Backup Exec 2010 Optimized Duplication”:
- Symantec best practices white paper — “Implementing Highly Available Data Protection with Veritas NetBackup”:
  http://eval.symantec.com/mktginfo/enterprise/white_papers/b-whitepaper_implementing_highly_available_dr_with_veritas_netbackup_01_08_13599373.pdf
Appendix B  Dell Labs Performance Test

This performance testing was conducted by Dell performance labs in June 2012

Media server:

- 12 CPU, 32GB RAM, RHEL 5.5, Symantec NetBackup 7.5

DR4000:

- 2-TB drives variant
- Dell DR4000 Build: 1.1.

Connectivity:

- Dell DR4000 and the two media servers connected via 10-gigabit Ethernet using a Dell PowerConnect 8024 switch

Workflow:

- Two media servers each doing 8 jobs (backup or restore or duplication) simultaneously. Data set has 90% duplicate data.

Results:

- Optimized writes: Two media servers, each running 8 backup jobs: 1568 MBps (5.38 TB/hr)
- Pass-through writes: Two media servers, each running 8 backup jobs: 928 MBps (3.18 TB/hr)
- Readback: Two media servers, each running 8 restore jobs: 1200 MBps (4.11 TB/hr)
- Optimized duplication: Two media servers, each running 8 duplication jobs: 1400 MBps (4.80 TB/hr)