

BACK UP DEDUPLICATED DATA IN LESS TIME WITH THE DELL DR6000 DISK BACKUP APPLIANCE

PROTECT YOUR DATA MORE EFFICIENTLY

Dell™ DR6000 Disk Backup Appliance

$\frac{2}{3}$ & $\frac{1}{6}$ & $\frac{1}{3}$
THE TIME THE BANDWIDTH LOWER COST



versus an industry-leading deduplication appliance

Are long backup windows hurting your business? The Dell DR6000 Disk Backup Appliance used source-side deduplication to provide a fast backup in our datacenter while minimizing network resource consumption. The DR6000 backed up 3.5 TB of data from 12 media servers in just over 28 minutes—two-thirds of the time that it took the competition, an industry-leading deduplication appliance, to back up the same data. A sample media server backing up to the DR6000 appliance consumed less than one-sixth the bandwidth needed to back up to the competing appliance. What's more, the 6U DR6000 cost two-thirds the price of the 10U, industry-leading deduplication appliance.¹

Backing up data is vital to protecting your business, but IT staff and users can waste time when backups run longer than allotted windows and cause network congestion. IT must work quickly to rectify the problems, as accessing data through the network during a backup can feel sluggish and slow user productivity. Disk backup appliances such as the Dell DR6000 use deduplication, a data-reduction technology, to help control data growth, save time by reducing necessary backup windows, and manage resources, such as available storage, for your business.

Not all backup appliances approach deduplication the same way, however. The Dell DR6000 Disk Backup Appliance specifically has the option to use source-side deduplication, where deduplication occurs at the server, to back up only unique data at

¹ We gathered server prices in April 2015 from the respective vendor websites. They do not include discounts, tax, or shipping costs. Please check with Dell for current pricing as it is subject to change.



no additional cost to the customer. The appliance is part of a family of Dell DR appliances and can do target-side deduplication in addition to source side dedupe.

FASTER PROTECTION OF YOUR DATA WITH SOURCE-SIDE DEDUPLICATION

Deduplication is a form of compression that replaces unique chunks of data with reference points, ideally reducing the amount of backup data stored and transferred for replication and disaster recovery purposes in your datacenter. It is particularly useful for businesses with large amounts of data that need to handle data growth and perform frequent backups without dramatically increasing storage costs.

The Dell DR6000 Disk Backup Appliance, like the Dell DR4100 appliance, has built-in protocol accelerators that focus on increasing the performance of *source-side* deduplication, which works with different types of file-system protocols to provide a filter that deduplicates the data at the source. This enables these servers to send deduplicated data directly to the DR6000.

To aid the source-side deduplication process, the Dell DR Series offers Rapid NFS and Rapid CIFS write-operation acceleration technology for NFS and CIFS file-system protocols. The goal of these technologies is to provide better coordination and integration between the DR appliance operations and data management applications (DMAs), such as CommVault Simpana, which we used in testing. Rapid NFS and Rapid CIFS are new patent-pending, source-based deduplication technology plug-ins created by Dell for NFS and CIFS systems that ensures the DR appliance receives only unique blocks of data from NFS or CIFS clients that haven't already been stored in the backup storage repository within the DR appliance disk pool. Write operations use Rapid NFS, whereas metadata operations use the regular NFS protocol. For organizations using CIFS, the filter driver verifies that the DR appliance receives only unique data.

In our datacenter, we connected, installed, and configured a Dell M1000e chassis with two stacked Dell Networking MXL switches. We configured a 2 × 10 Gbps LACP port channel from the Dell Networking stack to our core network, a Dell PowerConnect™ 8024F 10 Gbps switch. We installed and configured 12 Dell M620 blades as media servers. On each of these media servers, we installed Windows Server® 2012. On our infrastructure server, a Dell PowerEdge™ R815, we installed Windows Server 2012 R2. For the Hyper-V® role, we connected the infrastructure server to the core network. We installed and configured a Dell DR6000 and an industry-leading deduplication appliance and attached them to our core network via 2 × 10 Gbps LACP port channels. Figure 1 shows the hardware setup we used in our testing.

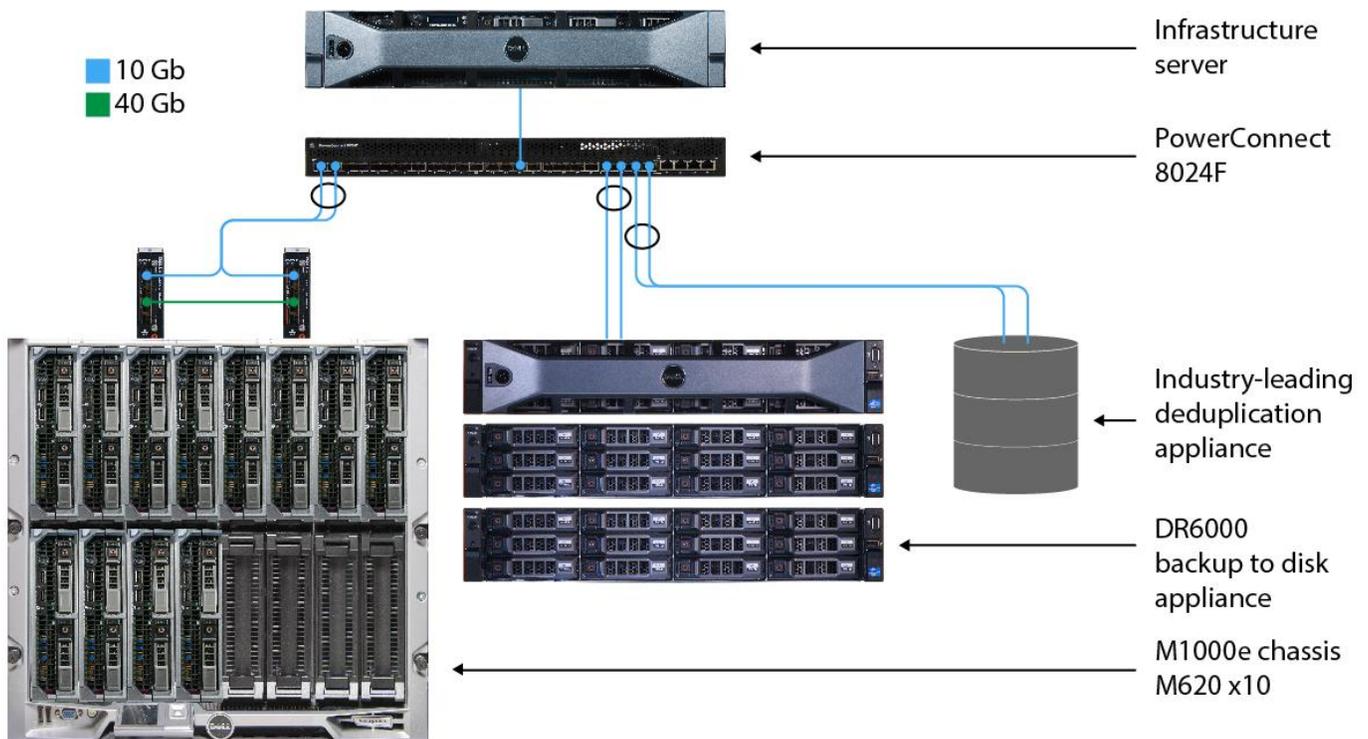


Figure 1: The components we used in our testing.

For more information on the Dell DR6000, see [Appendix A](#). For more information on the servers and appliances used in our testing, see [Appendix B](#). For detailed steps on how we tested, see [Appendix C](#).

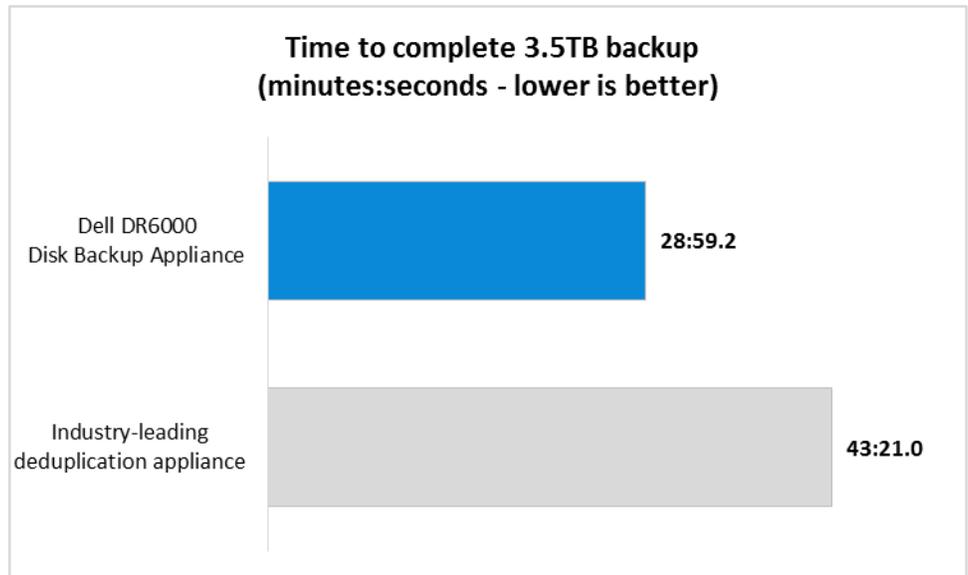
WHAT WE FOUND

Backing up data in less time with the Dell DR6000 Disk Backup Appliance

Thanks to source-side deduplication and Rapid CIFS technology, backing up 3.5 TB of data with the Dell DR6000 saved 14 minutes and 22 seconds compared to the industry-leading deduplication appliance in our testing—two-thirds of the industry-leading deduplication appliance’s backup window (see Figure 2). The DR6000 appliance finished the backup in 28 minutes and 59 seconds, at a rate of 8.99 TB per hour. The industry-leading deduplication appliance finished the backup in 43 minutes and 21 seconds at a rate of 5.99 TB per hour. By backing up only unique data with the DR6000, backup windows shrink, making life easier for your IT staff and database users. IT staff

can move on to other important tasks sooner, and your users won't have to struggle against sluggish responses from database applications.²

Figure 2: The time to complete the backup for both solutions. Less time is better.

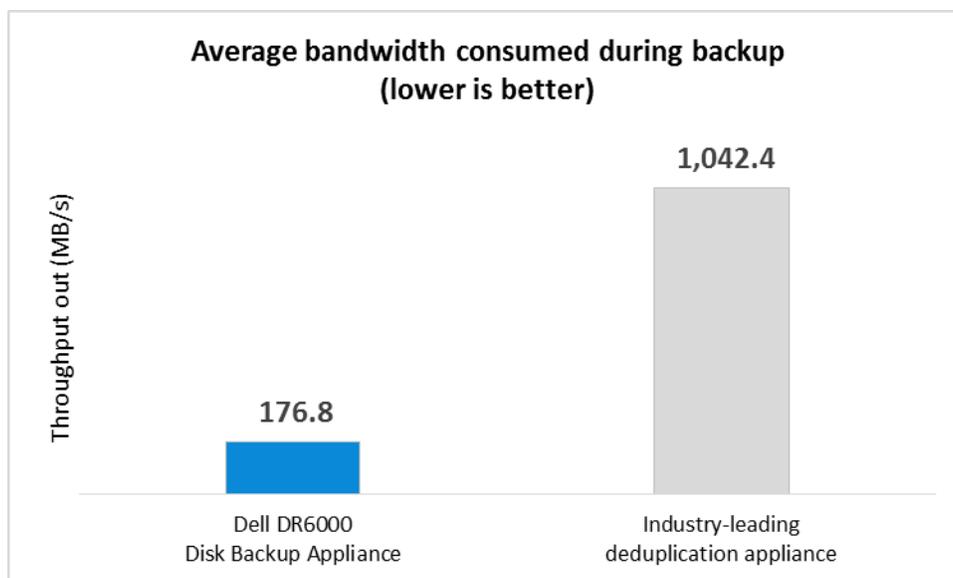


Consuming less network resources with the Dell DR6000 Disk Backup Appliance

Another advantage to backing up only unique data is the reduction in network resources that backing up data to the DR6000 consumes. We found the average throughput from a sample media server to the Dell DR6000 was 176.8 MB per second, less than a sixth of the network bandwidth needed during the back up to the industry-leading deduplication appliance. This reduction shows how minimal the performance impact would be for users who happened to access the network during the backup window. Figure 3 compares the average throughput from the two sample media servers.

² According to Dell, they achieved 25TB per hour throughput in their internal testing. To see their Best Practices Guide, visit downloads.dell.com/Manuals/all-products/esuprt_ser_stor_net/esuprt_powervault/powervault-dr6000_White%20Papers_en-us.pdf.

Figure 3: Average throughput from a sample media server to the backup appliance. Lower numbers are better.



Lower hardware cost in a smaller footprint for the Dell DR6000 Disk Backup Appliance

Figure 4 compares the hardware costs of the two solutions. By paying less for a deduplication appliance with a 4U-smaller footprint, you’re saving your business money with the initial purchase (money that your business could be spend on other projects) and potentially reaping all the savings benefits that come from needing less space in the datacenter. The Dell DR6000 occupied 40 percent less rack space and cost more than a third less than the industry-leading appliance—a total savings of \$85,467.³

	Rack units (U)	Purchase cost (USD)
Dell DR6000 Disk Backup Appliance	6	\$147,908.00
Industry-leading deduplication appliance	10	\$233,375.00

Figure 4: Footprint and initial cost for each deduplication appliance. Lower numbers are better.

³ We gathered server prices in April 2015 from the respective vendor websites. They do not include discounts, tax, or shipping costs. Please check with Dell for current pricing as it is subject to change.

CONCLUSION

Backing up data is a key component in data protection. However, long backup windows can cause headaches for IT and users while slowing down the network. We found that using source-side deduplication and Rapid CIFS technology to back up data to the Dell DR6000 Disk Backup Appliance was faster—with the average rate of data backup at 8.99 TB per hour. The backup to the DR6000 completed in two-thirds the time that the backup to the industry-leading deduplication appliance completed. Backing up to the DR6000 consumed less than one-sixth the bandwidth needed to back up to the industry-leading deduplication appliance. In addition, the DR6000 needed less rack space and cost a third less than the competition. The solution to lengthy backup windows is clear: Save time and network bandwidth with source-side deduplication built into the Dell DR6000 Disk Backup Appliance.

APPENDIX A – ABOUT THE COMPONENTS

About the Dell DR6000 Disk Backup Appliance

Dell designed the DR6000 Disk Backup Appliance to help reduce and ease the negative effects of data growth and backup complexity. Dell claims that the DR6000 offers “the industry’s first source-side ingest protocol accelerators for NFS/CIFS backup: Rapid NFS and Rapid CIFS (part of Dell’s DR Rapid technology plug-ins)” in addition to supporting NFS, CIFS, OST and RDA protocols. In a 10U form factor, the DR6000 can offer up to 252 TB of post-RAID capacity using four expansion shelves in 9, 18, 27, 36 and 54TB configurations. For more information about the DR6000, see software.dell.com/products/dr6000-disk-backup-appliance/.

APPENDIX B – SYSTEM CONFIGURATION INFORMATION

Figures 4 through 6 provide detailed configuration information for the test systems.

	Dell DR6000 Disk Backup Appliance
Number of primary enclosures	1
Disk model number	Constellation ES.3 ST1000NM0023
Disk size (TB) / disk count per primary enclosure	1 TB × 12
Disk type, speed	SAS, 7,200 RPM
Number of expansion shelves	2
Disk model number	Constellation ES.3 ST2000NM0023
Disk size (TB) /count per expansion shelf	2 TB × 12
Disk type, speed	SAS, 7,200 RPM
Total disks	36 (12 × 1 TB, 24 × 2 TB)
Total rack units	9

Figure 4: Detailed configuration information for the Dell DR6000.

	Industry-leading deduplication appliance
Number of primary enclosures	1
Number of expansion shelves	2
Disk size (TB) /count per expansion shelf	2 TB × 30
Disk type, speed	SAS, 7,200 RPM
Total disks	30 (30 × 2 TB)
Total rack units	7

Figure 5: Detailed configuration information for the industry-leading deduplication appliance.

System	Dell PowerEdge M620 (virtual client hosts)
Enclosure /chassis	
Blade enclosure/chassis	Dell PowerEdge M1000e Blade Enclosure with 2 × MXL 10/40GbE and 4 × Force 10 XML 10/40GbE switch
General	
Number of processor packages	2
Number of cores per processor	8
Number of hardware threads per core	2
CPU	
Vendor	Intel
Name	Xeon
Model number	E5-2660
Socket type	LGA2011
Core frequency (GHz)	2.20
Bus frequency	8.0 GT/s
L1 cache	32 KB + 32 KB
L2 cache	256 KB (per core)

System	Dell PowerEdge M620 (virtual client hosts)
L3 cache	20 MB
Platform	
Vendor and model	Dell PowerEdge M620
BIOS name and version	Dell 2.2.7
BIOS settings	Default
Memory module(s)	
Total RAM in system (GB)	32
Vendor and model number	Hynix® HMT42GR7MFR4C-PB
Type	PC3-12800R
Speed (MHz)	1,600
Speed running in the system (MHz)	1,600
Size (GB)	16
Number of RAM module(s)	2
Rank	Dual
OS/hypervisor	
Name	VMware® ESXi™ 5.5.0
Build number	1746018
File system	VMFS
Language	English
RAID controller	
Vendor and model number	PERC H310 Mini
Hard drives	
Vendor and model number	Dell MBF2600RC
Number of drives	2
Size (GB)	600
Type	SAS
Network adapter	
Vendor and model number	Broadcom® NetXtreme® II BCM57810 10GB
Number of ports	2
Type	Integrated
Ethernet adapter B	
Vendor and model number	Intel 82599EB 10GB
Number of ports	2
Type	Mezzanine card
Ethernet adapter C	
Vendor and model number	Intel 82599EB 10GB
Number of ports	2
Type	Mezzanine card

Figure 6: Detailed configuration information for the 12 media servers.

APPENDIX C – HOW WE TESTED

Installing the DR6000 and industry-leading deduplication appliance

We installed both appliances with a 2 × 10 Gbps LACP team. We verified each to use jumbo frames (MTU 9000). We created 12 CIFS file shares on the DR6000 and the industry-leading deduplication appliance.

Setting up the Dell DR6000

1. Log on to the console as administrator\StOr@ge!
2. Type `network -create_bond -bondif bond0 -static -nwif eth2 eth3 -ip <your ip address> --netmask <your netmask> --gateway <your gateway> --mtu 9000 -mode 802.3ad -restart`
3. Open a web browser to the ip address used in step 3.
4. Log in as administrator\StOr@ge!
5. Browse to System Configuration → Network, and verify that for the 2 × 10 Gbps LACP bond, the MTU size is set to 9000.
6. Browse to Storage → Containers and click Create.
 - Container name = Lib1
 - Type = auto
 - Connection type = NAS
 - Checkbox enable CIFS
 - Checkbox open access to all
7. Repeat step 6 until you have created 12 containers (Lib1 to Lib12).

Setting up the infrastructure server

1. Power on the Dell PowerEdge R815 server, and press Ctrl+R to enter the RAID controller configuration.
2. Select the local PERC H200 Mini controller.
3. Press F2 to create a new virtual disk and select four 300GB disks:
 - RAID-5
 - VD name: vol1
4. Click Advanced, and select Initialize.
5. Click OK.
6. Reboot the server.

Installing Microsoft Windows Server 2012 R2 Datacenter Edition

1. Insert the installation media into the CD/DVD drive, and restart the server.
2. When the option appears, press F11 to enter the Boot Manager.
3. Select BIOS Boot Menu.
4. Select SATA Optical Drive, and press Enter.
5. Press any key when prompted to boot from DVD.
6. When the installation screen appears, click My language is English (United States).
7. Leave language, time/currency format, and input method as default, and click Next.
8. Click Install now.
9. When the installation prompts you, enter the product key.
10. Select Windows Server 2012 R2 Datacenter (Server with a GUI), and click Next.
11. Check I accept the license terms, and click Next.
12. Click Custom: Install Windows only (advanced).
13. Select Drive 0 Unallocated Space, and click Next, at which point Windows begins automatically, and restarts automatically after completing.

14. When the Settings page appears, fill in the Password and Reenter Password fields with the same password.
15. Log in with the password you set up previously.

Configuring Windows Update

1. In the left pane of the Server Manager window, click Local Server.
2. In the main frame, next to Windows Update, click Not configured.
3. In the Windows Update window, in the main pane, click Let me choose my settings.
4. Under Important updates, select Never check for updates (not recommended), and click OK.
5. In the left pane, click Check for updates, and install all available updates.
6. Close the Windows Update window.

Installing Hyper-V and creating virtual machines

1. Log in to the Windows Server 2012 R2 server.
2. Open Server Management and click on Manage.
3. Click on Add roles and Features.
4. Under Installation type, select Role-based, and click Next.
5. Select the local system, and click Next.
6. Select the Hyper-V roles, and click Next.
7. Select Add features, and click Next.
8. Choose a port for the virtual switch and click Next.
9. Choose whether or not you want to add live migration capabilities, and click Next.
10. Set the default storage, and click Next.
11. Check the box for automatic restart, and click Install.

Creating a new virtual machine

1. Open the Hyper-V manager.
2. Right-click the host server, and choose New→Virtual Machine.
3. Click Next on the Before You Begin screen.
4. Name the VM (DC1 for the first VM, and then CommCe111 and ComCe112 for the next two), and choose the storage option. Click Next.
5. Choose Generation 2, and click Next.
6. Enter 16384 MB for the startup memory, and click Next.
7. Choose the network connection, and click Next.
8. Choose 40 GB for the disk size, and click Next.
9. Choose Install an operating system later, and click Next.
10. Click Finish.
11. When the VM has been created, right-click the VM and choose Settings...
12. Change the number of processors to 8, and click Apply.
13. Click on the SCSI Controller, highlight Hard Drive, and click Add.
14. Choose Virtual hard disk, and click New.
15. Click Next on the Before You Begin screen.
16. Choose Fixed size, and click Next.
17. Name the HDD Database, and choose a volume for the location. Click Next.
18. Set the size to 100 GB, and click Next.
19. Click Finish.
20. Install Windows Server 2012 R2 and updates on the VM following the same steps outlined in previous sections.
21. Repeat steps 1-20 until you have created three Windows Server 2012 R2 VMs (named DC1, CommCe111, and CommCe112).

Installing Active Directory, DNS, and DHCP services on DC1

1. Open Server Manager, and click Add Roles and Features.
2. At the Before you begin screen, click Next.
3. Select Role-based or Feature based Installation, and click Next.
4. Click Active Directory Domain Services, and click Next.
5. Click Add Features, and click Next.
6. Click Next, and click Install.
7. In Server Manager, click AD DS.
8. Next to Configuration required for Active Directory Domain Services, click More...
9. Click Promote this server to a domain controller...
10. Click Add a New Forest, type `domain` for the root domain name, and click Next.
11. Leave the forest and domain levels at Windows Server 2012, enter a DSRM password, and click Next.
12. Ignore the DNS root delegation message, and click Next.
13. Leave the default NETBIOS name, and click Next.
14. Leave the default paths for AD database, log files, and SYSVOL, and click Next.
15. Leave the Review Options as default, and click Next.
16. Click Install.
17. Log on as `<domain\administrator>`
18. Open Server Manager.
19. Run `dnsmgmt.msc`.
20. Create a reverse lookup zone for DC1.

Configuring the Windows time service on DC1

To ensure reliable time, we pointed our Active Directory server to a physical NTP server.

1. Open a command prompt.
2. Type the following:

```
W32tm /config /syncfromflags:manual /manualpeerlist:"<ip address of a NTP server>"
W32tm /config /reliable:yes
W32tm /config /update
W32tm /resync
Net stop w32time
Net start w32time
```

Setting up DHCP services on DC1

1. Open Server Manager, and click Add Roles and Features.
2. At the Before You Begin screen, click Next.
3. Select Role-based or Feature-based installation, and click Next.
4. Select DC1, and click Next.
5. Select DHCP server, and click Add Features.
6. For Validation, click Continue, and click Next.
7. Do not add any additional features, and click Install.
8. Click Server Manager→Tools→DHCP.
9. Select DHCP Server, and click Next.
10. At the Introduction to DHCP Server screen, click Next.
11. At the Specify IPv4 DNS Settings screen, type `domain.local` for the parent domain.
12. Type the preferred DNS server IPv4 address, and click Next.
13. At the Specify IPv4 WINS Server Settings screen, select WINS is not required for applications on the network, and

click Next.

14. At the Add or Edit DHCP Scopes screen, click Add.
15. At the Add Scope screen, enter the Name DHCP Scope name.
16. In the next box, set the following values, and click OK.
 - Start IP address = <your address range start>
 - End IP address = <your address range end>
 - Subnet mask = <your subnet mask>
17. Check the Activate This Scope box.
18. At the Add or Edit DHCP Scopes screen, click Next.
19. Click the Enable DHCP v6 Stateless Mode radio button, and click Next.
20. Leave the default IPv6 DNS Settings, and click Next.
21. At the Authorize DHCP server dialog box, select Use current credentials.
22. At the Confirm Installation Selections screen, click Next. If the installation is set up correctly, a screen displays saying that DHCP server install succeeded.
23. Click Close.

Configuring the industry-leading deduplication appliance

On our infrastructure server, we created two Simpana® CommCell® instances and added six media servers to each. We installed the Media Agent role and Windows file system components to each of the media servers. Once completed, we created a dedicated disk library for each media server and configured each media subclient and storage policy to back up the D:\data directory on each server. We intentionally disabled software compression and deduplication. We installed and set up the industry-leading deduplication appliance and its relevant software in accordance with best practices.

Installing CommVault® Simpana® on the master CommCell servers (CommCell1 and CommCell2)

1. Log on to CommCell1 as administrator.
2. Join the domain.local domain and reboot.
3. Log on as <domain\administrator>.
4. Provide the CommVault Simpana installation media to the VM to be used as the Media Agent and CommCell Console host.
5. Launch the Simpana installer.
6. Accept the terms of the license agreement, and click Next.
7. Select Install Packages, and click Next.
8. Select Standard, and click Next.
9. Select Create a New CommCell, and click Next.
10. Uncheck the MediaAgent box, and click Next.
11. Click Next.
12. Click Install.
13. Select a database path, and click Next.
14. Select Create a New Database, and click Next.
15. Enter and confirm an administrator password, and click Next.
16. Click Next.
17. If asked to wait for the software cache creation to complete, click Yes.
18. When installation completes, click Finish.
19. When the Connect to CommCell window appears, enter your administrator credentials and click OK.
20. Repeat steps 1-20 on CommCell2.

Updating and configuring CommVault Simpana

1. In the CommCell Console of CommCell1, click Initial CommCell Configuration in the Getting Started tab.
2. Click Download Software.
3. Check the boxes for Download Packages and the Windows options, and click OK.
4. When updates complete, click the Add Active Directory button in the Getting Started tab.
5. Provide the NetBIOS Name and Domain Name, and click Edit.
6. Enter the domain administrator credentials and click OK.
7. Click OK.
8. Click Configure Storage in the Getting Started tab.
9. Click Add Disk Storage under Configure Storage Devices.
10. Provide a name and the appropriate connection information for the DR6000's disk library, and click OK.
11. Repeat steps 1-10 on CommCell2 to complete the updates on both CommCell instances.

Setting up media servers on the Dell PowerEdge R815

Each of our media servers had one 300GB SAS disk (C:\) and one 400GB SATA SSD (D:\). We installed Windows Server 2012 R2 on each server's C:\ partition and built our data on the D:\ partition. We then installed Microsoft Server 2012 R2 Datacenter Edition on the C:\ partition.

Setting up the Dell PowerEdge M620

1. Power on the server, and press Ctrl+R to enter the RAID controller configuration.
2. Select the local PERC H310 Mini controller.
3. Press F2 to create a new virtual disk, and select the 600GB disk.
 - RAID-0
 - VD name: OS
4. Click Advanced, and select Initialize.
5. Click OK.
6. Press F2 to create a new virtual disk and select the 400GB disk.
 - RAID-0
 - VD name: Data
7. Reboot the server.
8. Install Microsoft Windows Server Datacenter Edition (see the section of this methodology titled Installing Microsoft Windows Server 2012 R2 Datacenter Edition).
9. Join the <domain.local> domain.
10. Reboot.
11. Log on as <domain\administrator>
12. In the Server Manager window, click Tools, and click Computer Management.
13. In the left pane, click Disk Management.
14. Right-click the shaded area, and click New Simple Volume.
15. On the New Simple Volume Wizard that pops up, click Next.
16. Select a size (maximum, for all volumes), and click Next.
17. Assign a drive letter (D:\), and click Next.
18. Click Finish.
19. Repeat 1-18 on all 12 media servers.

Install CommVault Simpana on 12 media servers

1. Log on to the CommCell1 server.
2. Click the Getting Started tab.
3. Click Configure Agents.

4. Click Add File System Client.
5. In the Install wizard, click Next
6. Select Windows, and click next.
7. Select Manually select computers, and click Next.
8. Click on Import from active directory.
9. Enter the server name of the AD server and credentials, and click OK.
10. Select the media servers 1-6 that CommVault Simpana will install, and click Add.
11. Enter the domain administrator's account, and click Next.
12. Select packages to install, and click Next:
13. Media Agent
14. File System Core
15. File system
16. VSS Provider
17. Leave the storage policy to use and blank, and click Next.
18. Leave additional install options as defaults, and click Next.
19. Leave optional Settings as defaults, and click Next.
20. Leave firewall configuration as defaults, and click Next.
21. Click immediate to finish the install.
22. Log on to CommCell2 and repeat steps 1-17 for media servers 7-12.

Setting up Dell Rapid CIFS on 12 media servers

1. Log on to media server 1.
2. Download the Dell Rapid CIFS plugin installer.
3. Press the Windows key, type `cmd.exe`, right-click the Command Prompt icon, and click Run as Administrator.
4. Navigate in the command prompt to the folder to which the installer was downloaded.
5. Run the DellRapidCIFS-XXXXXX.msi file.
6. When the setup wizard appears, click Next.
7. Accept the terms of the license agreement, and click Next.
8. Click Install.
9. Click Finish.
10. In a browser, navigate to the IP address of the DR6000, and log in with the administrator credentials.
11. Click the Container Statistics menu on the left, and scroll down to the CIFS Connection Configuration box.
12. To check that the Rapid CIFS plug-in is working properly, ensure the CIFS Write Accelerator item is listed as active.
13. Repeat steps 1-12 on all 12 servers.

Creating 12 CommVault virtual libraries on the 12 media agent servers

1. In CommCell, open Storage Resources→Libraries.
2. Right-click and select add→ Disk Library...
3. Enter the following attributes:
 - Name: Lib1
 - Connect As: <domain\administrator>
 - Password: <password>
 - Folder: <\\ipaddress of the appliance\lib1>
4. Repeat steps 1-3 to create Lib2-Lib12.

Optimizing libraries for unbuffered I/O

1. In CommCell, open Storage Resources→Libraries.

2. Expand lib1 and select the data path <\\ip address of appliance\lib1>.
3. Right-click the data path and select properties.
4. Check the box to use unbuffered I/O.
5. Click OK.
6. Repeat steps 1-5 for Lib2-Lib12.

Creating storage policies for each the media servers

1. In the CommCell Open Policies→Storage policies, right-click New Storage Policy.
2. Click Add Storage Policy.
3. When the Create Storage Policy Wizard appears, select Data Protection and Archiving, click Next.
4. Provide a name for the storage policy, and click Next.
5. Select Lib1 library, and click Next.
6. Select server1 as the MediaAgent associated, and click Next.
7. Select a number of device streams, and click Next.
8. For deduplication, deselect yes to disable CommVault client-side deduplication, and click Next.
9. Click Finish.
10. Repeat steps 1-9 to create a storage policy for each of the 12 media servers.

Configuring subclients and storage policies on each media server

1. In the CommCell1 CommCell Browser, check the Client Computers.
2. Expand the first of the Client Computers, select server1, expand its file system, right-click on defaultBackupSet, and select Properties.
3. In the Content tab, click Browse.
4. Select D:\data, and click Add. Click Close when finished.
5. In the Storage Device tab:
 - In the Data Storage Policy subtab, select the Lib1 storage policy.
 - In the Data transfer Option subtab, turn soft compression to off and increase the network agents from 2 to 4.
 - In the Deduplication subtab, uncheck the checkbox next to Enable Duplication.
6. In Advanced Options, change the number of Data Readers from 2 to 8, and check the box next to the option Allow multiple data readers within a drive or mount point. Click OK.
7. Repeat steps 1-6 to configure backup jobs on all 12 media servers.

Testing

Our testing consisted of seven parts—the first three were preparation, the last three were to reset the environment.

5. Corpus creation on each media server, 100 percent unique data (run unique.bat; see [Appendix D](#))
6. Running a scheduled backup on media servers, 100 percent unique data
7. Corpus alteration on each media server to 90 percent duplicate data (run 10p_change.bat; see [Appendix D](#))
8. Running a scheduled backup on media servers, 90 percent duplicate data
9. Deletion of backup data
10. Industry-leading deduplication appliance data aging
11. Deduplication appliance cleaning job

We recorded throughput numbers from both CommCells for step 4 and created our total throughput numbers for both appliances.

Running a scheduled backup on media server

12. Log on to CommCell1.
13. Browse to client computers→slot1→file System→DefaulBackupset, right-click default, and select Backup.
14. Select Full, schedule, and click Configure.
15. For schedule, select One time, select the time and date to run the backup, and click OK.
16. Click OK to commit the job.
17. Repeat steps 1-5 on CommCell 1 and 2 to create 12 backup jobs to run at the same time.

Deleting backup data

18. Browse to Storage Resources → Libraries→lib1→ right-click \\ipaddress\lib1, and select Delete all contents.
19. Repeat step 1 on libs 1-12 on CommCell 1 and 2.

Running Data Aging

20. Log on to CommCell1.
21. Right-click CommCell1, and select All tasks→ Data Aging.
22. To run the job immediately, click OK.
23. Click Job Controller to monitor the progress.
24. Repeat steps 1-4 on CommCell 2.

Schedule cleaning on the DR6000 and the industry-leading deduplication appliance

After we deleted our backup data, we ran a cleaning job on both backup targets.

25. Log on to the DR6000 web UI as <domain\administrator>
26. Select Schedules → Cleaner Schedule.
27. Select Run now.
28. Wait until the cleaning job becomes idle to proceed.

APPENDIX D – FILE CORPUS CREATION BAT SCRIPTS

We needed two bat scripts to get an approximately 90 percent duplicate ratio between jobs. Each server needed an integer that was distinct from that of the other server at runtime. The script prompted us to enter the integer. We used the server number for each server to ensure no duplicate files were created across the 10 servers. For example, on server 1, we entered 1 for unique.bat and 10p_change.bat, and for server 2, we entered 2 for both unique.bat and 10p_change.bat.

unique.bat

```
~~~~~begin~~~~~
set /p slot=""
del d:\data\*.data* /s
for /l %%G in (1,1,350) do (
    cmd/c "d:\data\ddt.exe op=write threads=1
filename=d:\data\%computername%.data%%G filesize=1024 blocksize=256 dup-
percentage=0 dup-distribution=cyclic buffering=direct io=sequential
contents=binary seed=%slot%%G verbose-results=yes" )
~~~~~END~~~~~
```

10p_change.bat

```
~~~~~begin~~~~~
set /p slot=""
del d:\data\*.data* /s
for /l %%G in (1,1,350) do (
    cmd/c "d:\data\ddt.exe op=write threads=1
filename=d:\data\%computername%.data%%G filesize=1024 blocksize=256 dup-
percentage=90 dup-distribution=cyclic buffering=direct io=sequential
contents=binary seed=%slot%%G same-perc-distr=90 verbose-results=yes"
)
~~~~~END~~~~~
```

ABOUT PRINCIPLED TECHNOLOGIES



Principled Technologies, Inc.
1007 Slater Road, Suite 300
Durham, NC, 27703
www.principledtechnologies.com

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

Principled Technologies is a registered trademark of Principled Technologies, Inc.
All other product names are the trademarks of their respective owners.

Disclaimer of Warranties; Limitation of Liability:

PRINCIPLED TECHNOLOGIES, INC. HAS MADE REASONABLE EFFORTS TO ENSURE THE ACCURACY AND VALIDITY OF ITS TESTING, HOWEVER, PRINCIPLED TECHNOLOGIES, INC. SPECIFICALLY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, RELATING TO THE TEST RESULTS AND ANALYSIS, THEIR ACCURACY, COMPLETENESS OR QUALITY, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE. ALL PERSONS OR ENTITIES RELYING ON THE RESULTS OF ANY TESTING DO SO AT THEIR OWN RISK, AND AGREE THAT PRINCIPLED TECHNOLOGIES, INC., ITS EMPLOYEES AND ITS SUBCONTRACTORS SHALL HAVE NO LIABILITY WHATSOEVER FROM ANY CLAIM OF LOSS OR DAMAGE ON ACCOUNT OF ANY ALLEGED ERROR OR DEFECT IN ANY TESTING PROCEDURE OR RESULT.

IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC. BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS TESTING, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC.'S LIABILITY, INCLUDING FOR DIRECT DAMAGES, EXCEED THE AMOUNTS PAID IN CONNECTION WITH PRINCIPLED TECHNOLOGIES, INC.'S TESTING. CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES ARE AS SET FORTH HEREIN.
