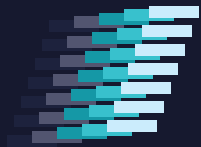## Dell PowerProtect Data Manager with Transparent Snapshots
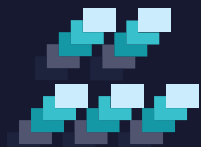
Backed up 1,000 VMs in **43% less time***

Completed 7 days of incremental backups in **75% less time***

Restored one large VM in **56% less time***

Completed a restore of five large VMs in **51% less time***

*compared to the Vendor X solution with VADP NBD

Reduce time to complete backups and restores with Transparent Snapshots with Dell PowerProtect Data Manager

Compared to a competitor solution, Transparent Snapshots Data Mover (TSDM) took less time to perform incremental backups and restore data from a backup on VMware VMs

Each day, your organization's apps and users generate data that keep your critical operations running. Routinely backing up this data can mitigate risk of data loss or corruption. While backups are standard practice among security-minded organizations, they can also come with a downside: If data is unavailable during a backup window, users might experience interruptions to productivity when trying to complete their everyday work. A faster data protection solution, such as Dell PowerProtect Data Manager with Transparent Snapshots, could help reduce time to complete those routine backups and—in the event of a problem—restore data from a backup.

In our tests, we ran an incremental backup scenario and a restore scenario on two data protection solutions:

- Dell PowerProtect Data Manager with Transparent Snapshots

- A similarly sized solution from a key competitor ("Vendor X") using their management software and the VMware® vStorage API for Data Protection (VADP) network block device (NBD) transport mode

We found that Transparent Snapshots with PowerProtect Data Manager backed up and restored virtual machines (VMs) in less time than the Vendor X solution with NBD.

About Transparent Snapshots

Transparent Snapshots creates consistent VM backup copies and sends them to the backup storage in conjunction with PowerProtect Data Manager. Transparent Snapshots follows this general lifecycle to create backups:

Change monitoring
Transparent Snapshots monitors VMs and lists changes that have occurred since the previous snapshot

Snapshot processing
Transparent Snapshots sends the list of changes to PowerProtect Data Domain

Snapshot release
Transparent Snapshots removes temporary data blocks and the list of changes it created

Dell introduced Transparent Snapshots in PowerProtect Data Manager 19.9. According to Dell, "Transparent Snapshots simplifies VM image backups for near-zero impact to your VM or VM resources by backing up the VMs without having to suspend and resume the VM workload to be backed up. Transparent Snapshots works with any VMware-supported storage. Transparent Snapshots innovation increases backup performance, lowers costs, simplifies management and reduces the risk of data loss."[1]

How we tested

We ran all tests remotely, and had full control over and unfettered access to the testbeds. Both PowerProtect Data Manager and the Vendor X solution were physically located in an offsite data center lab.

On each solution, we captured an initial backup of 1,000 VMs, then simulated seven days of typical operations on those 1,000 VMs, including data changes such as file system and database updates and real backup operations. We used a mix of operating systems and various VM sizes, with most VMs being 130 GB, 136 GB, or 139 GB. This scenario mirrors an organization that performs incremental backups each day of the week, copying only the data that users have changed or created since the previous backup. We also performed an incremental backup and restore on a single large VM and five large VMs.

We first ran this scenario on PowerProtect Data Manager with TSDM, and then ran the scenario on the Vendor X solution, which uses the VADP framework with the NBD transport mode.

Complete large backups in less time

Backups are vital for any large organization, and they all begin with an initial backup, or ingest, of the hosted VMs. The faster a solution can back up a large number of VMs, the sooner vital data is protected and production workloads can resume unfettered.

We completed an ingest of 1,000 VMs on the backup solutions to see which offered the fastest path to finish a large initial backup (logically 130TB). As Figure 1 shows, Dell PowerProtect Data Manager with TSDM was able to complete the ingestion within a single overnight backup window, while the Vendor X solution was not. PowerProtect Data Manager with TSDM completed the 1,000-VM backup in 43 percent less time than the Vendor X solution.

Time to back up 1,000 VMs
Time (hh:mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
10:02:51

Vendor X with NBD
17:44:54

Backed up
1,000 VMs in
43% less time

Figure 1: Time required for each solution to complete an initial backup of 1,000 VMs of various sizes. Lower is better. Source: Principled Technologies.

About Dell PowerProtect Data Manager

We managed the PowerProtect Data Domain with PowerProtect Data Manager. In addition to the VM backup capabilities that we tested, Dell claims that PowerProtect Data Manager "provides software defined data protection, automated discovery, deduplication, operational agility, self-service and IT governance for physical, virtual and cloud environments." To learn more about PowerProtect Data Manager, visit https://www.dell.com/en-us/dt/data-protection/powerprotect-data-manager.htm.[4]

Save time on incremental backups

Planning backup windows can be a challenge, particularly for companies with users or customers across many time zones. Incremental backups back up only the data that has changed since the last snapshot, enabling backups to complete more quickly and minimizing the risk of downtime around them. If catastrophe occurs and the organization must rely on their backups, these incremental backups also allow IT to recover data from closer to the time of the outage, helping to get up and running with less business disruption. With incremental backups, as with any backup, faster is better.

After the initial backup of 1,000 VMs (see Figure 1), we simulated seven days of incremental backups and measured the total time those backups required across the seven days. As Figure 2 shows, when we used TSDM with PowerProtect Data Manager, the backups took 75 percent less total time to back up the data than the Vendor X solution with NBD.

Time to complete seven days of incremental backups
Time (hh:mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
4:15:32

Vendor X with NBD
17:38:15

Completed 7 days of incremental backups in
75% less time

Figure 2: Time required for each solution to complete seven days of incremental backups on 1,000 VMs of various sizes. Lower is better. Source: Principled Technologies.

Note: Because Figures 1 and 2 depict times greater than an hour, they use a different scale than the rest of the figures in this paper. Please be mindful of each figure's data range as you read.

Lower overall performance impact during backups

Even though VADP-based backups use snapshots, these activities running on the virtualized server host will inevitably require some storage resources. This means that during backup windows, the backup process could tie up key disk resources in use by your workloads, increasing disk latency and hurting performance. Thus, the shorter the backup window and the lower the overall performance impact, the better.

During the backup of the single VM, we used Perfmon running inside the individual Windows Server VM to capture disk performance metrics. This provides a view of how the VM is responding to the resource pressure from backup activities. We found that PowerProtect Data Manager with TSDM had a significantly smaller impact on latency than the Vendor X solution with NBD (see Table 1).

At the same time, workload throughput results, which we measured as IOPS within the VM running the open-source DISKSPD utility workload, are higher for the VM simultaneously backing up data with PowerProtect Data Manager with TSDM because the resources the backup used didn't unduly inhibit workload performance. Note that Table 1 includes the average IOPS and latency results for the VM running the workload and that each solution is backing up; for full results, including the minimum and maximum IOPS and latency during each solution's backup window, see the science behind the report

.

Table 1: Average disk activity, in throughput (IOPS) and latency (ms), of a single 136GB VM being backed up by each solution. Higher is better for throughput; lower is better for latency. Source: Principled Technologies.

	Dell PowerProtect Data Manager with TSDM	Vendor X with NBD	Percent win with TSDM	TSDM provided:
Average latency (ms)	0.305	1.466	79.1%	Faster response times
Average read IOPS	9,471	2,524	275.2%	Better continued workload performance during backup
Average write IOPS	3,165	844	274.8%	Better continued workload performance during backup

Figure 3 shows the IOPS activity for both solutions over the1 hour 25 minutes we captured before, during, and after backup of the single 136GB VM. Dell PowerProtect Data Manager with Transparent Snapshots maintained consistent throughput, even when completing backup activities. In contrast, the Vendor X solution with NBD was unable to maintain its workload performance while backing up the VM, as IOPS plummeted.
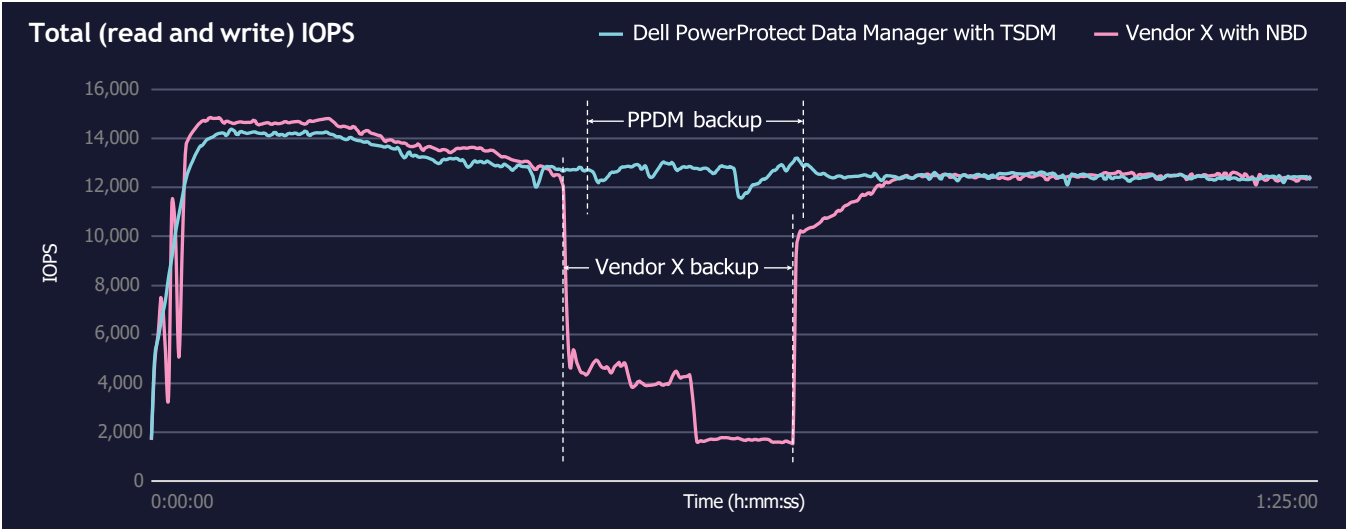

Figure 3: Throughput, in IOPS, for both solutions before, during, and after a backup. Note: These backups did not run concurrently, but are plotted on the same graph for ease of comparison. Higher is better. Source: Principled Technologies.

Restore data faster after an incident

Recovery is the other side of the backup coin—when disaster strikes, how quickly can you use your backups to get your systems up and running? The loss of access to data and applications can quickly turn into the loss of customers and revenue. First, we backed up both a single VM and five VMs. (To see backup times for these tests, visit the science behind the report.) Then, we tested how long it took to restore a single large VM (530GB) and five large VMs (530GB each) with each solution, first restoring the VM to a PowerMax array and then to a PowerStore array. We performed the restore to two different arrays to ensure that we were highlighting the performance of the software solutions under test rather than the target storage, and to provide both an enterprise-level and midrange storage option.

When we restored the VM to a PowerMax array, the restore required only eight minutes and 38 seconds with PowerProtect Data Manager with TSDM—52 percent less time than NBD on the Vendor X solution (see Figure 4). The speed of each solution was similar when we restored the VM to the PowerStore array. There, PowerProtect Data Manager with TSDM took less than 10 minutes to perform the restore—56 percent less time than the Vendor X solution (see Figure 5).

Time to complete a restore of one large VM to a PowerMax array
Time (mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
08:38

Vendor X with NBD
18:18

Restored one large VM in 52% less time

Figure 4: Time required for each solution to restore a single 530GB VM to a Dell PowerMax array. Lower is better.
Source: Principled Technologies.

Time to complete a restore of one large VM to a PowerStore array
Time (mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
09:40

Vendor X with NBD
22:19

Restored one large VM in 56% less time

Figure 5: Time required for each solution to restore a single 530GB VM to a Dell PowerStore array. Lower is better.
Source: Principled Technologies.

When we restored five large VMs using each solution, we found similar differences in performance. As Figure 6 shows, when restoring to the PowerMax array, PowerProtect Data Manager with TSDM took 51 percent less time than the Vendor X solution.

Time to restore five large VMs to a PowerMax array

Time (mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
16:37

Vendor X with NBD
34:32

Restored five large VMs in **51% less time**

Figure 6: Time required for each solution to complete a restore of five 530GB VMs to a PowerMax array. Lower is better.
Source: Principled Technologies.

For the five-VM restore on the PowerStore array, PowerProtect Data Manager with TSDM took 46 percent less time than the Vendor X solution using NBD (see Figure 7).

Time to restore five large VMs to a PowerStore array

Time (mm:ss) | Less time is better

Dell PowerProtect Data Manager with TSDM
26:05

Vendor X with NBD
49:11

Restored five large VMs in **46% less time**

Figure 7: Time required for each solution to complete a restore of five 530GB VMs to a PowerStore array. Lower is better.
Source: Principled Technologies.

These results show that Dell PowerProtect Data Manager with TSDM was able to consistently restore VMs quickly to both midrange and enterprise-level storage.

About Dell PowerProtect Data Domain

In our testing, we used Dell PowerProtect Data Manager on Dell PowerProtect Data Domain. According to Dell, their data protection software and appliances are purpose-built backup solutions designed to be "your one stop for proven and modern data protection."

We tested using PowerProtect Data Manager v19.10 and the PowerProtect DD6900 appliance. The appliance is part of Data Domain, which is "the preferred target appliance for Dell PowerProtect Data Manager" and, according to Dell, "enables your organization to protect, manage and recover data at scale."[3]

Conclusion

Unplanned outages can be catastrophic to a business. McKinsey reports that one software company took an 8% revenue hit after a service outage, while a multi-day outage lost a bank $10M.[5] Backups, therefore, are vital for any large or growing business, and faster backups and restores can make for fewer interruptions in regular operations as well as faster recovery in the event of an outage.

In our testing, we saw Dell PowerProtect Data Manager with Transparent Snapshots deliver faster incremental backups and a faster VM restore than a competitive solution using a traditional transport mode (NBD). In an ideal world, you'd never have to rely on your backups—but if you do, these results indicate that Dell PowerProtect Data Manager with Transparent Snapshots could help your business recover more quickly.

1. PowerProtect Data Manager, accessed May 20, 2022,
   https://www.dell.com/en-us/dt/data-protection/powerprotect-data-manager.htm.
2. Dell PowerProtect Data Domain and software, accessed May 20, 2022,
   https://www.dell.com/en-us/dt/data-protection/index.htm.
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   https://www.dell.com/en-us/dt/data-protection/powerprotect-backup-dd-appliances/powerprotect-dd-backup-appliances.htm.
4. PowerProtect Data Manager.
5. Himanshu Agarwal, Ritesh Agarwal, Basel Kayyali, and Dan Stephens, "Four ways to improve technology service resiliency," accessed May 23, 2022, https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/four-ways-to-improve-technology-service-resiliency.

Read the science behind this report at https://facts.pt/Pm3eU7f ►

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