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Protecting VM Backup at Scale With Dell Technologies

Christophe Bertrand, Practice Director; and Jen Duey, Economic Validation Analyst

Abstract: Traditional virtual machine (VM) backup methods have been available for many years but often present challenges, and until now, alternative approaches have amounted to stopgap solutions. They could not meet all the requirements of scaling with performance, forcing organizations to accept tradeoffs. To solve this, Dell Technologies developed Transparent Snapshots, an innovation that is available with Dell PowerProtect Data Manager. By integrating with VMware by Broadcom products, Transparent Snapshots simplifies the way rapidly growing VMs can be protected, at scale, in today's highly transactional, data-intensive workload environments.

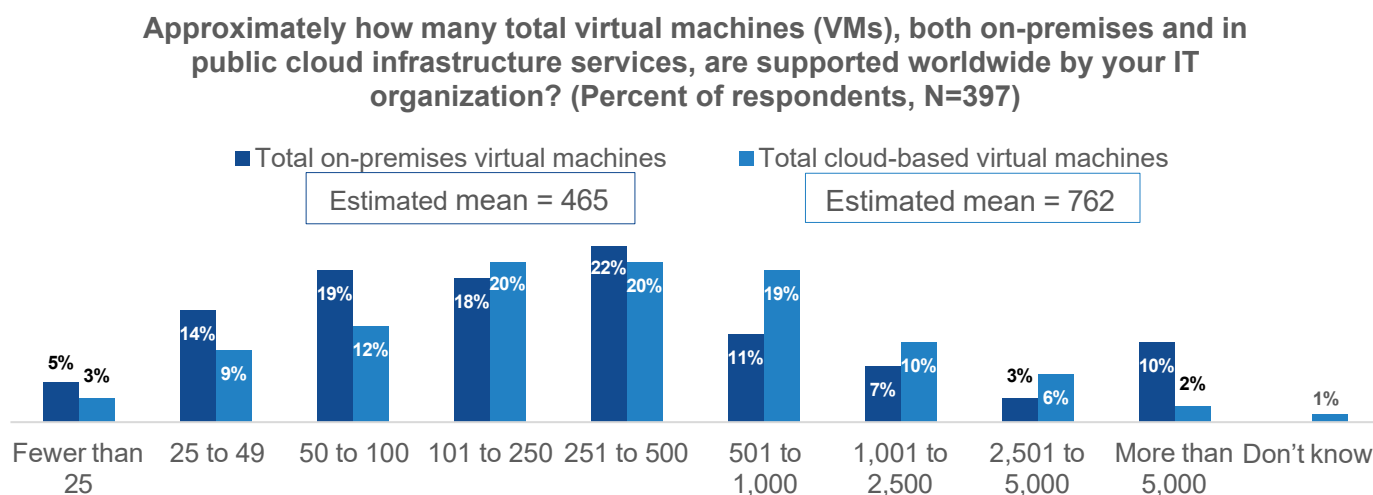
Why Traditional VM Backup Methods Fall Short

Market Dynamics

In our data-driven world, where we risk falling prey to cyberthreats or data loss events, IT complexity is not improving. In 2023, 53% of organizations reported that their IT environment is more complex—18% said it is significantly more complex—than two years ago.¹

This translates into organizations having to manage and protect a plethora of VMs. TechTarget's Enterprise Strategy Group research indicates that the average number of VMs on premises is 465, but in the cloud, the average number of VMs is 762; 10% of organizations report having more than 5,000 VMs on premises (see Figure 1).² These are significant numbers!

Figure 1. Number of VMs Supported by IT Organizations



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

¹ Source: Enterprise Strategy Group Research Report, [2023 Technology Spending Intentions Survey](#), November 2022.

² Source: Enterprise Strategy Group Research Report, [Cloud Data Protection Strategies at a Crossroads](#), August 2023.

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With petabytes of mission-critical data hosted on VMs against a backdrop of increased ransomware attacks, protecting these VMs effectively and efficiently has never been more critical.

A Little History

When VMware first introduced VMs, everybody backed them up using a physical agent-based backup approach. Then, in 2009, VMware came out with VMware APIs for Data Protection (VADP). That advancement enabled image-based backups with dynamic policies.

Since 2009, however, there hasn't been a lot of innovation regarding protecting VMs. Everybody's still leveraging the same APIs to create image-based backups. This is unfortunate because data in VM-based workloads has grown rampantly.

Some organizations tried to leverage snapshot-based protection via storage array integration, but they still faced challenges in maintaining acceptable performance at scale. Cost issues and management difficulties arose. Other organizations have tried leveraging journaling and continuous data protection (CDP) technologies to meet tight service-level agreements (SLAs). That approach narrowed their operational recovery windows.

The bottom line is that organizations maintaining big or fast-growing VMware environments have trouble backing up large numbers of VMs and large individual VMs. Notably, the mission-critical VMs these organizations are trying to protect with legacy technology, such as VADP, are predominantly on premises. Regardless, it makes little sense today to use the same technology that existed more than ten years ago to do backups and still hope to meet SLA windows. This is why organizations have faced what seems like an impossible data protection trade-off: Either compromise production performance or give up on meeting established backup-related service-level metrics.

Companies run into backup window issues when their VM environments grow large...or fast. That's because they are doing a lot of deltas (i.e., backing up changed data). Performance issues in the production environment often ensue. The performance-impact problem has become so severe that many organizations have been forced to revert to an agent-based backup, avoiding image-based VADP backup. But then they lose their dynamic policies. They're essentially back to using an approach not from 2009, but from 2003.

That's one of the reasons it is such a promising development that Dell has figured out how to help organizations avoid performance impacts to their environments yet still achieve a remarkably more straightforward, far less intrusive way to do image-based backups and granular-level recoveries—*all at a massive scale*.

Transparent Snapshots: The Preferred Solution

Who Needs It?

Most organizations really should consider leveraging newer VM backup technology, especially midmarket organizations that typically have smaller IT staffs. Those organizations have been growing their VM environments at a very fast pace—sometimes doubling the number of VMs every year—and they are encountering issues. Very large organizations with thousands of on-premises VM deployments are also a natural fit and certainly would benefit from a better backup approach.

How It Works

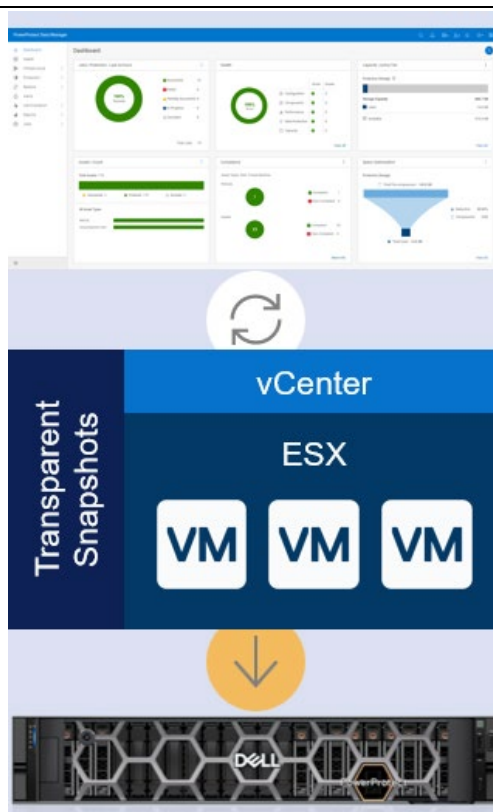
The approach that Dell takes centers not on an API but instead on a new ESX plugin called Transparent Snapshots (see Figure 2). Certified by VMware by Broadcom, Transparent Snapshots performs lightweight monitoring of VMs, capturing deltas as they occur. In this manner, when Data Manager asks for a backup, it receives that list of the deltas directly. Because Transparent Snapshots is part of the ESX layer, it directly reads the VMs' disks to obtain those deltas, sending them via plugin directly to PowerProtect Data Domain.

This is a no-compromise solution. The performance benefits of Data Domain remain available, as Dell has embedded them in the DD Boost library. And all the benefits of external proxies are part of Transparent Snapshots. Client-side deduplication and compression are both part of the data movement inside the ESX plugin. Dell claims up to 5x faster backups and up to 6x faster restores.³

The result is that all deltas are captured, as with a traditional image backup, without affecting latency or slowing down the application to the point where it would cause a backlog. Dell claims this results in up to a 5x reduction in VM latency.⁴ It has a near-zero impact on VMs and ESX overhead. In other words, data is backed up without business disruption.

Best of all, IT doesn't have to do anything regarding managing the deployment. Simplicity is a major hallmark of this solution. It's automatically placed on new ESX hosts without any additional work. No reboot is required on ESX. There is no maintenance mode either. As VMs are added and must be protected, Data Manager ensures that deployment and security occur.

Figure 2. ESX Integration for Transparent Snapshots



Source: Dell Technologies

This solution also eliminates the need to deal with proxies for data movement. The IT organization does not have to be concerned with how many proxies they need to deploy when placing a certain number of VMs on an ESX host.

Since no proxies are required, the amount of server hardware is significantly reduced, leading to significant cost savings and simplification of hardware, floor space, power, etc. due to the reduced complexity and management

³ Source: Dell Technologies. Results not audited by Enterprise Strategy Group.

⁴ Ibid.

required. Alternatively, it gives organizations the choice, flexibility, and option to deploy those server resources elsewhere.

And because of the new, lightweight monitoring, backups happen without impact to VMs or ESX, precisely because of the new, continuous in-memory delta that the solution leverages as part of the plugin.

Transparent Snapshots is both storage agnostic and also available with [Dell PowerProtect Data Manager](#). It is able to perform at a granular VM level, and the plugin is also deployed automatically as part of PowerProtect Data Manager. Transparent Snapshots does not require IT teams to buy expensive flash storage to leverage storage-array snaps to get around the performance challenges seen with traditional VADP. Transparent Snapshots can also target single VMs for backup, eliminating the involvement of other VMs, thus avoiding impacts on the entire environment to protect a single virtual machine. In addition, it features direct data movement to PowerProtect Data Domain, further enhancing operational efficiency and making SLAs easier to meet.

Measuring Economic Performance

Enterprise Strategy Group reviewed an economic model created by Dell to compare the infrastructure cost of backing up virtualized environments using VMware VADP to the cost of using Transparent Snapshots. The model uses a simple yet detailed formula to calculate the number of vCenters and ESX hosts required to support a volume of data, then calculates the resources needed by VADP and Transparent Snapshots.

Configurable parameters include total storage to be protected, gigabytes of storage per VM, number of VMs per host, data change rate (%), backup window length (in hours), and snapshot overhead. In our analysis, we modeled environments of varying size, from 240 TB to 1.5 PB. For the calculations, we adjusted the total storage in the environment but left the remaining parameters at the defaults, as shown in Table 1. These values fit a broad range of use cases in our experience.

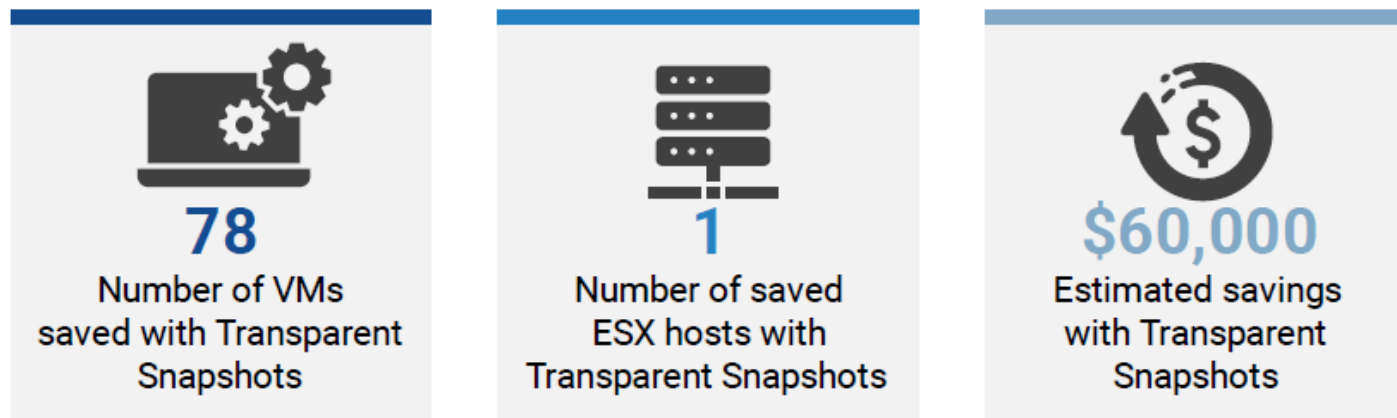
Table 1. Measurement Tool Parameters

Parameter	Value
Total VM storage to be protected	240 TB, 500 TB, 1 PB, 1.5 PB
Storage per VM	320 GB
Number of VMs per host	40 (used in all scenarios)
Data change rate	5% (used in all scenarios)
Backup window	8 hours (used in all scenarios)
Snapshot overhead	10% (used in all scenarios)

Source: Dell Technologies.

First, we modeled a small organization with 240 TB of VM data to be protected. We also modeled organizations of varying sizes based on the total storage consumption of all virtual machines in the environment.

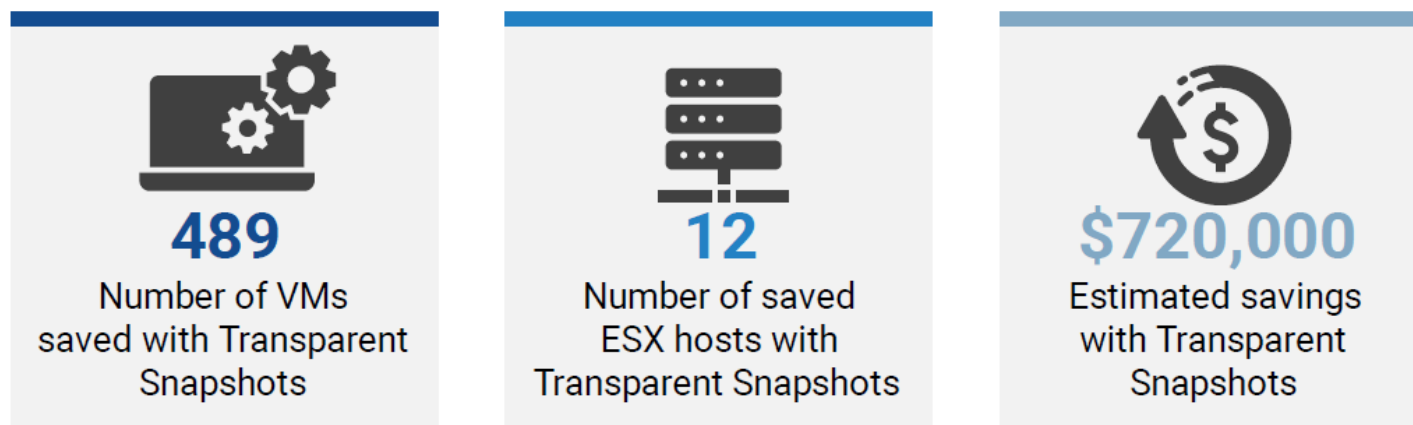
Figure 3. Transparent Snapshots Savings Impact – Small to Medium Enterprise



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

In this scenario, an organization protecting just 240 TB of data can free up a significant amount of memory and storage resources. In this case, that's enough to support 78 VMs and one ESX server, realizing a cost savings of \$60,000. Next, we scaled up our calculations to model a large enterprise, with 1.5 PB of VM data to be protected.

Figure 4. Transparent Snapshots Savings Impact – Large Enterprise



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

We found that as the amount of storage to be protected scaled, the resource savings with Transparent Snapshots scaled linearly. As seen in Figure 4, in a 1.5 PB environment, organizations can free up 489 VMs worth of resources, which equals 12 ESX hosts, realizing a cost savings of \$720,000.

In other words, an organization using Transparent Snapshots today in a virtualized environment—regardless of the amount of data to be protected—would recover significant resources, enabling them to redeploy ESX servers to run production workloads that would otherwise have been occupied running backup with VADP.

Conclusion

This integration between Dell and VMware by Broadcom is particularly unique and highly differentiated. It fundamentally changes how VM backup is performed, providing cost savings and backup and recovery performance without disruption, simply—without compromise.

With Transparent Snapshots, organizations no longer need to settle between performance and capacity, and they don't need to worry about backup-related side effects when scaling performance and capacity simultaneously. That's a benefit, even if an organization is not a large enterprise.

The benefits of Transparent Snapshots abound and center on increased resource efficiency without negative impact on VMs or ESX hosts when making a full backup. Dell claims up to 5x faster backups, up to 6x faster restores, and up to 5x reduced latency on VMs.⁵ This also translates into cost savings, enabling customers to get more from their budgets. The modeled results Enterprise Strategy Group reviewed speak for themselves.

The plugin is also deployed automatically as part of PowerProtect Data Manager, making scaling easy. Transparent Snapshots is storage agnostic and handles orchestration, direct data movement, and more. It is about the simplification of VM backups.

Most things have evolved dramatically since 2009, so why haven't image-based backups? At last, we're seeing this much-needed evolution. Transparent Snapshots is changing the way VMs are backed up by addressing disruption issues (unlike other "solutions," which don't solve the problem but rather force cost and performance trade-offs). Transparent Snapshots is the best of both worlds: large-scale image-based VM backup without business disruption. Using Transparent Snapshots is the optimal way to protect VMs.

⁵ Ibid.

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