CHALLENGE

the complexity of virtual server backup.

HP Data Protector software

Guide to virtual server protection

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"We can complete full backups in less than a day, which used to take almost a week. This new backup process has improved disaster-recovery preparedness ... [and] we no longer waste storage or server resources."

Kim Andersen, Head of Systems Administration, Vitus Bering Denmark

What's on your wish list? Being able to choose your hypervisor, select from the broadest range of options, and manage everything through one easy-to-use graphical user interface (GUI)? Avoiding a performance load on your servers and virtual machines? To achieve instantaneous, application-consistent data recovery, and frequent backups for your mission-critical applications? You can do it all with HP Data Protector software.

One of the biggest information management challenges is protecting virtual machines with frequent backups and minimal impact to the virtual infrastructure.

Today's backup challenges

Protecting data in today's complex environments is no small challenge. You must allocate scarce resources to protect data according to its relative importance to the organization.

You must cope with a narrow backup window or a slow network, or both, while maintaining high performance. And, if the worst should happen, you'll be under tremendous pressure to recover fast.

You may be driven by some tough recovery time objectives (RTO) and recovery point objectives (RPO) requiring you to:

- **Optimize cost**—when RTO and RPO are fairly low
- **Protect often**—when RPO is higher
- **Recover instantly**—when RTO is highest

Added to this, you must now also deal with virtual server backup. You know that server virtualization brings great benefits, but you also know it presents significant new challenges to data protection.

Delivering complete protection

HP Data Protector software can provide complete data protection for your virtualized environment, including support for the virtual machine and all of its application data. And you can use it with any hypervisor—Microsoft® Windows® Server 2008 Hyper-V, Microsoft Virtual Server 2005, Citrix XenServer, Sun Solaris Zones, and HP Integrity VM.

More than 37,000 customers worldwide use HP Data Protector across a wide variety of platforms and applications. It ensures that server and storage performance stays high, while covering all of your data protection needs, such as tape and disk-based backup and restore, comprehensive snapshot management, industry-leading application integration, storage capacity optimization, and centralized management.

With extremely simple and inexpensive licensing, HP Data Protector offers an outstanding performance-to-price ratio, costing up to 70 percent less than alternative solutions. Many customers report a return on investment in as little as six months, with up to a 50 percent reduction in backup total cost of ownership (TCO).

In addition, HP Data Protector, when combined with HP StorageWorks EVA, Windows XP and HP P4000 disk arrays, offers a uniquely powerful data protection solution with sophisticated snapshot management and instant recovery of data from a single, easy-to-use interface.

HP Data Protector software protects the virtual machines and the information your business relies on.

We need a new approach to virtual server backup—one where we enjoy the benefits of virtualization without having to worry about the issues associated with data protection.

Virtual server backup challenges

If you're rethinking your backup methodology, you're not alone. Protecting data in a virtual server environment adds new challenges and complexity to an already difficult backup task. And it can create gaps in your total protection strategy.

Performance

In both physical and virtual environments, the backup process consumes server resources including the CPU, memory, and network interface card. In a virtual environment, one or more virtual machines exist on one physical server—and each places the same demands on their host during a backup. As a result, both server and application performance are impacted as virtual machines compete for resources.

Unprotected data

Some virtual server backup methods can leave data vulnerable. In traditional environments, an online backup agent is application-aware and so communicates to the application when a backup is happening. As a result, in the event of a restore, the backed-up data is consistent with the application. However, some hypervisors are not able to communicate with the application running inside the virtual machine, and thus cannot inform the application that a backup is running. This can leave application data in a crash-consistent state, so it may not restore properly. Backup administrators would be faced with lost data, or the need to check consistency after a restore. In mission-critical environments, either scenario could be catastrophic.

Management

Backup administrators must now protect both physical and virtual servers, and different tools have evolved for each environment. And there is yet more to learn—IT staff must familiarize themselves with their hypervisor's proprietary backup tools.

These challenges take additional time and resources, and could discourage your organization from expanding server virtualization. But the benefits of a virtualized environment are within easy reach. HP Data Protector software addresses all of these challenges and more, giving your organization confidence to operate effectively in today's complex, rapidly changing IT environments.

Overcome virtual server backup challenges

HP Data Protector, when combined with selected HP StorageWorks disk arrays, offers a powerful and unique data protection solution for VMware and Microsoft® Hyper-V environments in particular. This tightly integrated solution provides the only way to avoid server performance degradation in a virtual environment and ensure application-consistent backups—all from one interface.

The HP Data Protector Zero Downtime Backup (ZDB) agent utilizes functionality on HP disk arrays to automate snapshots of virtual machines (VM). As a result, backup is performed on the snapshots—not the production environment—without impact to the application or virtual machine.

HP Data Protector online agents (Microsoft Exchange, Oracle®, SAP, etc.) are also application-aware, which means that HP Data Protector communicates with the application during the snapshot process to ensure restored data is consistent with the application. In addition, snapshots are maintained on the disk array for use by HP Data Protector Instant Recovery (IR). HP Data Protector IR can recover data in mere seconds—automating the entire process to meet even the most demanding recovery time objectives. And all of these tasks can be managed from the same, easy-to-use HP Data Protector interface. This unique solution delivers:

- Simplified management
- No performance load on the servers or VMs
- Instantaneous, application-consistent recovery of data
- Frequent backups for mission-critical applications

VMware backup methods

Choosing the right method for protecting VMware virtual servers involves understanding your organization's specific recovery time and point needs. All these methods can be simply executed through the HP Data Protector GUI.

HP Data Protector + VMware	Backup	Recovery
Online agent in VM	Easiest method, but impacts server performance	Application data consistency
ESX Server/vSphere snapshots	Impacts server performance	Crash-consistent data only
VMware Consolidated Backup (VCB)	No server performance impact, but requires additional proxy server(s)	Crash-consistent data only
HP Data Protector Zero Downtime Backup & Instant Recovery	No server performance impact	Application data consistency guaranteed, and recover to any point in time

HP Data Protector software is tightly integrated with the VMware infrastructure and provides a variety of methods for protecting VMware virtual machines to meet your own unique RTO, RPO, and other priorities. In a VMware environment, backup administrators can install an HP Data Protector online backup agent in the virtual machine or the console operating system itself.

All of the following can be managed via the HP Data Protector GUI:

- Traditional online backup agents inside the virtual machine
- ESX Server/vSphere snapshots
- VMware Consolidated Backup (VCB) image- and file-level backups
- HP Data Protector Zero Downtime Backup (array-based snapshots) and Instant Recovery

Traditional online backup agents inside the virtual machine

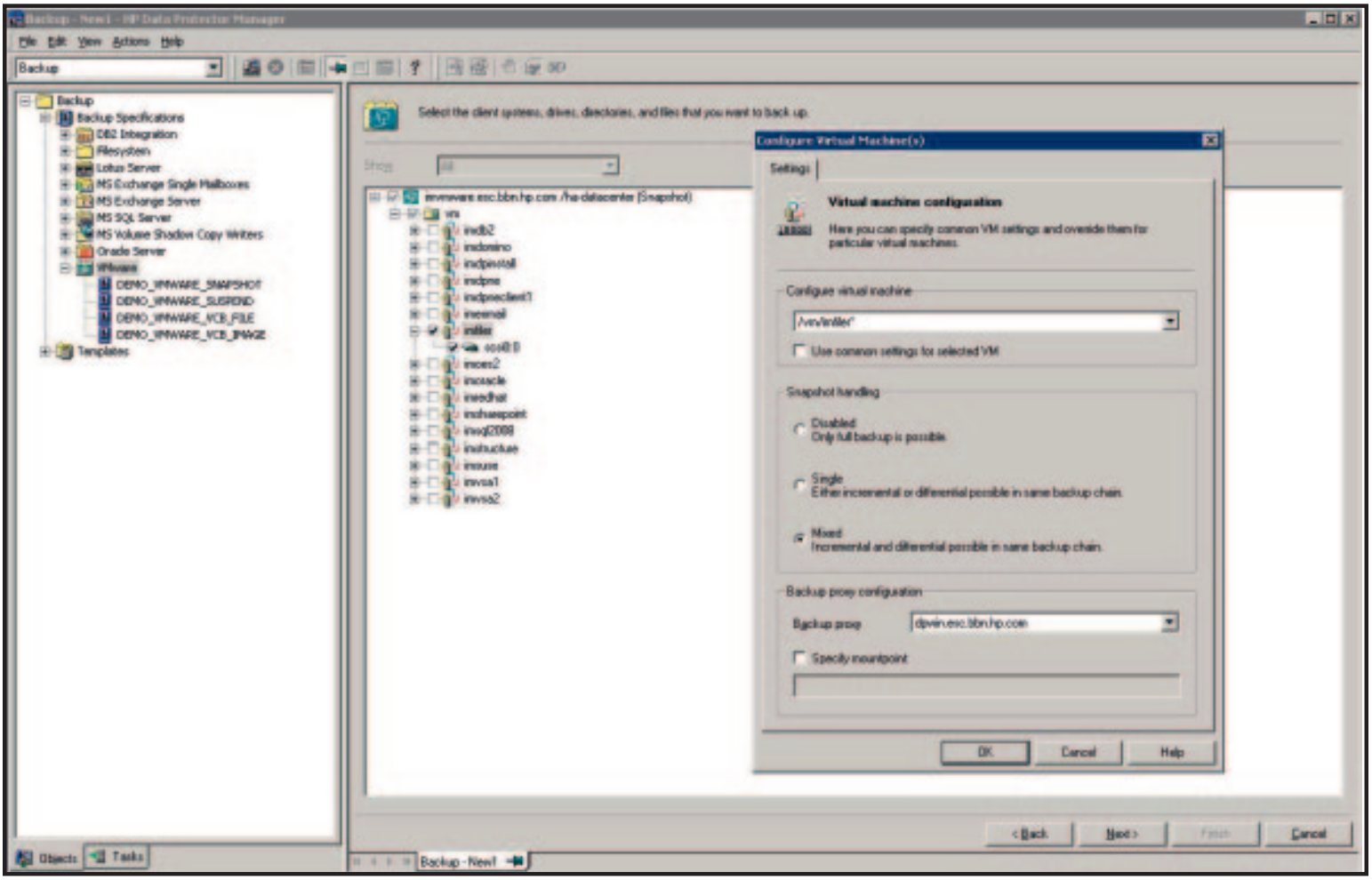
Installing an online agent in each virtual machine, just as you would in the physical world, is probably the easiest way to back up VMware servers, simply because it's the method with which backup administrators are most familiar. This approach delivers consistent backups, so data is synched with the application upon restore, as the HP Data Protector backup agent communicates directly with the application.

However, with all the other virtual machines on that physical host competing for resources, server performance can be impacted.

Restoring data from a virtual machine is no different to restoring data from a physical machine. The backup administrator browses for desired objects in the HP Data Protector GUI and retrieves information through a simple mouse click.

VMware ESX Server snapshots

VMware ESX Server and vSphere have the ability to take snapshots of data on every virtual machine. Each snapshot is then stored on disk or can be moved to tape for recovery as needed. By installing HP Data Protector online agents within the ESX Server or vSphere hypervisor, administrators can use the HP Data Protector GUI to automate execution of server-based snapshots. As most organizations use a combination of physical and virtual servers, this allows you to simplify your backup and recovery operations by managing both the physical and the virtual from the same HP Data Protector interface without scripts, separate clients, or third-party utilities.

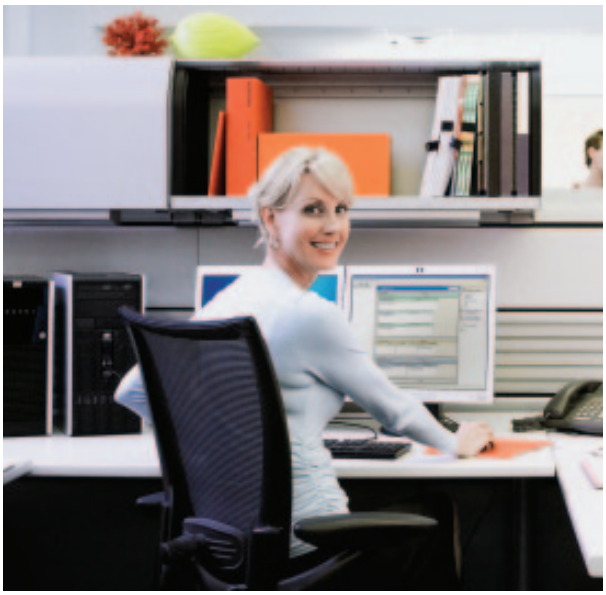


Executing VMware ESX Server (vSphere) snapshots from the HP Data Protector GUI

When configuring a VMware virtual machine, choose incremental or differential backups (single), or the ability to perform both in the same backup chain (mixed).

However, server-based snapshots impact server performance and yield only crash-consistent data. For some customers, this is acceptable for certain classes of data but it's not an option for business- or mission-critical applications.

To perform a restore, the backup administrator simply browses for the desired snapshot image and restores the information to the virtual machine with a single mouse click. HP Data Protector then restarts the virtual machine to a particular point in time.



VMware Consolidated Backup image- and file-level backups

To reduce the impact of backup on performance, VMware developed a tool called VMware Consolidated Backup (VCB). This is loaded on a dedicated server—or proxy host—from which you can run either an image- or file-level backup. Because the proxy host offloads the processing from the virtual machine, you overcome any server performance issue. However, in either case backup administrators are left with crash-consistent data only once they restore. This method also requires a dedicated host to be added in order to run the backup process. HP Data Protector is closely integrated with VCB for both image- and file-level backups and communicates with the VCB proxy host to manage the process. As with server-based snapshots, you can manage the VCB backup-and-restore processes from the same HP Data Protector GUI you use to protect all your physical servers.

To restore an image- or file-level backup, the administrator browses for the desired object in the HP Data Protector GUI, and restores with a single mouse click. File system data can be restored to any virtual or physical machine running the HP Data Protector VMware integration agent.

HP Data Protector will also support the VMware vStorage API for data protection after the release of VMware vSphere 4.1.

HP Data Protector Zero Downtime Backup and Instant Recovery

In a VMware environment, HP Data Protector's Zero Downtime Backup (ZDB) agent is the only way to avoid server performance degradation in a virtual environment and ensure application-consistent backups—all from one interface.

HP Data Protector ZDB utilizes replication techniques (such as split-mirror, snapshot, or snapclone) to move the processing load off the virtual machines and onto the array, where a copy of the data is created at very high speed. HP Data Protector then performs backup operations on the copy, rather than on the original data. This staged backup process allows you to keep your business applications online 24x7 without impacting server performance. The HP Data Protector ZDB agent is also application-aware, so it provides you with consistent backup in VMware environments. ZDB allows you to perform backups more frequently than once a night and, in fact, expands your backup window to all day, every day.

In addition, HP Data Protector maintains snapshots on the disk array for use by HP Data Protector Instant Recovery (IR). HP Data Protector IR can recover data in mere seconds—automating the entire process to meet even the most demanding recovery time objectives. And all of these tasks can be completed from the same, easy-to-use HP Data Protector interface. For more information on HP Data Protector ZDB and HP Data Protector IR, see page 14.

A new approach to virtual server backup: **Hyper-V protection**

Similar to the VMware scenario, there are two places where backup administrators can install the online backup agent in a Microsoft Hyper-V environment: the child partition (virtual machine) and the parent partition (the root partition on which the virtualization stack runs). Both sit logically on top of the hypervisor.

HP Data Protector software leverages this infrastructure to support a variety of methods for protecting Hyper-V virtual servers, all of which can be centrally managed from the HP Data Protector GUI:

- Traditional online backup agents inside the virtual machine
- Hyper-V server-based snapshots
- Offline backups
- HP Data Protector Zero Downtime Backup (array-based snapshots) and Instant Recovery

Hyper-V backup methods

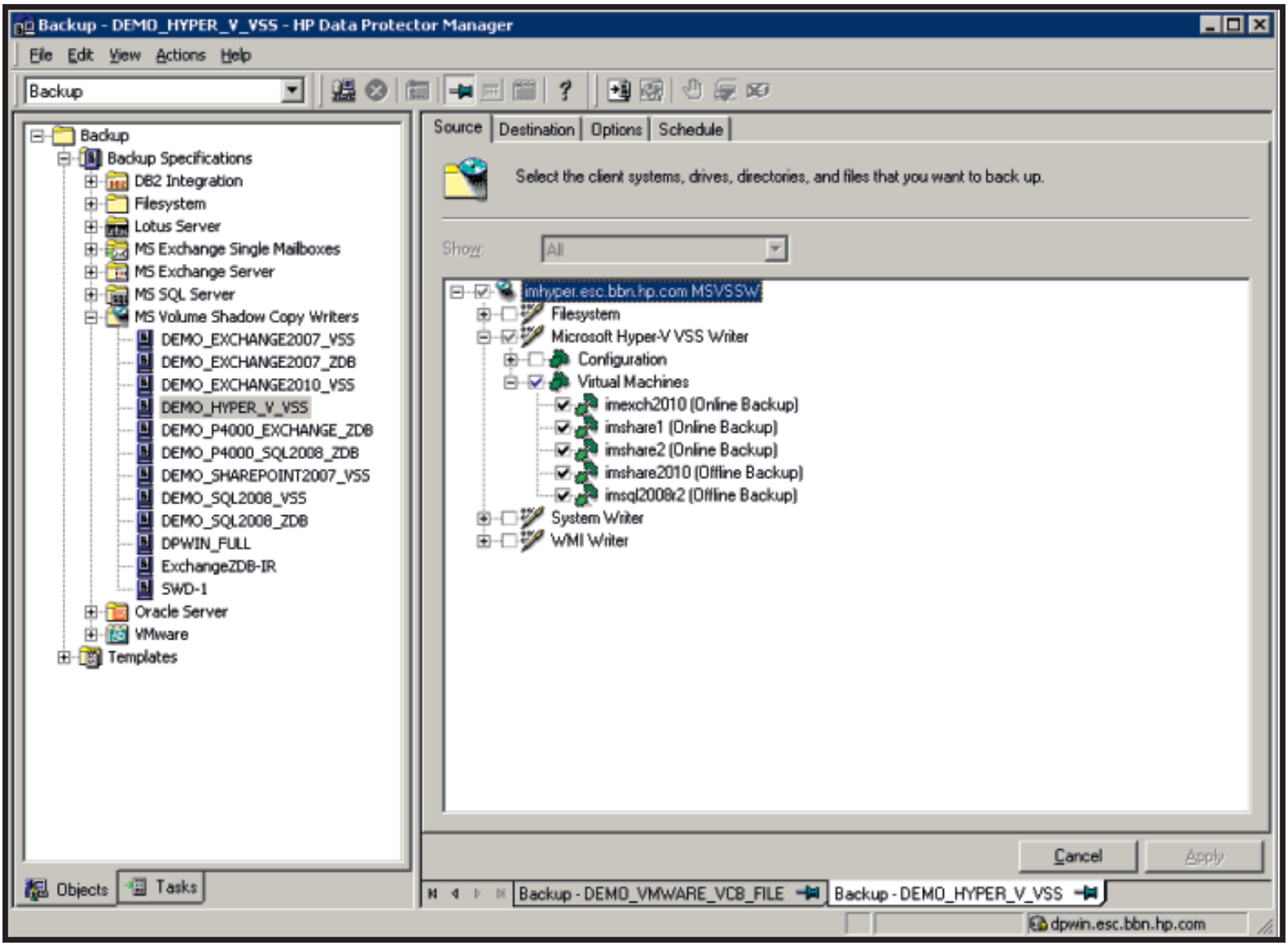
Tight integration between Microsoft Hyper-V and the Volume Shadow Copy Service framework (VSS) provides application data consistency in Hyper-V environments. All of these methods can be simply executed through the HP Data Protector GUI.

HP Data Protector + Hyper-V	Backup	Recovery
Online agent in VM	Easiest method but impacts server performance	Application data consistency
Hyper-V server-based snapshot	Impacts server performance; limited point-in-time recovery	Application data consistency
Offline backups	Server and application performance impact	Application data consistency
HP Data Protector Zero Downtime Backup & Instant Recovery	No server performance impact	Application data consistency, and recovery to any point in time

Traditional online backup agents inside the virtual machine

As with VMware, administrators install an HP Data Protector online backup agent inside each virtual machine (or child partition) and, while this approach delivers consistent backups, it impacts server performance.

In a Hyper-V environment, restoring data from a virtual machine is very similar to restoring it from a physical machine. The backup administrator browses for the desired objects in the HP Data Protector GUI and retrieves information with a few simple mouse clicks.



Backing up Hyper-V virtual machines

When selecting a backup specification object in the HP Data Protector GUI, select which source virtual machines to back up within the Hyper-V server.

Microsoft Hyper-V server-based snapshots

Data on child partitions can also be protected by executing sever-based snapshots. In this case, an HP Data Protector agent is installed directly in the parent partition.

Hyper-V provides tight integration with the Volume Shadow Copy Service (VSS) framework, which enables snapshots to be taken directly from the parent of one or more child partitions. When the snapshot is complete, HP Data Protector backs up the snapshot image to the desired target.

Because of the integration between Hyper-V and the VSS framework, these backups will be application-data consistent. However, this method can still impact performance because all backup operations are being performed on the server.

When restoring server-based snapshots in a Hyper-V environment, the administrator can use HP Data Protector to restore one or more child partitions within a Hyper-V server. If the physical host goes down, you would also need to restore the parent partition—which contains Hyper-V configuration information. Partitions can also be restored to another physical Hyper-V server.

Hyper-V only allows restoration of an entire child or parent partition, regardless of whether you're restoring to the same or a different physical server. During a restore, Hyper-V stops the partition being restored (if it's still running), deletes it, and restores the entire partition from the desired backup target. After the restoration, the partition is always offline and needs to be restarted by the backup administrator.

Offline backups

To use the server-based snapshot method described above, the child partition needs to be online and based in a VSS-aware operating system (OS). If the child partition is offline, or based on a non-VSS-aware OS, the Volume Shadow Copy Requestor component is unavailable. In this case, Hyper-V only allows offline backup. HP Data Protector automatically detects the configuration and, as appropriate, executes a saved-state—or offline—backup.

When HP Data Protector initiates a backup, one of two things happens. Either Hyper-V identifies the child partition in the state in which it was saved prior to being shut down or powered off by the backup administrator, or the VSS writer suspends the child partition before it begins the backup.

The backup process then proceeds as it would in traditional suspend mode in a physical environment, with the data being backed up to disk or tape prior to restarting the application.

In this case, backed-up data is only crash-consistent with the application once restored, because the application was "frozen" at the time of backup.

To restore data, you simply use the HP Data Protector GUI and follow the same restore process described for Hyper-V server-based snapshots.

HP Data Protector Zero Downtime Backup and instant recovery

All of the above methods consume Hyper-V host resources to run the backup, which impacts server and application performance. In addition, the offline backup method yields only crash-consistent data. HP Data Protector Zero Downtime Backup (ZDB) is currently the only way to avoid server performance degradation in a Hyper-V environment and recover to a specific point time—all from one interface.

The concept behind HP Data Protector ZDB is the same for both Hyper-V and VMware. In a Hyper-V environment, you have two options for installing HP Data Protector ZDB. You may install the ZDB agent in the parent partition, which would oversee execution of snapshots on all the child partitions in that server. Or, you may choose to install the agent in one or more child partitions and thus utilize ZDB functionality for specific applications only. As with the server-based snapshot example above, in this case all the child partitions must be running in Microsoft Windows and the applications must be VSS-aware.

In addition, HP Data Protector maintains snapshots on the disk array for use by HP Data Protector Instant Recovery (IR). HP Data Protector IR can recover the data in mere seconds—automating the entire process to meet even the most demanding recovery time objectives.

"The combination of HP Continuous Access XP and HP Data Protector gives us the dependable, low-maintenance mirroring and backup we need to protect the information that is at the heart of our operation."

Gerald Scharding, Chief Technology Officer, National Emergency Operations Centre, Switzerland

More power with HP StorageWorks

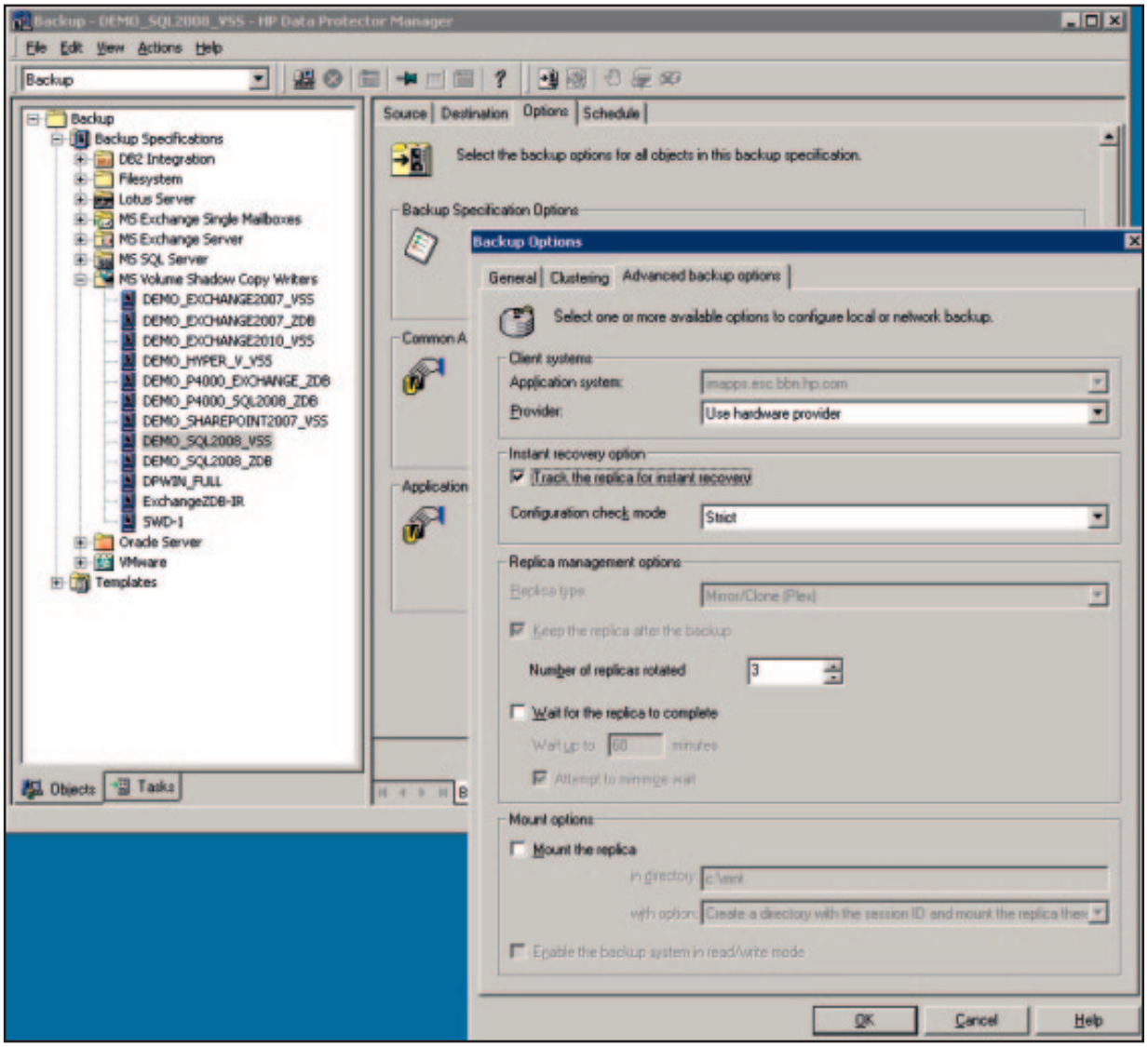
What's the maximum amount of time your business can afford for a recovery operation. What is your recovery time objective (RTO)? What's the maximum amount of data your business can afford to lose. What is your recovery point objective (RPO)?

With increasingly exacting recovery objectives, tolerance of application downtime diminishes and the backup window continues to shrink. That's why it's essential to think beyond traditional tape backup, and plan carefully for recovery.

Together with HP StorageWorks, HP Data Protector software delivers some of the most advanced disk-based data protection capabilities available for physical or virtual servers. And HP Data Protector is the only backup software which provides such sophisticated integration with HP StorageWorks arrays.

ZDB reduces server overhead and improves restore time

This HP Data Protector Zero Downtime Backup screen shot shows the backup options. The administrator is rotating three hardware copies for instant recovery.

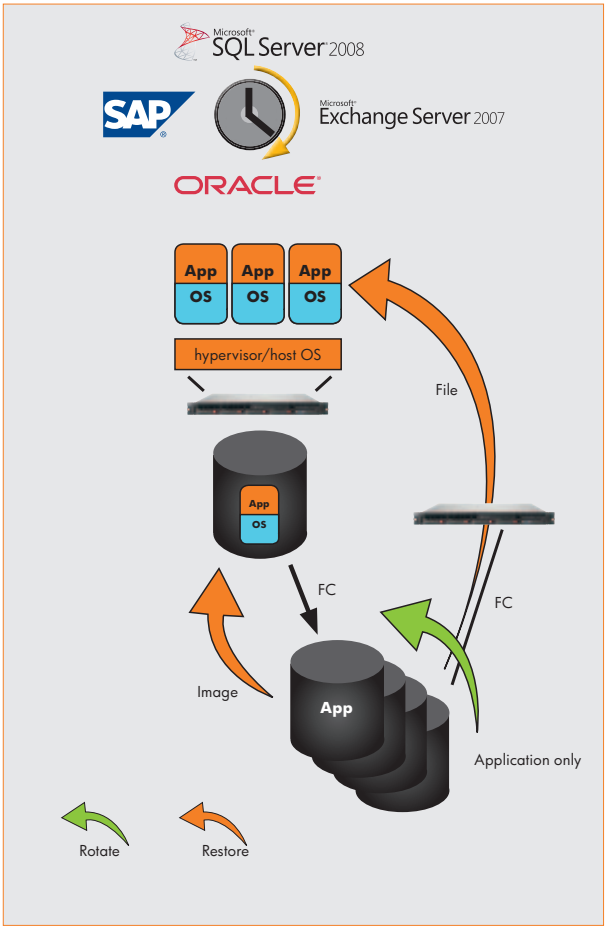


HP Data Protector Zero Downtime Backup and Instant Recovery

HP Data Protector Zero Downtime Backup (ZDB) takes advantage of array-based functionality to provide zero-impact backup by performing backup operations on a copy of the data, with the option to duplicate or move backup data to disk. Unlike alternative solutions, HP Data Protector ZDB is a fully automated process with an integrated and easy-to-use GUI, so no additional scripting is required.

HP Data Protector Zero Downtime Backup & Instant Recovery

HP Data Protector avoids performance load on the server and VMs by facilitating array-based snapshots, which virtually eliminate backup windows in a virtual environment. HP Data Protector also automates snapshot management, and instantly retrieves data directly from one of multiple replicas stored on disk at either local or remote sites.



HP Data Protector Instant Recovery (IR) takes this a step further, ensuring information availability during disasters and other potential data-loss scenarios. IR allows you to keep multiple snapshots on disk and automatically retrieves the correct version based on your own individual RPO/RTO needs, allowing you to recover critical data in minutes rather than hours.

Integration with HP StorageWorks EVA and XP disk arrays

HP Data Protector ZDB and IR are tightly integrated with the HP StorageWorks Enterprise Virtual Array (EVA) family and the HP StorageWorks XP Disk Array family. In addition, HP Data Protector is fully aligned with the local and remote replication array software which runs on the arrays (HP StorageWorks Business Copy and HP StorageWorks Continuous Access software).

Business Copy software takes snapshots (replicas) of data to be stored locally on the XP or EVA, while HP StorageWorks Continuous Access software enables array-to-array replication for remote protection. HP Data Protector utilizes this functionality to automate the execution, movement, and overall management of snapshots—plus management of physical and virtual backup operations in the rest of your environment—from a single GUI.

HP Data Protector starts the virtual server backup process at the VM level, which is facilitated through close integration of HP Data Protector agents with VMware and Microsoft Hyper-V solutions. Then backup occurs at the application level as HP Data Protector ZDB initiates EVA or XP array-based snapshots (or replicas) of application data. HP Data Protector automatically directs Continuous Access to replicate the snapshots locally or on an HP StorageWorks array at a remote location, depending on your organization's configuration and recovery needs. Snapshots can be taken frequently, without impact to server performance, to meet even the most stringent recovery objectives.

For recovery, HP Data Protector can restore data from either tape or disk. However, restoring data from tape is a more time-consuming process better suited to non-critical business data. For business- or mission-critical applications, taking replicas on the XP or EVA using HP Data Protector IR enables you to get your application up and running again in mere seconds in both physical or virtual environments.

With just a few clicks in the HP Data Protector GUI, HP Data Protector IR automatically retrieves the appropriate snapshot, synchronizes the snapshot and application log file, restores the data to the VM, and then restarts the application—all according to your pre-defined backup parameters.

If you are using an application-specific VSS agent inside the virtual machine you also have the option to restore your application using the HP Data Protector "No recovery" option. This allows you to apply application logs manually after the Instant Recovery in order to reach the desired point in time.

Whether you're running Microsoft Exchange, SQL, Oracle, or a variety of other applications on a VMware virtual machine or Hyper-V child partition, HP Data Protector IR, together with HP StorageWorks XP and EVA arrays, delivers data protection for even the highest RTO and RPO demands.

Integration with HP StorageWorks P4000 SAN solutions

HP Data Protector also provides robust backup and recovery functionality with the iSCSI-based HP StorageWorks P4000 SAN solutions through Microsoft VSS (Microsoft Volume Shadow Copy Service) integration.

P4000 SAN solutions are optimized for virtual server environments, and are based on a clustered architecture with integrated replication capabilities and an enterprise feature set. Together with VMware ESX and Microsoft Hyper-V, P4000 SANs can offer simple and seamless high availability for virtual machines across servers, storage, and sites.

P4000 snapshots offer space-efficient data recovery, and can be mounted on any server that accesses the SAN. This process is very useful for recovering files, creating test environments, or mounting to a backup server for a centralized backup environment.

HP Data Protector ZDB Zero Downtime Backup* can be deployed with the P4000 to improve backup efficiency, and lets you execute, manage and move snapshots to suit your organization's availability needs. With ZDB, P4000 snapshot functionality can be easily managed via the HP Data Protector GUI, which runs on any Microsoft Windows or Linux machine connected to the network.

The combination of the P4000 with HP Data Protector and ZDB achieves a highly cost-effective, full-featured and tightly integrated backup and recovery solution, ideal for mid-market deployments of applications such as Microsoft SharePoint, Microsoft Exchange and SQL Server. It also provides an ideal resolution for situations in which backups take too long and use too many resources, recovery from tape would be difficult and time-consuming, or traditional snapshots waste capacity.

Unlock the power of HP

Don't let virtual server backup challenges stifle your organization's data protection goals. By combining HP Data Protector software with HP StorageWorks arrays, you can unlock powerful disk-based backup and recovery solutions to help you realize all the benefits of server virtualization.

* Support for Instant Recovery (IR) and Hyper-V for HP P4000 SAN solutions will be included in the next release of HP Data Protector software.

A single solution that automates snapshot-based backups and provides point-in-time recovery of virtual machines at the click of a button. HP Data Protector.

More than 37,000 customers around the world trust HP Data Protector software to protect their physical and virtual servers. HP Data Protector automates high-performance backup and recovery from disk or tape to enable 24x7 business continuity—all while providing a compelling price-to-performance ratio.

A reliable solution that reduces IT costs and complexity, HP Data Protector can scale from single-server environments to the largest distributed enterprise infrastructures with centralized, multi-site management capabilities.

HP Data Protector is championed by over 2,000 consulting, support and education professionals around the world, and used by nearly half of all Global 500 corporations.

- **Broad interoperability**—supports all leading IT environments
- **Industry-leading functionality**—powerfully unique integration with HP StorageWorks disk arrays, centralized physical and virtual server protection, automated backup and recovery, unique virtual and synthetic full backups for space reduction, and a sophisticated user interface
- **Multiple RPOs and RTOs**—provide all the building blocks to satisfy even the most stringent recovery objectives; choose the appropriate protection method for each class of data
- **Simple and inexpensive**—acquisition and deployment costs are between 30 and 70 percent less than the competition, with the simplest licensing model in the industry

For more information

Explore a rich source of knowledge on HP Data Protector software

Access a wealth of technical documentation—white papers, installation manuals, and integration guides. Learn more about the latest product enhancements and new features. Participate in community discussions—share your knowledge and learn from peers.

Join the dedicated HP Data Protector software web community at www.hp.com/go/imhub/dataprotector

Why pay more for backup than you need to?

Of course you need rock-solid facts before investing in backup and recovery. We're happy to prove that HP Data Protector software will cost you significantly less to buy and own than competing solutions, and our simple licensing structure will further reduce your costs, even when your business grows.

Calculate your savings and generate a customized report now! www.hp.com/go/imhub/dataprotector/roi

How much time do you spend restoring single SharePoint files or folders?

Too much, right? Now the SharePoint administrator can restore single items directly via the SharePoint GUI—without ever calling the backup administrator.

See for yourself how it works. Watch the demo of HP Data Protector Granular Recovery Extension for SharePoint at www.hp.com/go/dp/sharepoint

Extend data protection policies to business laptops and desktops

HP Data Protector Notebook Extension software is a new solution that provides continuous and, transparent backup of data stored locally—even when working offline. It reduces the significant cost and productivity impact of data loss incidents by enabling users to rapidly restore files without needing IT assistance.

Try it for yourself. Get a free 60-day trial license. Visit www.hp.com/go/trydpne

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