



Configuration Guide: Best Practices... with HP Storage and Veeam

Modern Data Protection
Built for Virtualization | **#1 VM Backup**

November, 2013

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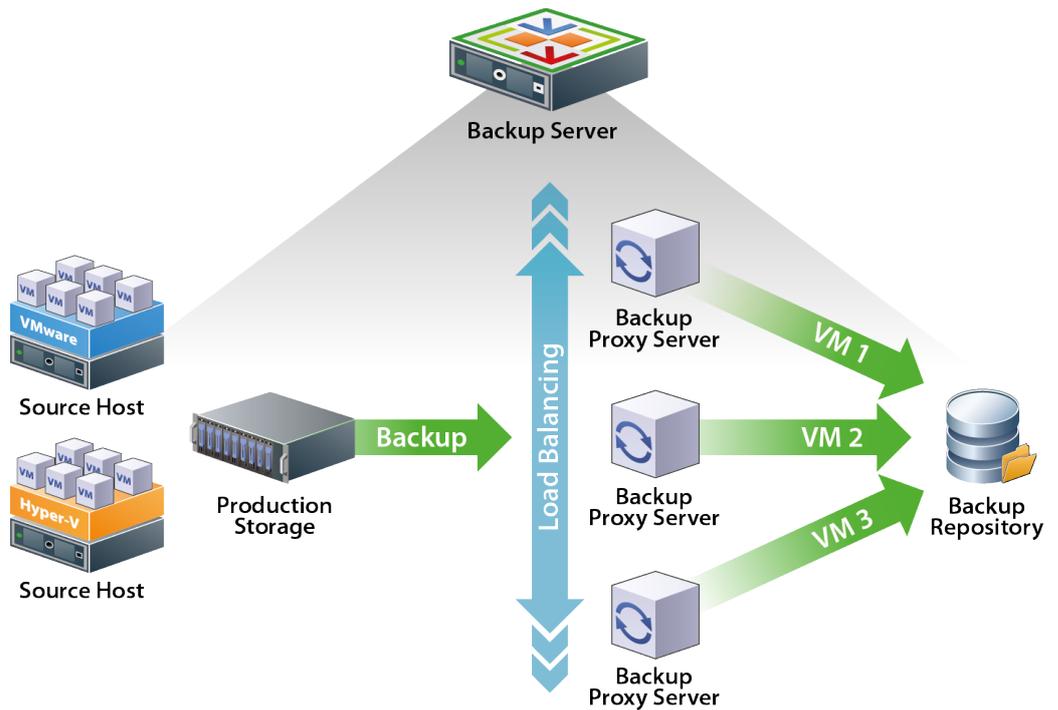
Intended audience

This guide is intended for those involved in the design, acquisition and implementation of data protection solutions for vSphere and Hyper-V virtual machines (VMs) on shared SAN storage and/or NAS. It was written for IT generalists and specialists alike, whether they need to back up a dozen or hundreds of VMs. The audience includes but is not limited to: Systems Administrators responsible for servers, hypervisors, storage, and backup; Sales Engineers; Systems Engineers; Solution Architects; Professional Services Engineers; and Consultants. The technical information contained herein is intended as a starting point for designing and implementing a VM data protection solution. This backup and replication solution has been tested and certified jointly by HP and Veeam®.

Veeam Backup & Replication overview

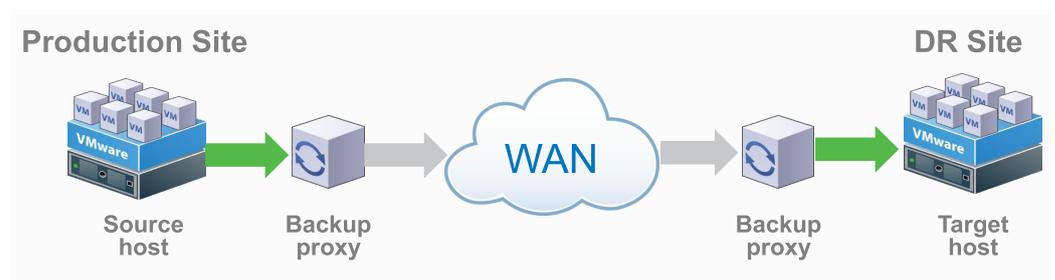
Veeam Backup & Replication™ is one of the most powerful solutions for VM backup, replication and recovery in VMware vSphere and Microsoft Hyper-V environments. With Veeam Backup & Replication, VMs can be backed up to disk, archived to low-cost storage and replicated from one host to another. Recovery of VMs can occur in a matter of minutes using Veeam's patented technology integrated with HP Storage.

The major components of Veeam Backup & Replication consist of a management server, proxy servers, backup repository servers and disk-based backup repositories. The backup proxy servers are Windows-based installations. The backup repositories can be Windows or Linux based, network attached storage systems or tape. These resources can be virtual or physical depending upon the storage and network topology, desired throughput of backup and recovery data streams, as well as the available server resources.



Veeam backup architecture

The following diagram represents a typical example of the Veeam replication architecture with distributed backup proxies at the source (production) and target (recovery) locations. VM-level replication occurs from one ESX or Hyper-V host to another of the same type. It does not require identical hardware from source to target nor does it require additional Veeam licensing on the target. Veeam VM replication is covered in detail in the Veeam Backup & Replication User's Guides for [VMware](#) and [Hyper-V](#).



Veeam replication architecture

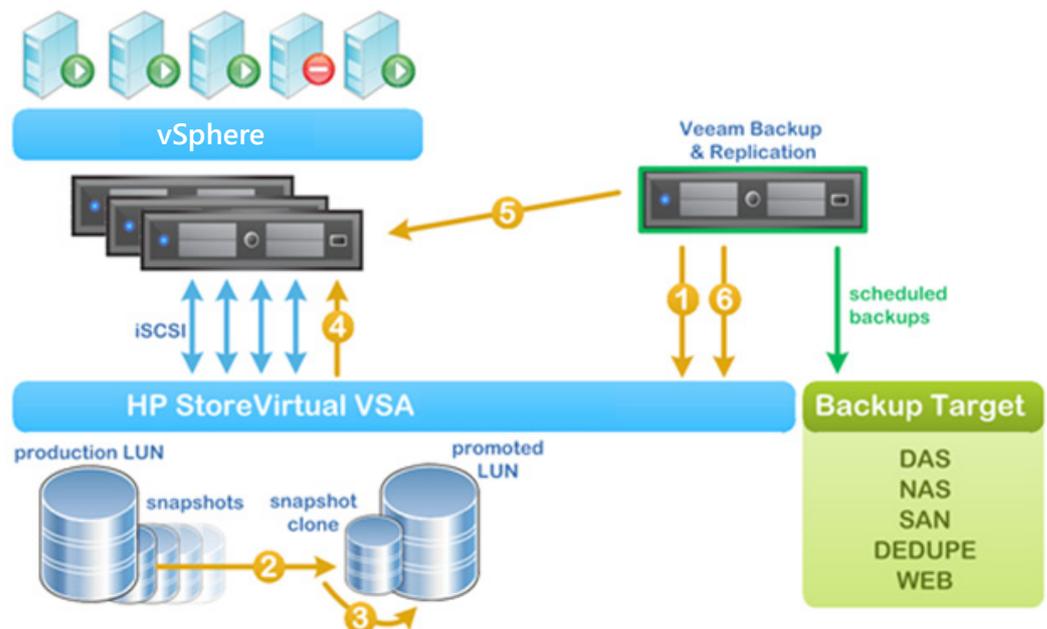
Veeam VMware integration with HP StoreVirtual and HP StoreServ

Veeam Explorer for Storage Snapshots

Veeam integrated HP StoreServ Virtual Copy (SAN snapshot) & HP StoreVirtual snapshot technology to create Veeam Explorer™ for Storage Snapshots and Backup from Storage Snapshots. This integration enables a VM Recovery Point Objective (RPO) of 30 minutes or less, automated recovery in minutes and superior backup performance which is non-disruptive to production VM workloads.

Veeam Explorer for Storage Snapshots integrates Veeam fast recovery with the efficiency of HP StoreServ Virtual Copy and HP StoreVirtual snapshots. Once a SAN snapshot of a vSphere VMFS volume is created on the primary storage system, it becomes visible in the Veeam console. In a restore scenario, Veeam Explorer for Storage Snapshots mounts VMFS volumes from the arrays and uses the Veeam recovery engine for restore tasks.

Veeam Explorer for Storage Snapshots provides fast recovery of VMs, Windows or Linux guest files, SharePoint and Exchange items (messages, meetings, etc.) from the snapshots on primary storage. SAN snapshots can enable VM RPOs of as little as 5 minutes with HP StoreServ Virtual Copies and 30 minutes with HP StoreVirtual snapshots.



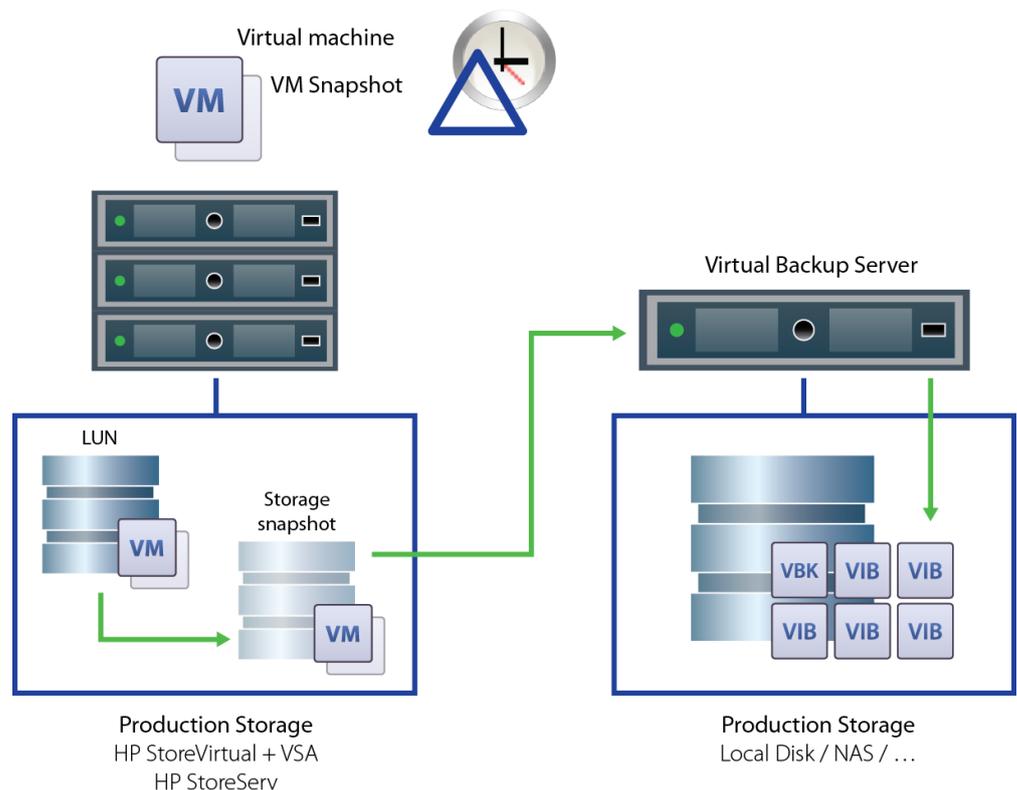
Veeam Explorer for Storage Snapshots

NOTE: HP 3PAR StoreServ storage systems require a Virtual Copy license to enable storage snapshot functionality.

Backup from Storage Snapshots

Veeam Backup from Storage Snapshots can reduce backup windows by hours – utilizing HP StoreVirtual snapshots and HP StoreServ Virtual Copies as the source for creating full and incremental backup images. Without the use of storage snapshots, VM backup images must be created using VMware snapshots alone. When VMware snapshots are used to backup heavily utilized VMs, performance of the hosts, storage system, VM and application can be seriously impacted. With Backup from Storage Snapshots, the hypervisor snapshot is used briefly to create an application-consistent state for the storage snapshot. The hypervisor snapshot is then released after the storage snapshot is taken. This hardware-level storage snapshot then becomes the source of the VM backup, independent of the production VM.

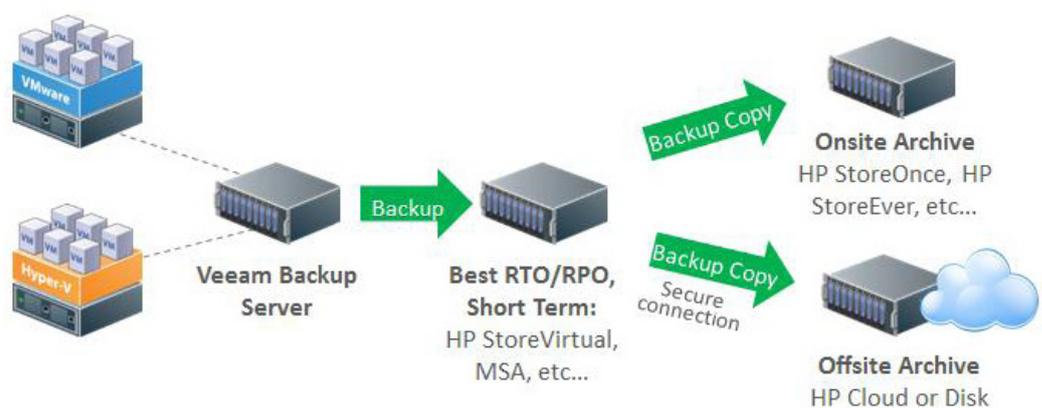
The storage snapshot is read by a Veeam proxy as the backup source. The VM's CBT map is queried for fast incremental backup of quiesced VMs from the snapshot clone to disk without mounting the storage snapshot to the hypervisor or registering the VM with the host. The use of CBT for storage snapshot backup sources is unique to the industry and is responsible for the dramatic reduction in backup windows when deploying HP Storage and Veeam.



NOTE: Veeam Backup from Storage Snapshots is part of the all-inclusive Enterprise *Plus* Edition of Veeam Backup & Replication. HP 3PAR StoreServ storage systems require a Virtual Copy license to enable storage snapshot functionality.

Moving backups for longer retention - Backup Copy jobs

Backup images can be copied to different types of storage to achieve different objectives. A backup might first be written to fast storage (DAS or SAN-based) then moved to less expensive, higher capacity storage after a specific period of time. This data movement can be automated via Veeam job settings including Backup Copy job. A job can be automated to back up VMs to a specific location with a predetermined number of restore points based on the job's retention policy before the backup is moved to longer-term storage.



Achieving best practices: VM backup and recovery

Veeam Backup & Replication can be architected for multiple tiers of data protection. A VM backup image file is written to disk to create the first copy of a virtual machine. VM replicas are used to create a second copy of a VM off premises. Recovery of VMs, guest files as well as SharePoint and Exchange items from HP

StoreVirtual and HP StoreServ SAN snapshots can be achieved directly from production storage with a hardware snapshot copy as well. For longer retention periods, backup image files can be copied off premises using tape and to cloud providers based on OpenStack or other object-based storage services.

Tradeoffs occur with different classes of backup storage. Deduplication appliances provide the highest level of data reduction and the longest retention periods at the expense of longer VM Recovery Time Objectives (RTOs). The performance of key Veeam Backup & Replication vPower® features, such as Instant VM Recovery™ and SureBackup® can also be impacted. Primary storage systems provide a balance of scalability and fast recovery performance (low RTO) versus a more capacity-efficient deduplication appliance.

Administrators can avoid the classic backup and recovery tradeoff that occurs between efficient storage with long retention capability and fast VM recovery in one of two ways. With HP StoreServ and HP StoreVirtual storage, fast recovery from production storage snapshots may be achieved with Veeam Explorer for Storage Snapshots and achieve the high-efficiency and long retention that is possible with HP StoreOnce Backup Systems. If Veeam Explorer for Storage Snapshots is not an option, a backup can be written to fast backup storage (DAS or SAN) to satisfy a short-term retention and recovery schedule prior to being written to longer-term storage such as a deduplication appliance, tape or cloud storage. This tiered backup approach can be easily automated in the Veeam backup job settings.

Adding Veeam to your virtual infrastructure

NOTE: For detailed instructions on installation and configuration best practices download the Veeam Backup and Replication user guides for [Hyper-V](#) or [VMware](#) and [Veeam Best Practices Guide for VMware](#).

Configuring backup infrastructure

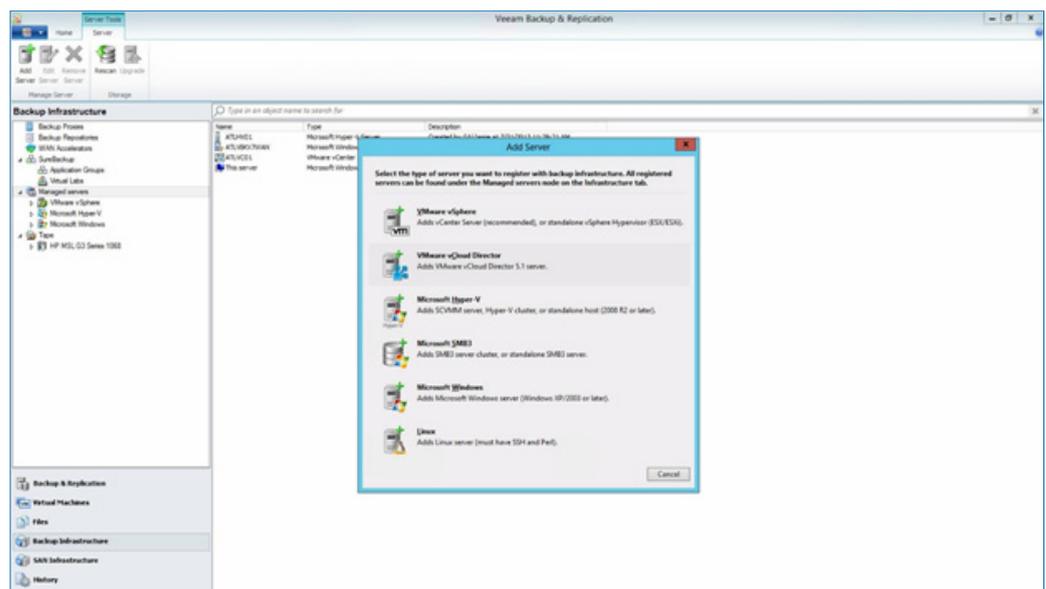
Install Veeam Backup & Replication on a Windows system. The user guide outlines the system requirements, but both physical system and VM installations are supported. [Download](#) the latest version of Veeam Backup & Replication from: <http://www.veeam.com>.

The default installation creates a backup folder (c:\Backup) and installs the VMware backup proxy role by default so that VMware VMs can be backed up to this Windows server or VM. The VM backup infrastructure is scaled by adding additional virtual and physical Windows proxy servers to move data, disk-based backup storage resources in the form of CIFS shares, LUNs and Linux paths as backup repositories.

NOTE: The Veeam Management Server should have a minimum configuration of one modern 64-bit capable processor (minimum four cores) and 4 GB of RAM when running the supplied SQL Express instance (standalone SQL servers can be used).

Add vCenter, SCVMM or host information

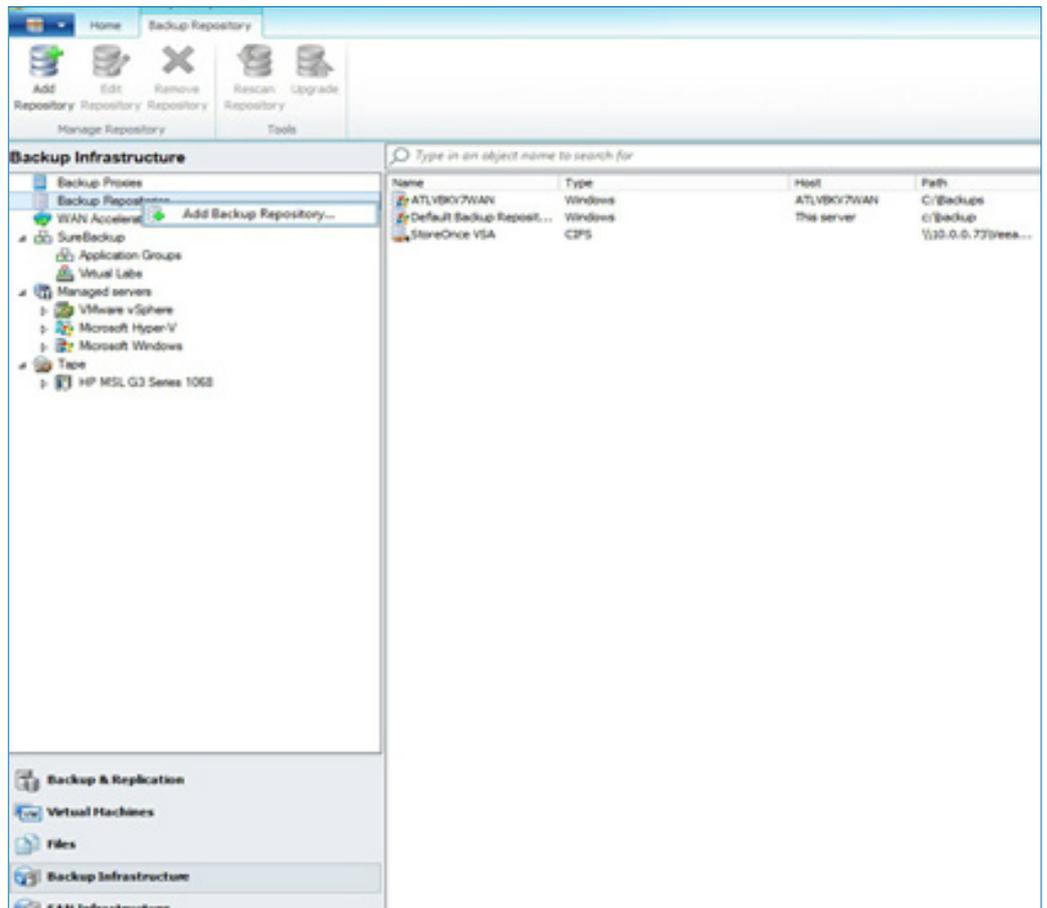
Servers and VMs used for proxies and backup repositories must first be added to *Managed Servers* via the *Add Server* wizard. To add a backup proxy to the backup infrastructure, a Windows server already added to the list of managed servers should be assigned to the role.



NOTE: Proxy and repository servers should be configured with at least one modern x86/x64 processor (minimum two cores); 2 GB RAM; 200 MB disk space.

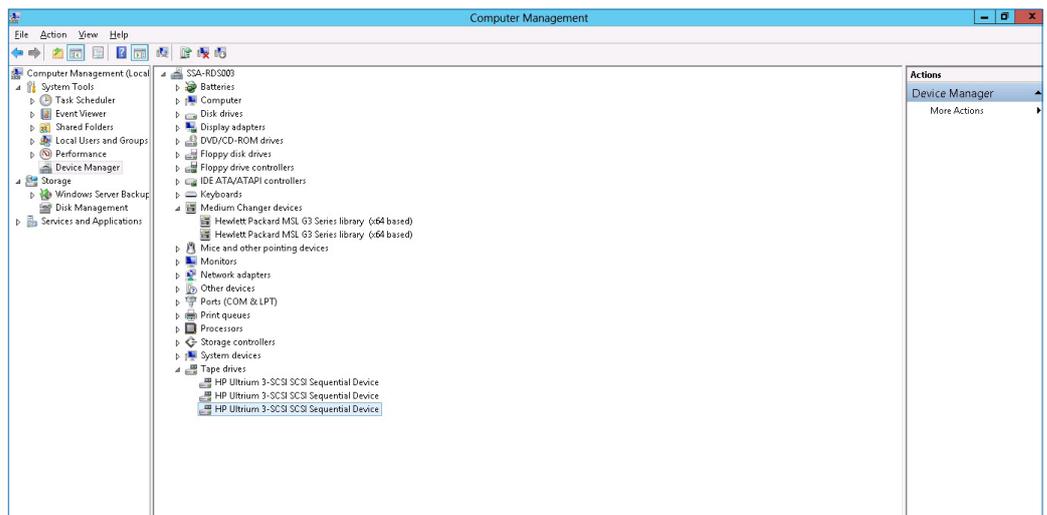
Adding backup repositories

You can assign the role of a backup repository to any Windows or Linux server added to the list of managed servers in Veeam Backup & Replication, or to any shared CIFS folder, to which the backup server has access.



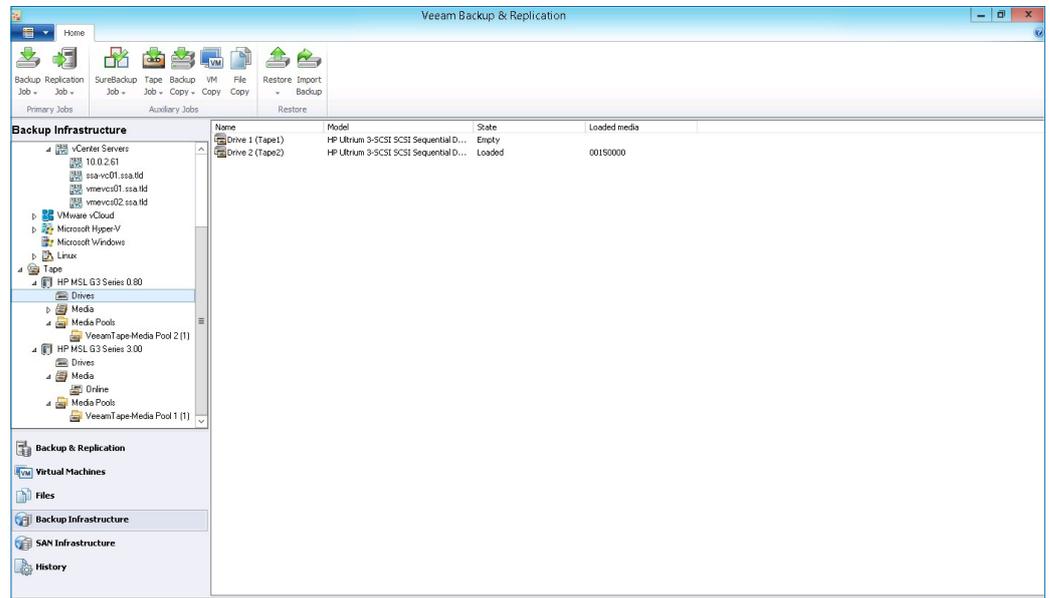
Detecting tape libraries

Veem Backup & Replication will automatically import tape resources with device-specific OEM Windows drivers which are visible to the Veem management server via Windows Device Manager.



NOTE: It is important for both the changer devices and the tape drive(s) to be visible in Windows Device Manager.

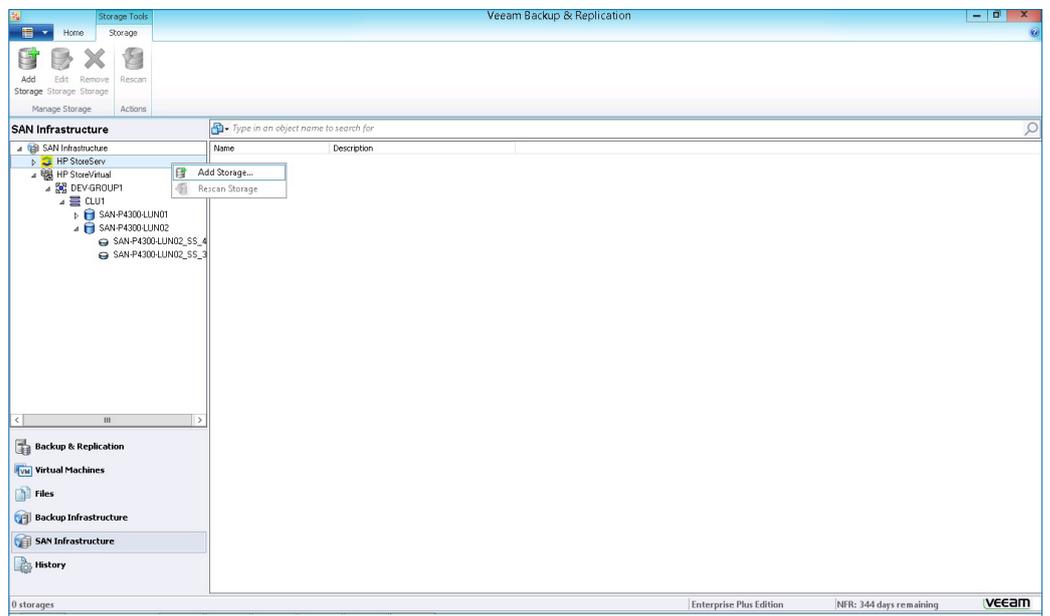
Tape libraries and media will automatically be displayed in the *Backup Infrastructure* view.



Configuring storage infrastructure

Adding HP production storage for hardware-assisted backup and recovery of VMware VMs

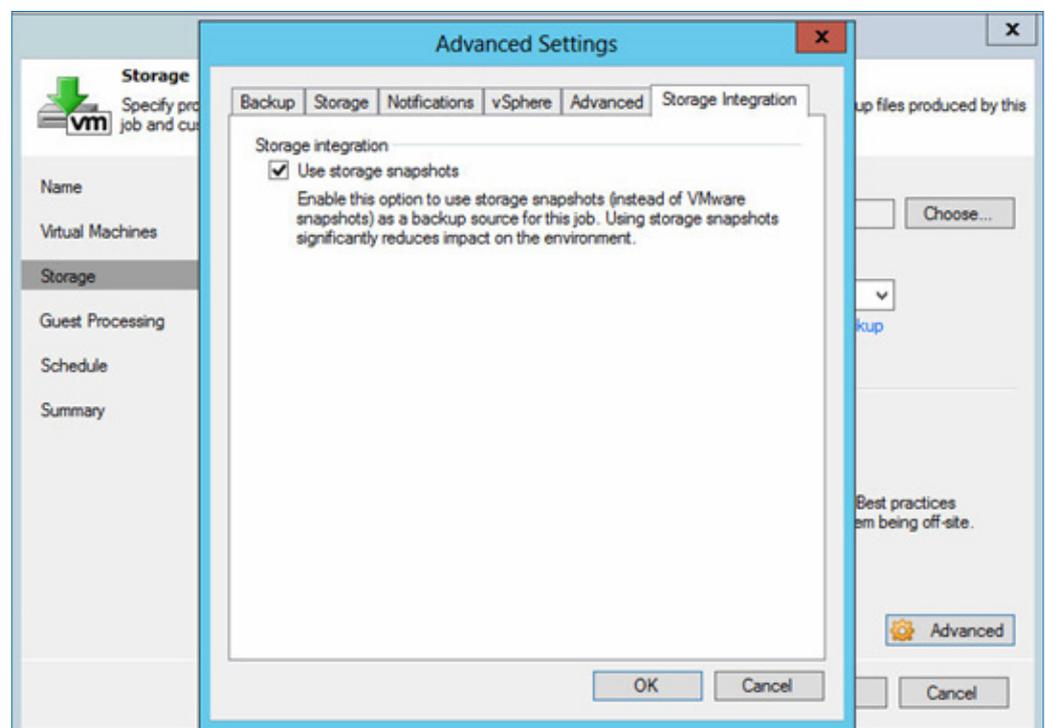
When using HP StoreVirtual and HP StoreServ storage, SAN snapshots can be used for hardware-assisted backup and recovery of VMs and guest files, as well as Microsoft SharePoint and Exchange items. Add the management console address and credentials for automatic importation of VMFS volumes, snapshots and associated VMs. To utilize hardware-assisted backup with storage snapshots, the Veeam Backup Proxy must have, at minimum, read access to vSphere VMFS volumes on the SAN. This is not a requirement for hardware-assisted recovery.



NOTE: For support of Veeam Explorer for Storage Snapshots with HP StoreVirtual storage, the minimum version of LeftHand OS (previously SAN/iQ) is 9.5.01.

Configuring backup jobs to use HP storage for hardware-assisted backup of vSphere VMs

By default, Veeam Backup & Replication jobs are set to use storage snapshots as the method of retrieving vSphere VM data. However, it is possible to enable or disable this capability manually by right clicking on a backup or replication job and clicking *Edit*, followed by *Storage*, and choosing the *Advanced* button. You will see a tab labeled *Storage Integration*.

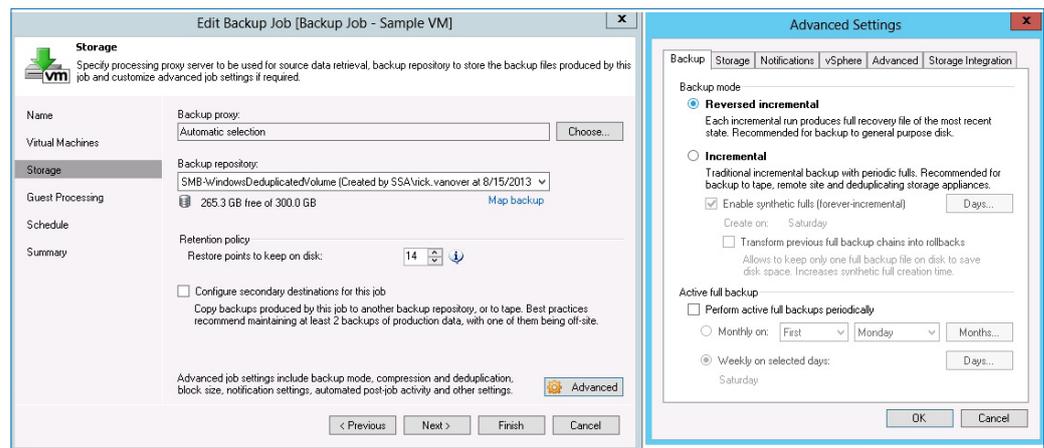


Configuring backup jobs using DAS- and SAN-based backup repositories

Primary storage arrays and direct-attached storage in servers offer good random I/O performance characteristics which is required for recovering VMs fast with object-level granularity. The trade-off with an online primary storage array versus a nearline backup appliance with deduplication is fast recovery and granular restoration at the expense of lower storage efficiency and shorter retention periods. Backup appliances are purpose-built to offer a lot of bulk storage for longer retention and overall lower cost per GB at the expense of longer recovery times when compared to general-purpose primary disk arrays.

The mode of incremental backup, source-side deduplication and compression can all be configured by clicking the *Advanced* button in the Storage step of the *New Backup Job* or *Edit Backup Job* wizards. Deduplication is always recommended regardless of the choice of backup target device to minimize the backup image size and reduce network traffic. The settings in the drop-down lists under the *Backup* and *Storage* tabs display detailed descriptions for particular use cases when selected.

Reversed incremental backup mode

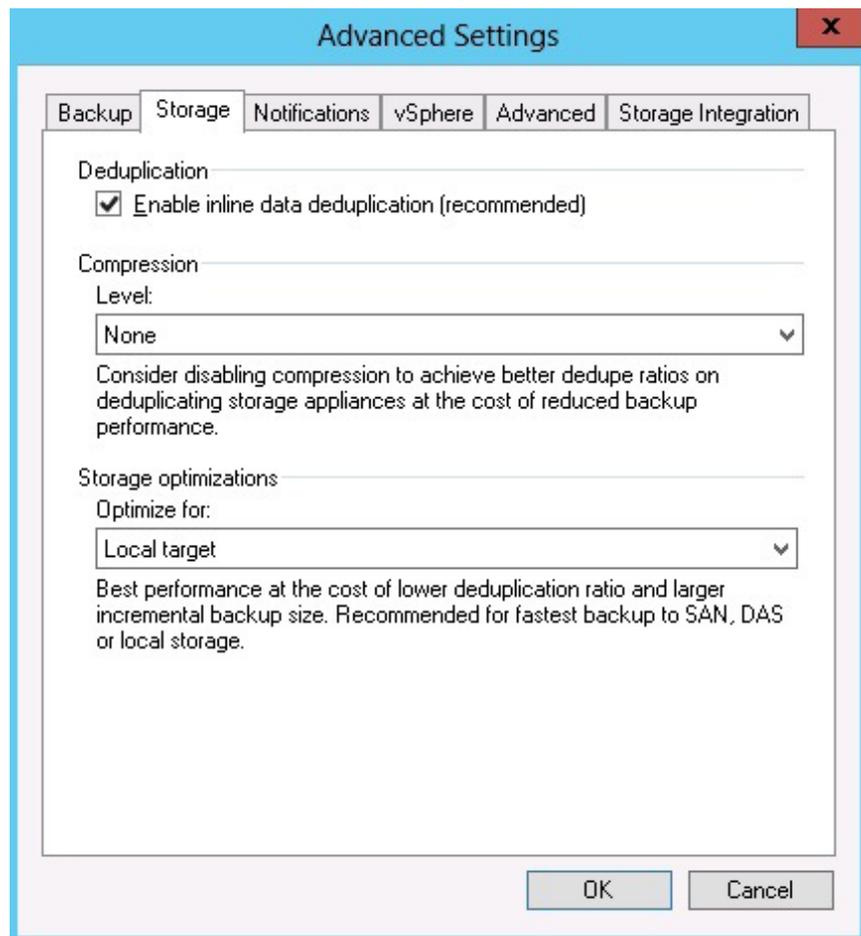


Setting compression for backup jobs using SAN and DAS

The *Edit Backup Jobs* wizard *Storage* tab provides the configuration settings for compression. The following example shows compression enabled, which is the recommendation for backing up to primary disk arrays. The setting in this example is for optimal compression, which strikes a balance between compression (which reduces network traffic during backup) and the CPU load on the backup proxy. A compression setting of "best" yields the smallest backup image and uses less network bandwidth. However, the wizard recommends a six-core processor in the backup proxy.

Setting block size for backup jobs using SAN and DAS

The *Storage* tab optimizations, configured for a local target in this example, determine the block size used for backup and deduplication. The block sizes can be: 256 KB for a backup target over a WAN; 512 KB for backup over a LAN; or 1024 KB for backup targets located directly on the backup server. For DAS and SAN storage the local target setting is recommended.



Note: To launch the *Advanced* Settings dialog, click on the *Advanced* button in the *Edit Backup Jobs* wizard. then open the *Storage* tab in the *Advanced* Settings dialog to see the configuration options. When you select an option from the drop-down list, a detailed description of the appropriate use case is displayed, ensuring a simple and successful deployment experience.

Best practices for maximizing VM recovery with HP Storage primary storage subsystems:

Design your disk array for fast random read I/O profiles to better enable Veeam's Instant VM Recovery. Mounting NFS exports on a Linux server can improve RTOs up to 25% in many cases. Enable deduplication and compression with Veeam Backup & Replication in order to reduce backup traffic on the network and to achieve maximum space savings of the backup images.

Recommended Backup Mode = Reversed Incremental

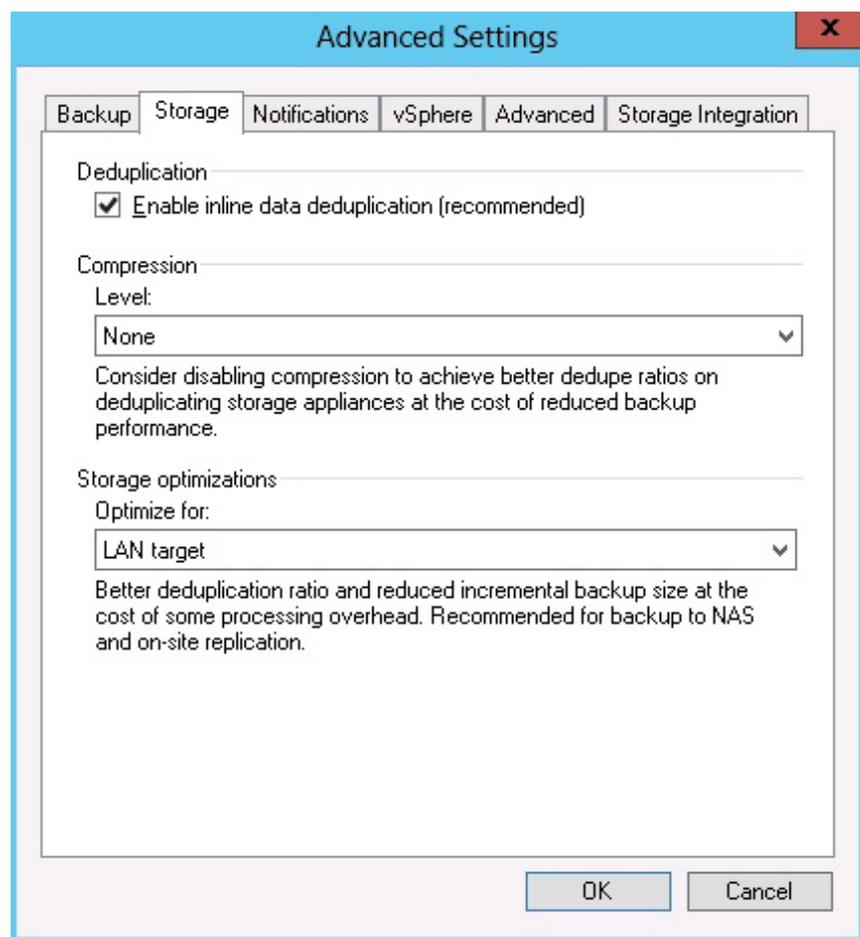
Configuring backup jobs when using the HP StoreOnce Backup System as a backup repository

Setting compression for backup jobs

The settings for compression are selected from the *Advanced* tab of the *New/Edit Backup Jobs* wizard's *Storage* screen. A compression setting of *Optimal* balances the CPU load on the proxy server vs. the backup size and the amount of network bandwidth used. In this example, *Compression* is set to *None*, which optimizes the HP StoreOnce deduplication ratio at the expense of increased network traffic during backup. The following section explains how to reduce network traffic while optimizing deduplication.

Setting block size for backup jobs

For HP StoreOnce Backup Systems presenting CIFS shares (or NFS Exports), use the *LAN target* setting under *Advanced Settings*.



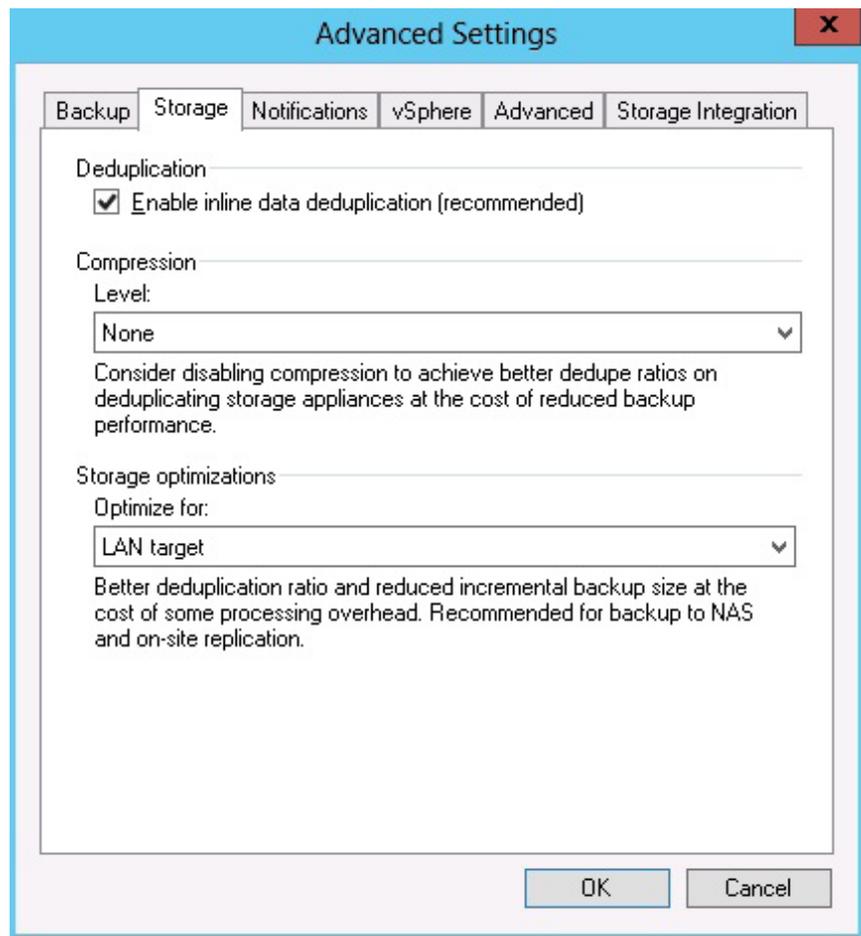
Best practices for maximizing VM backup capacity and retention with HP StoreOnce:

Enable deduplication for both Veeam Backup & Replication and the appliance to achieve maximum network throughput.

Set your backup repository to decompress backup images before they are written to disk or disable compression for the backup job. Compressing VM images prior to backing them up to a deduplication appliance reduces backup traffic on the network; however, it will negatively impact the appliance's ability to deduplicate the backup image on disk. This is not a bad thing: while dedupe has already taken place, HP StoreOnce Backup Systems will not report the consolidated ratio between Veeam and the appliance.

Recommended Backup Mode = Forward incremental

The type of incremental backup as well as source-side deduplication and compression can be configured in the backup job wizard (click the *Advanced* button). Deduplication is always recommended regardless of the choice of backup target device. Select a setting from the drop-down list (*Storage* tab) to display a detailed description for particular use cases. The following example shows the recommendation for disabling compression on a backup/dedupe appliance. There is a low compression (10 -15%) setting called *Dedupe Friendly* which can be used. The disclaimer that no two data sets are alike must be heeded. Always test alternate settings where possible.

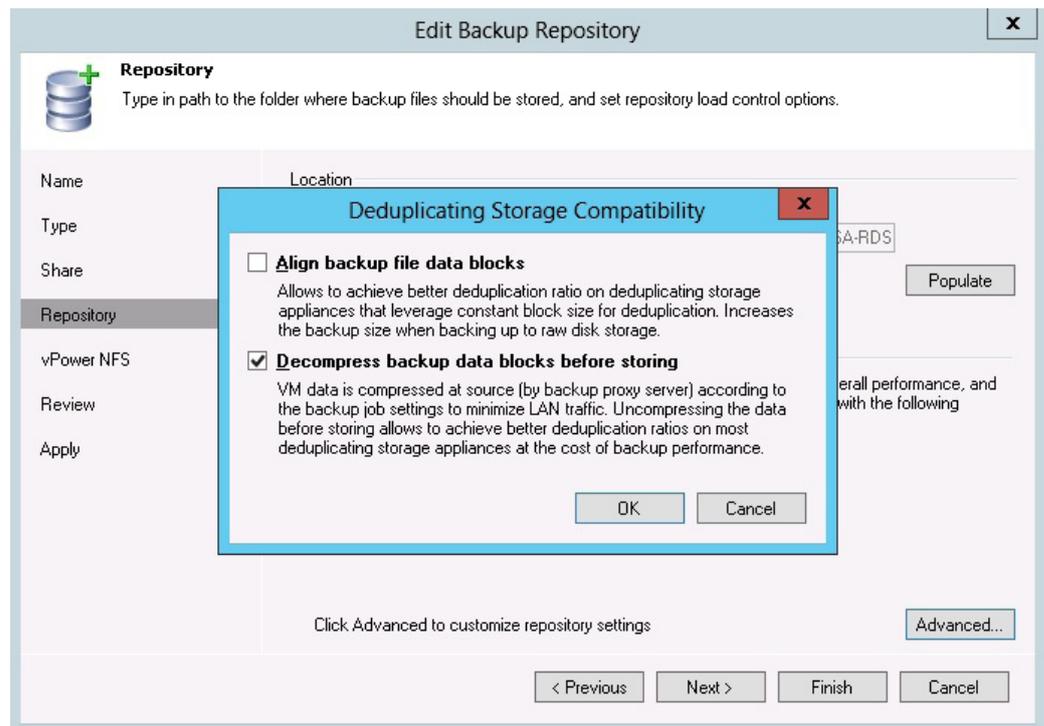


The selection for the type of incremental backup mode is made in the *Backup* tab of the *Advanced Settings* dialog box. Incremental backup mode is the recommended configuration when backing up to an HP StoreOnce Backup System as shown below.

Incremental backup mode, also known as forward incremental, can be configured for forever-incremental backup using synthetic full backups or you can elect to run periodic full backups. A synthetic backup is simply a series of incremental backups rolled into a previous full backup to create a current synthetic "full" backup.

Data block decompression and data block alignment settings for HP StoreOnce Backup Systems

This section describes how to enable source-side compression to reduce network traffic and then decompress prior to writing the backup image to the target. The decompression and alignment settings are found in the *New Backup Repository* wizard (click the *Advanced* button on the *Edit Backup Repository* wizard). For HP StoreOnce Backup Systems, select the checkbox for *Decompress backup data blocks before storing*. Leave the *Align backup file data blocks* checkbox unselected, as StoreOnce deduplication uses a variable block size.



Best practices for maximizing capacity and retention with HP StoreOnce with fast VM recovery:

Fast recovery of a VM is predicated on a backup target’s ability to handle random I/O, whether or not “rehydration” of deduplicated data is required. If critical VMs need quick and granular recovery capability, consider backing up to a physical backup proxy server with locally attached disks or a primary storage array to complement the appliance. Low-cost storage in a proxy or a disk array can provide a low-cost repository with a much lower RTO than a backup appliance. Once the desired retention period is met to accommodate fast recovery the backup can then be moved via the Backup Copy job function to longer-term storage. Fast recovery can also be automated using HP StoreVirtual snapshots and HP StoreServ Virtual Copies of production VMFS volumes with Veeam Explorer for Storage Snapshots.

Configuring Veeam backup servers and backup proxies

In order to achieve the fastest possible backup (e.g. the shortest backup window) and the fastest possible recovery (e.g. the shortest RTO), the backup infrastructure resources must be taken into consideration. Three factors directly affect the performance and effectiveness of this infrastructure: production (e.g. source) storage performance; backup (e.g. target) performance; and the performance of the backup management and proxy servers.

For maximum performance in a direct SAN environment, physical hardware proxies with direct FC or iSCSI connectivity are ideal. Virtual hardware can achieve acceptable performance in most environments and can actually be the best option in some cases. There are several advantages and disadvantages to consider when deciding between physical and virtual servers.

Physical server proxy	
Pros	Cons
<ul style="list-style-type: none"> • Provides best throughput, especially when using direct SAN access for FC and iSCSI storage • Multi-core processors can run more simultaneous jobs meaning less proxies to manage • No added multipathing or CPU load on virtual infrastructure • Easier and more robust recovery from catastrophic failures involving failed virtual infrastructure • Target storage can be attached directly to physical servers 	<ul style="list-style-type: none"> • Requires investment in additional hardware • Requires more complex storage setup for direct SAN access and ongoing configuration as storage environment evolves • Provides limited advantages for NFS environments

Virtual server proxy	
Pros	Cons
<ul style="list-style-type: none"> • Can use existing virtual machines • Leverages existing infrastructure • Requires no additional hardware • Generally the highest-performance option for NAS and DAS datastores • Simpler setup and configuration 	<ul style="list-style-type: none"> • Virtual proxies are limited by vCPU resources • Multiple proxies in the infrastructure can have significant impact on host resources • Generally requires more proxies to achieve the same throughput as physical • Target storage typically must be accessed via network which can be a potential bottleneck

The following recommendations are provided as starting points; significant variation can occur based on environmental factors. We assume typical environments with average change rates of 2-5% daily and an eight-hour backup window.

- Virtual proxy – one (1) four-vCPU VM for every 100 VMs or 10TB of data. This assumes two jobs each producing approximately 50MB/s each for full backups.
- Physical proxy – one 16 core physical system for every 400 VMs or 40TB of data. This assumes physical SAN connectivity and eight concurrent jobs each producing ~100MB/s each for full backups.

NOTE: You must have sufficient network bandwidth available to the physical server to achieve this level of performance. High-speed interconnects such as 8Gb Fibre Channel and 10Gb Ethernet are highly recommended. Deploying test proxies and running jobs to measure throughput is essential to determine more accurate numbers for the specific environment.

- For physical proxies, use SAN Access mode. Remember, SAN Access mode requires the physical server to be provisioned with access to the storage subsystem, either via Fibre Channel or iSCSI.
- For virtual proxies, use Hot-Add transport mode. Remember, Hot-Add mode requires the proxy server be located on a VM in the same cluster/host as the VM you are backing up.
- Use Network transport mode only when other modes are not available.

If a datastore cannot be accessed by Direct SAN or Hot-Add mode by any proxy, then the system will use Network mode to retrieve the VM disks via the ESXi management interface. When using Network mode, Veeam Backup & Replication attempts to locate a proxy that is on the same subnet as the ESXi management interface to reduce the risk of crossing slow, layer-3 networks. In this mode, the VM data is transferred over the IP management network so it is important that this network has the ability to handle sustained high-speed data transfer without interfering with normal management traffic.

NOTE: If you plan to deploy proxy server(s) on existing VM(s), and a virtual proxy is set-up to backup or replicate itself, be aware that CBT will be disabled and the job will automatically failover to Network mode. This can have a noticeable impact on backup performance.

Proxy servers are the real workhorse of Veeam Backup & Replication as such they consume considerable CPU resources. In general, assuming default compression options, it is recommended that one CPU be available for every active job:

- One (1) core for every job (physical servers) and one (1) vCPUs for every active job (virtual servers).
- At least four (4) vCPUs allocated for virtual proxies to leave resources available for other server functions.

For memory sizing, assume the proxy server's data mover agent will use the maximum memory (1.7GB), leaving additional headroom to be safe. Therefore, the requirement is 2GB of RAM per concurrent process as a minimum.

Best practices for increased backup repository performance:

Use the fastest possible disk and mirrored RAID levels. Fast VM recovery will necessitate a disk backup target with good random read capability such as a disk array (i.e. P2000 MSA, HP StoreVirtual, EVA, HP StoreServ, etc.) or Direct-Attached Storage (i.e. SMART Array P421/BBWC and D2600 JBOD enclosures). Fast backup targets can be deployed using existing DAS or SAN resources provided they're adequately sized (RAM; multi-core CPUs; number of HDDs and RPM speed; \geq Gb speed networking).

Summary of Veeam Backup & Replication Editions and Features:

	Veeam Backup & Replication Standard Edition	Veeam Backup & Replication Enterprise Edition	Veeam Backup & Replication Enterprise Plus Edition
Veeam Explorer for Storage Snapshots • Snapshot-assisted recovery	✓	✓	✓
Backup from Storage Snapshots • Snapshot-assisted backup	✗	✗	✓
Veeam Explorer for Microsoft Exchange • Exchange 2010/2013 message-level recovery	✓	✓	✓
Veeam Explorer for Microsoft Exchange • Direct recovery to mailbox ¹	✗	✓	✓
Veeam Explorer for Microsoft SharePoint²	✓	✓	✓
Native tape support³	✓	✓	✓
U-AIR® (Universal Application Item Recovery) • Exchange 2003/2007 message-level recovery • SQL and Active Directory object-level recovery	✗	✓	✓

1. Veeam Backup & Replication Enterprise Plus Edition also supports dissimilar mailbox restore targets (e.g. foreign mail domain, Office 365, etc.).
2. All editions support restore via save, send and export. Enterprise and Enterprise Plus editions also support restore to original location.
3. All editions support copying Windows, Linux and VM backup files to tape. Enterprise and Enterprise Plus editions add tight integration with backup jobs and support full tracking of VMs and restore points on tape.

Resources

[Veeam Backup and Replication User Guide for Hyper-V or VMware](#)

[Veeam Community Forums – Backup and Replication](#)

[HP Storage Landing Page](#)

[HP-VEEAM Landing Page on Veeam.com](#)

[HP Business Support Center](#)

[Veeam Support](#)

[Veeam Community Forums](#)

About Veeam Software

Veeam® is Modern Data Protection™ - providing powerful, easy-to-use and affordable solutions that are Built for Virtualization™ and the Cloud. [Veeam Backup & Replication™](#) delivers [VMware backup](#), [Hyper-V backup](#), recovery and replication. This #1 VM Backup™ solution helps organizations meet RPOs and RTOs, save time, eliminate risks and dramatically reduce capital and operational costs. [Veeam Backup Management Suite™](#) combines Veeam Backup & Replication and [Veeam ONE™](#) into a single integrated solution to protect virtualization investments, increase administrator productivity and help mitigate daily management risks. [Veeam Management Pack™](#) (MP) extends enterprise monitoring to VMware through Microsoft System Center. Veeam also provides [free tools](#) for the virtualization community.

Founded in 2006, Veeam is privately-owned and has been profitable since 2009. Veeam currently has over 20,000 ProPartners and 80,000 customers worldwide. Veeam's global headquarters are located in Baar, Switzerland and has offices throughout the world. To learn more, visit <http://www.veeam.com>.



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Gold Application Development
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Modern Data Protection

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Powerful

Easy-to-Use

Affordable

Veeam Backup & Replication

#1 VM Backup for VMware and Hyper-V

Virtualization changes everything – especially backup. If you've virtualized on **VMware or Hyper-V**, now is the time to move up to the data protection solution Built for Virtualization: **Veeam Backup & Replication**.

Unlike traditional backup that suffers from the "3C" problem (missing capabilities, complexity and cost), Veeam is:

- **Powerful:** Dramatically improve your RPOs and RTOs
- **Easy-to-Use:** Save time and eliminate risk
- **Affordable:** Reduce TCO and increase ROI

Join the 80,000 organizations who have already modernized their data protection with Veeam. **Download Veeam Backup & Replication** today!



To learn more, visit <http://www.veeam.com/backup>