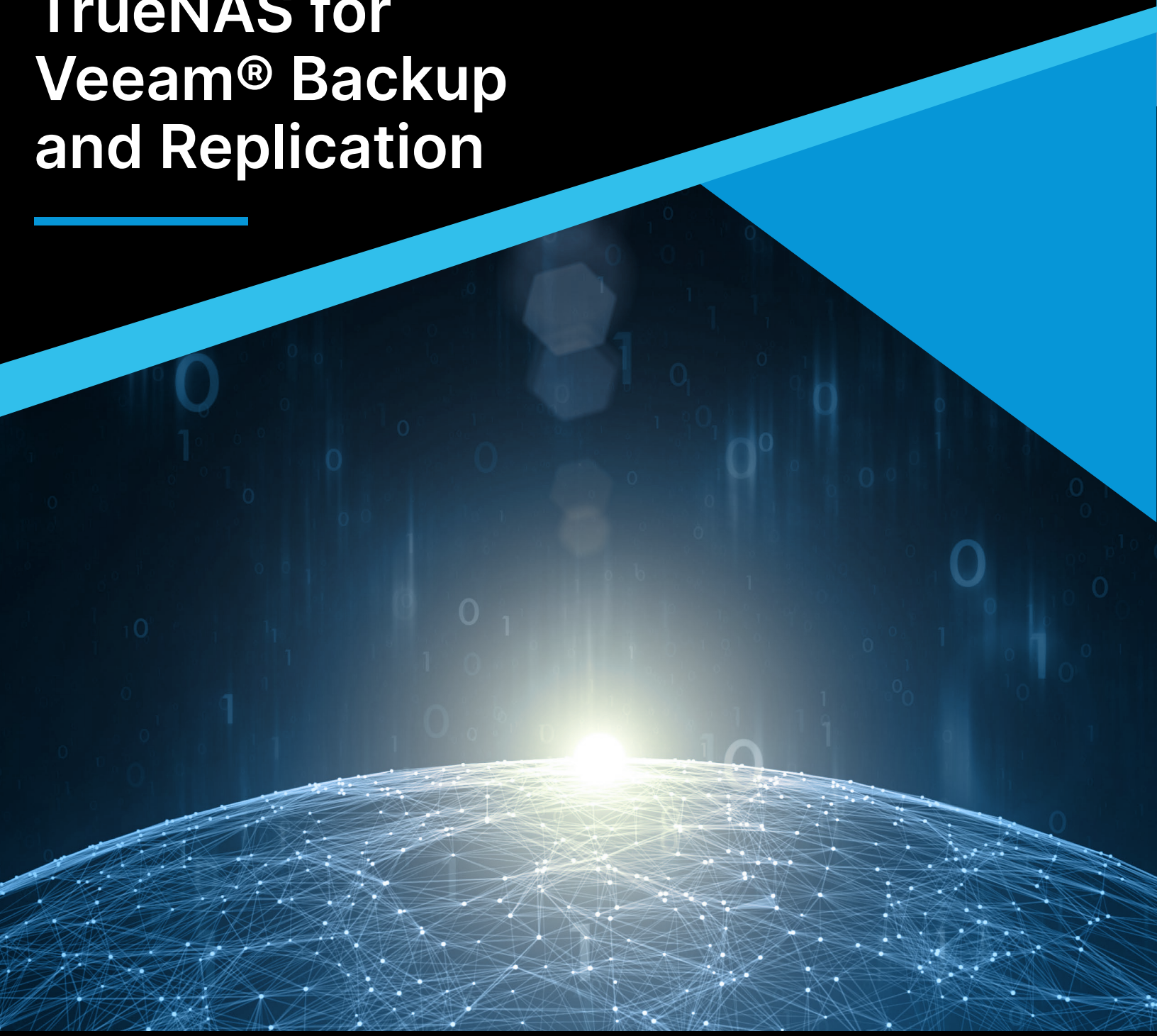
WHITE PAPER

TrueNAS for Veeam® Backup and Replication



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1 About this Document

TrueNAS Enterprise appliances are certified Veeam Ready and can be used to handle demanding backup requirements for file and VM backup. These certification tests measure the speed and effectiveness of the data storage repository using a testing methodology defined by Veeam for Full Backups, Full Restores, Synthetic Full Backups, and Instant VM Recovery from within the Veeam Backup & Replication environment. With the ability to seamlessly scale to petabytes of raw capacity, high-performance networking and cache, and all-flash options, TrueNAS appliances are the ideal choice for Veeam Backup & Replication repositories large and small.

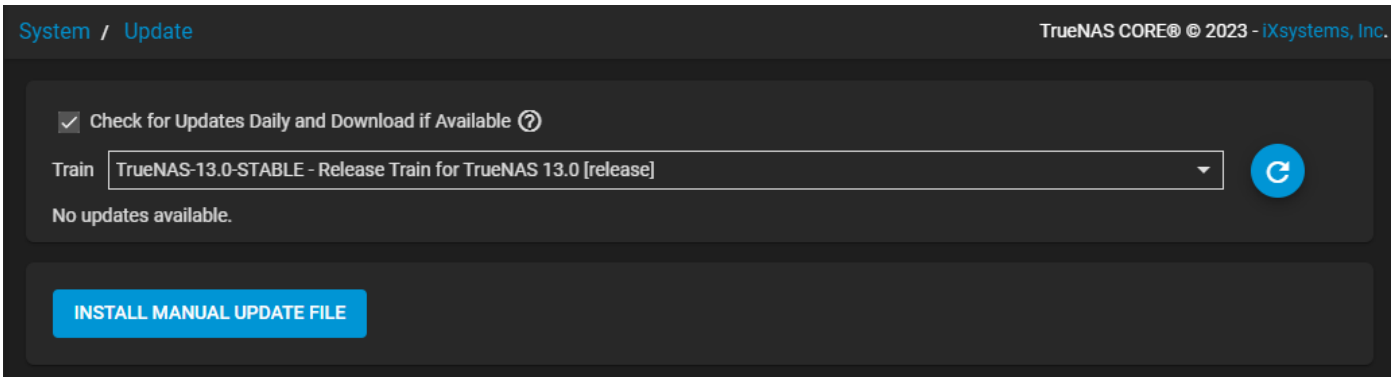
This document will cover some of the best practices when deploying TrueNAS with Veeam, specific considerations users must be aware of, and some tips to help with performance. The focus will be on capabilities native to TrueNAS, and users are encouraged to also review relevant Veeam documentation, such as their help center and best practices for more information about using and optimizing Veeam.

2 What is Needed?

When deploying TrueNAS with Veeam users should prepare the following:

- Veeam Backup & Replication dedicated server - either physical or VM
- Windows Server and Microsoft SQL for Veeam
- TrueNAS appliance with users pre-configured as determined by the admin
- Networking - 1/10/40/100 GbE infrastructure and cables
- Veeam connected to the Hypervisor or other clients to pull the data to TrueNAS
- All appropriate licenses
- Backup proxies as defined by Veeam - they can be virtual machines or physical machines or the backup server itself for low workloads

Update the TrueNAS systems to the latest version before beginning deployment. Go to **System → Updates** and click **Check Now**. Setting this before deployment ensures the appliance has the latest bug fixes, security updates and software enhancements to ensure maximum performance and security. If deploying on a closed network (LAN) without access to the Internet, users may also obtain and apply an update manually. Please contact TrueNAS support for details.



3 Certified Hardware

TrueNAS systems from the M, X, and R-series are certified as Veeam Ready for v12.

A full list of certified TrueNAS hardware is on the Veeam website.

4 Sizing Considerations

TrueNAS storage appliances range from entry-level to high-end, and the user's current usage scenario and backup demands must be considered.

Define Usage for Your Storage: While this guide focuses on Veeam, the unified design of TrueNAS allows it to multitask. If TrueNAS will be handling more than backup jobs, other usage needs should be taken into account. For example, if the storage appliance has one LUN (dataset or zvol) set as a VMware datastore for hosting VMs, and another LUN set to be used for backups, both capacities must be considered.

Estimate Capacity: The first step when estimating required capacity is to understand how much capacity is currently used by existing VMs and by files that users need to back up. Veeam and the TrueNAS appliance will both apply data compression, though different file types and the structure of the data in those files will affect the achieved compression levels. Some tools for capacity estimation are listed at the end of this section, but it is always good to err on the side of caution and 3x the current storage used is not unreasonable. ZFS performs best with utilization below 80%. Snapshots, full backups, and incremental backups will all require more storage than primary storage being used today.

Estimate Network Bandwidth: Bandwidth is harder to estimate and must take into account backup timeframes, backup sizes, and available network resources. Typically, backups run during off-hours when IT equipment is under a lighter load. This timeframe can be set, but if each backup is several terabytes in size, a longer amount of time and greater bandwidth is required. iXsystems tests its Veeam backups using a 10 GbE mixed network with the datastore storage, hypervisor hosts, and backup repository (the TrueNAS) on the same network. However, shorter backup windows, heavy network usage, and dozens of VMs being backed up at the same time may require 40 or 100 GbE networking and multiple Veeam Backup Proxies used in tandem.

An example from the Veeam Best Practice Guide backing up 1000 VMs, each 100 GB in size, with a backup window of 8 hours requires around 5 virtual Proxy servers with 8 vCores, 16 GB memory each, and around 3.7 GB/s of throughput. In such a scenario, iXsystems would recommend 100 GbE interconnect and TrueNAS appliances with over 100+ hard drives. However, bandwidth can be greatly reduced if users can accept incremental and staggered backups. For example, run an incremental backup on all VMs each day, and a full backup on 100 VMs per night, rotating a different 100 VMs each night. This strategy provides a 5X increase to the maximum number of VMs and reduces costs by 75%.

Choose a TrueNAS model: TrueNAS systems are excellent for backup and archiving, and like any system, the configuration that is recommended depends on how demanding the requirements are.

Model	Backup Only?[1]	Number of VMs Backed Up[2]	Network	Max Usable Capacity
R20	Yes	19,600	25 GbE	2 PB
R40	No	12,100	100 GbE	720 TB
R50	No	75,900	100 GbE	5 PB
X10	Yes	6,800	10 GbE	500 TB
X20	Yes	13,600	10 GbE	1 PB
M30	No	6,800	25 GbE	500 TB
M40	No	29,400	40 GbE	3 PB
M50	No	151,800	100 GbE	10 PB
M60	No	303,600	100 GbE	25 PB

Configure the Pools, datasets, and zvols: For high-capacity deployments, iXsystems recommends 9+2+1 RAID groups (called "Virtual Devices" or "vdevs" by ZFS terminology). This configuration consists of a RAIDZ2 (similar to RAID 6 with 2 drive parity so 2 drives can fail without data loss) with one to two global hot-spares added to the pool. Pools can include several of these groups, so the capacity can be expanded as needed. For example, 390 TB of usable space with 12 TB drives requires four groups and 48 drives. Detailed configurations can be discussed with iXsystems sales representatives and engineers.

Storage lifecycle planning: TrueNAS storage pools can be expanded online to the maximum size supported by a particular TrueNAS system. Storage pools can be expanded one vdev (RAID group) at a time so long as each vdev shares the same type. When deploying an iSCSI share requiring a zvol (LUN), users should consider thin provisioning using the sparse option during setup.

In addition to the above considerations, there are many tools, forums, and other discussion groups to help verify the amount of storage needed for Veeam backup. In many sites, Veeam compression or deduplication is around 1.5x to 2x, but this is more a reference than a rule. Backup types, applications, and the diversity of VMs can all factor into the true amount of storage needed. Capacity must also be considered alongside desired performance, as a smaller quantity of large drives often will not yield the same performance as a larger number of small drives[3]. For rough calculations, additional resources are listed below:

3rd party Veeam sizing guide
Estimate Veeam space - Veeam Knowledge Space
Sizing from Veeam Best Practices

1 Backup only assumes that the storage is being used only as a backup repository. This can be understood as a recommendation, not a rule. The number of VMs is based upon conservative throughput estimates with an average VM size set as 100 GB and a backup window of 8 hours running full backups. All other requirements for the number of Veeam Backup Proxies, and networking dependencies also apply.

2 Numbers are based on max capacity and estimating 100 GB per VM and a 2:1 optimal compression ratio. Compression and Deduplication settings can radically change the estimates, and Veeam allows for fine tuning: Veeam Help Center

3 While generally true that fewer spindles equals less performance, your RAID type and the TrueNAS read-ahead caching capabilities help mitigate this issue as much as possible. Of more concern could be the RAID-hit incurred with larger drives (i.e. RAIDZ2 across 6 TB HDDs loses 12 TB, while the same across 2 TB HDDs is only 4 TB). It is important to discuss with TrueNAS sales engineers and sales representatives what the best configuration is given specific workload and backup requirements.

5 Advantages of Using TrueNAS for Veeam

TrueNAS is a robust, unified storage system well-suited for nearly any environment. For backups, the platform takes advantage of the data integrity offered by ZFS that includes features such as copy-on-write, unlimited snapshots, and checksums that prevent bit-rot. TrueNAS appliances can also be expanded at any time simply by adding more drives so datasets can grow to keep pace with your data. Additional key features offered out-of-the-box at no extra cost to the user are listed below.

Self-healing file system: ZFS places data integrity first with data scrubs and checksums to ensure files are saved correctly and preserved.

Native replication to TrueNAS systems: perfect for disaster recovery and compliance.

High-availability (HA) architecture with 99.999% availability: Ensure the system is always ready to receive the latest backups.

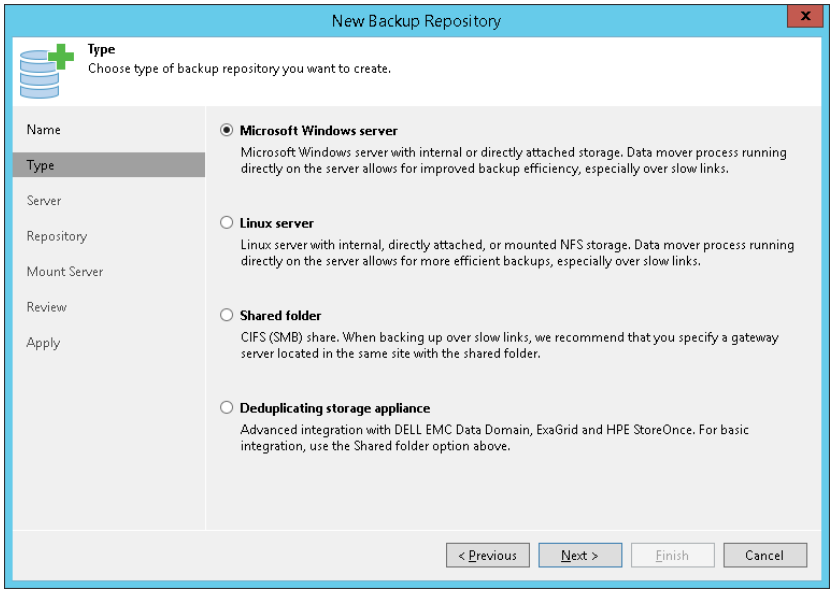
Triple-parity: RAID groups (vdevs) can be configured with mirror, single-parity (RAIDZ), dual-parity (RAIDZ2), or triple-parity (RAIDZ3) levels, while copy-on-write, checksums, and data scrubbing help protect long-term data integrity.

Certified with VMware® and Citrix® XenServer®: TrueNAS can be both a hypervisor datastore and a backup repository with data on different datasets and even pools. Just be mindful of the scale of the workloads being run.

Unrivaled scalability in a single dataset: Scale the backup repository from terabytes to petabytes of usable capacity. No LUN limits, clustering or licenses needed.

6 Set up TrueNAS as a Veeam Repository

Veeam Backup & Replication runs on a Windows operating system, typically Windows Server 2012 or newer, and can connect to a variety of storage systems. iXsystems recommends using iSCSI with a Veeam scale-out repository architecture. Users can also use SMB to mount the volume to the backup server directly. With support for SMB/CIFS, NFS, AFP, iSCSI, and FC, TrueNAS offers many ways to connect to Veeam backup servers.

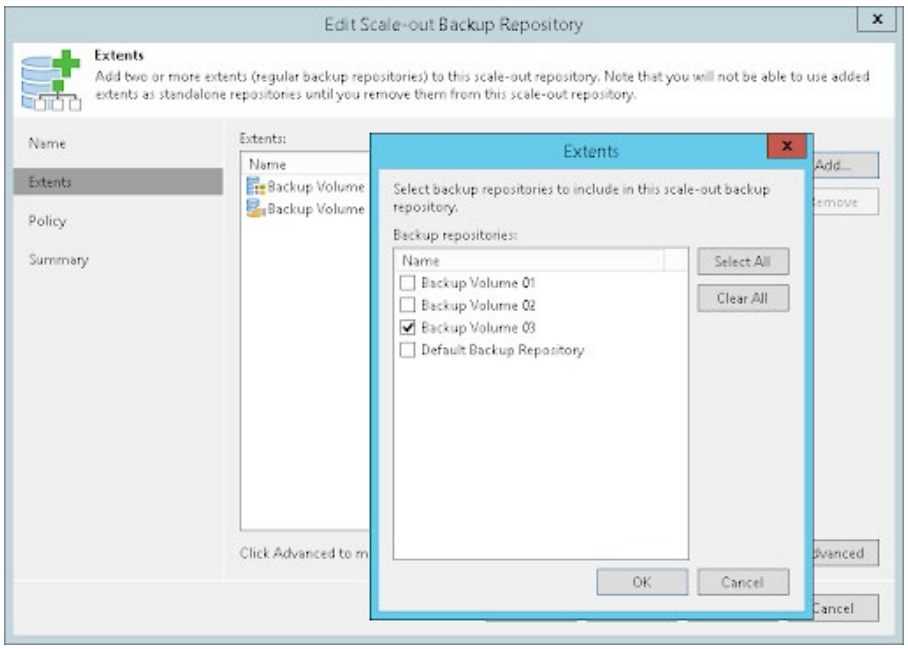


7 Performance Tuning for Veeam Backup and Replication

When testing Veeam, the TrueNAS X Series was shown to outperform benchmark standards by around 100 percent using the scale-out repository setup detailed in the Veeam help center. When testing, the VMs being backed were each 100 GB in size running Linux or Windows Server; more details are listed below.

Using a Scale-out Backup Repository, users can link multiple backup repositories (Extents) together to help with performance and load balancing across the various repositories. In the topology above the TrueNAS is broken across four LUNs to act as the scale-out extents. Both the TrueNAS datastore and the TrueNAS backup only used one 10GbE link when connecting to the VMware server pool.

Note: Scale-out Backup Repository is only available in Veeam Backup & Replication Enterprise and Enterprise Plus editions.



Source: Veeam Help Center

Results:
Testing in this configuration with a backup server and backup proxy, both Windows Server 2012 R2 VMs, yielded excellent results with the TrueNAS X-Series platform. iXsystems reference numbers can be seen below. These were achieved with just a single Veeam Backup Server and a Veeam Backup Proxy Server. For more demanding workloads, results can be scaled by adding more VMs to act as the Veeam Backup Proxy.

Test	Time Limit	TrueNAS Time	Result
Full Backup	30:00 Minutes	13:10 Minutes	2X Faster
Full Restore	25:00 Minutes	12:00 Minutes	2X Faster
Synthetic Full Backup	50:00 Minutes	24:18 Minutes	2X Faster

8 Additional Resources

For more information on using your TrueNAS and tuning Veeam performance, it is recommended to review the user guides, forums, or contact the TrueNAS support team.

- TrueNAS Documentation
- Set up an iSCSI share on TrueNAS
- Set up SMB (CIFS) share on TrueNAS

Veeam Backup & Replication Scale-Out repository references:

- Scale-Out Backup Repositories page
- Scale-Out Backup Repositories video

- TrueNAS support
- Additional Veeam tips can also be found here.