Veeam Backup and Replication v12 Beta 2 Throughput Benchmark

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MinIO Veeam Backup and Replication v12 Beta 2 Throughput Benchmark

Backups are an integral part of enterprise business continuity planning. The bulk of enterprise backups consist of virtual machines (VMs) and virtual disks (VMDKs). The leader in backup, recovery and replication of VMs and VMDKs is Veeam. Veeam requires scalable, high-performance storage to support efficient operations.

This document describes the performance of MinIO object storage when run as a Direct to Object backup target for Veeam 12 Beta 2.

MinIO is a cloud-native object storage suite designed for high-performance workloads such as AI/ML, advanced analytics and databases. MinIO is software defined and open-sourced under the AGPL v3 license. The object storage suite consists of a server, and optional components such as a client, a management console, a Kubernetes Operator and Operator Console and a software development kit (SDK).

Veeam is the leader in backup, recovery and data management solutions that deliver Modern Data Protection. With their single platform for Cloud, Virtual, Physical, SaaS and Kubernetes environments they provide a trusted back-up solutions that deliver cloud data management and protection, keeping the world moving for over 400,000 customers including the vast majority of Fortune 500 companies. Named a Leader in the Gartner Magic Quadrant and won over 200 top industry awards.

Our results running backup and restore operations of VMware vSphere virtual machines and virtual disks using 8 hosts for vSphere as a source and 8 hosts for MinIO over a 100 Gbps Network can be summarized as follows:

Number of VM	Veeam Operation	Veeam Block Size	Veeam Compression	Max. Throughput Frontend	Max. Throughput Backend
1	Backup Full	8	2:1	860 MB/s	430 MB/s
1	Restore Full	8	2:1	960 MB/s	480 MB/s
14	Backup Full	8	2:1	3000 MB/s	1500 MB/s
112	Backup Full	8	2:1	23000 MB/s	12000 MB/s

The maximum throughput measured in our testing was 12000 MB/s or 12 GB/s backend speed.

1. Benchmark Environment

1.1 Hardware and Lab details

Hardware used for this testing is as follows:

Instance	# Nodes	CPU	MEM	Storage	Network
VMware vSphere	4	2 sockets x 20 cores @ 2.10GHz	384 GB	8 x SEAGATE 1.6TB SSD	100 Gbps
MinIO Server	8	2 sockets x 20 cores @ 2.10GHz	384 GB	10 x INTEL 1TB SSD	100 Gbps

The following VM setup was used on Veeam side:

Instance	# VMs total	Details
Veeam Proxy Server	16	Two per vSphere Host
Veeam Gateway Server	8	One per vSphere Host
Veeam Backup & Replication Server	1	One server managing the whole backup
Source VMs	112	112 VMs with unique data and exact 2:1 compression

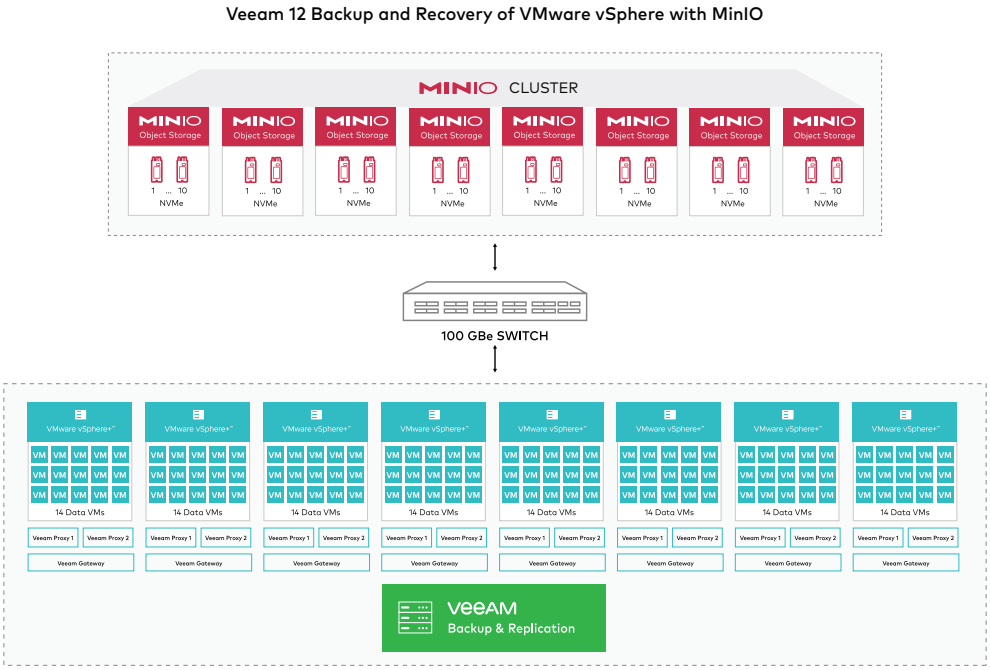

Figure 1. Veeam 12 Beta 2 backup and recovery of VMware vSphere with MinIO system architecture.

1.2 Software

Property	Value
Veeam	12 Beta 2
MinIO Version	RELEASE.2022-06-22T03-12-50Z
VMware vSphere	7.0.3

1.2 Veeam Backup and Restore 12 Performance Tests

Veeam and MinIO ran a series of backup and restore operations, ranging from a full backup and restore of a single VM to full backup and restore of 112 VMs, from a VMware vSphere host to MinIO. For each test run, we recorded the data volume on the vSphere host's drives, the amount of data processed, read, and transferred, the compression that was achieved, block size, average object size, network throughput, S3-API throughput and the number of GETs and PUTs.

The environment was configured in a way where 14 source VMs per host were distributed across the available. local NVMe disks of the vSphere hosts. Per host there were two Veeam Proxy servers and one Veeam Gateway server, where the proxy servers read the data via Hot-Add and then used the Gateway server to write this data towards the S3 endpoint on MinIO side.

We ran an equal number of Veeam servers and MinIO servers in an attempt to max out each.

1.4 MinIO Configuration

The MinIO binary was downloaded onto each server node and installed using the default configuration. Erasure coding remained in the default configuration of EC:4.

2. Understanding Hardware Performance

2.1 Network Performance

In virtually all cases with MinIO, the network is the bottleneck. MinIO takes full advantage of the available underlying server hardware. In this test, we used a single network for all communications.

Each server was connected directly to a 100 Gbit/sec Ethernet switch using a single NIC. 100 Gbit/sec equates to 12.5 Gbyte/sec (1 Gbyte = 8 Gbit).

Therefore, the maximum throughput that can be expected from each of these nodes would be 12.5 Gbyte/sec.

There are 8 MinIO nodes, making the theoretical maximum GET throughput 100 GB/sec (800 Gbps) and PUT throughput 50 GB/sec (400 Gbps). Note that such theoretical maximums aren't achievable in the real world given the overhead imposed by TCP and Ethernet technologies. When Ethernet, TCP and IP header overhead are taken into account along with other factors such as preamble size, inter-frame gap and frame size, many switched networks run at about 80%-90% efficiency. In the

case of a 100 Gbps network, that translates to real-world available file transfer speeds between 40 GB/sec and 45 GB/sec.

3. Running Veeam 12 Backup and Restore Operations

3.1 Results

The throughput of Veeam 12 Beta 2 backup and restore of vSphere VMs to 8 MinIO nodes running 10 NVMe drives, as measured from the Veeam console is presented below:

Number of VM	Veeam Operation	Veeam Block Size	Veeam Compression	Max. Throughput Frontend	Max. Throughput Backend
1	Backup Full	8	2:1	860 MB/s	430 MB/s
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Interpretation of Results

Throughput was limited by CPU utilization on the vSphere cluster as the vSphere hosts were not able to process more data at that time. Throughput was not limited by the MinIO cluster or the network.

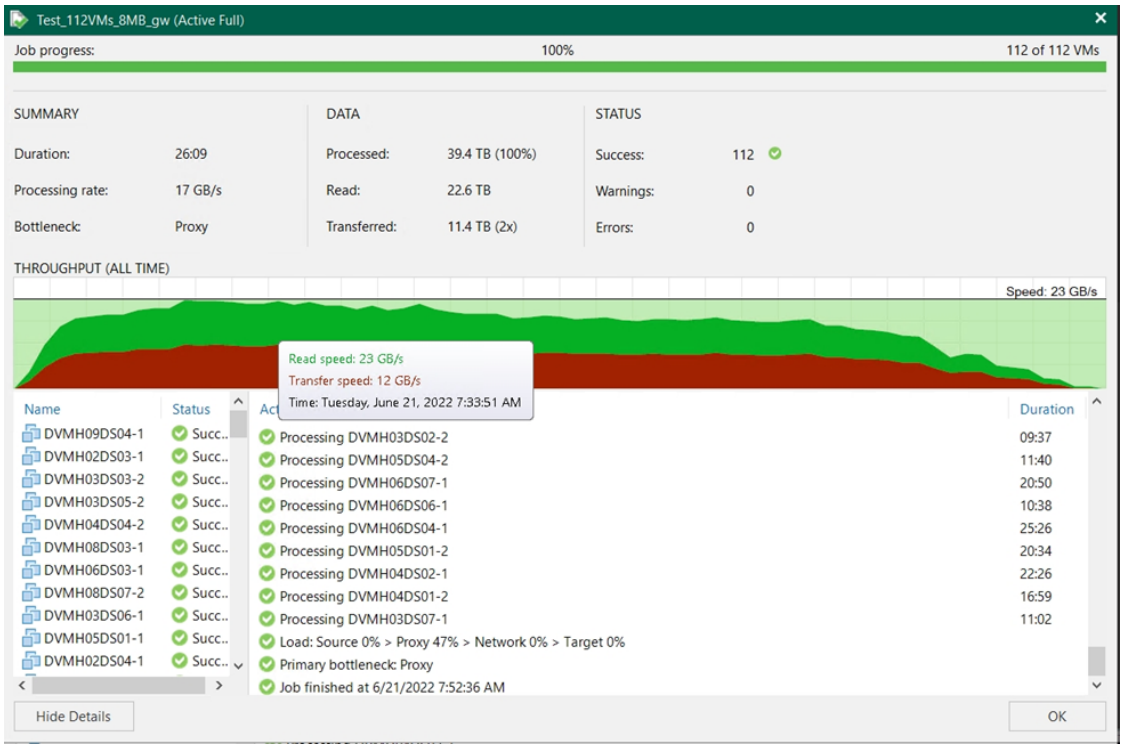

Figure 2. The Veeam console demonstrated that the primary bottleneck was Veeam, the proxy.

4. Conclusion

Based on the results above, we found that an 8 node MinIO cluster with 10 NVMe drives provides an outstanding target for Veeam backing up VMs and VMDKs from VMware vSphere. The throughput that this system displayed shows that MinIO should be among the fastest S3 targets available. It is likely that increasing the source side with more vSphere hosts and VMs will result in even better throughput.