



Fast restore using HPE Alletra Storage MP X10000 and Commvault

We operate in an era where expectations for resiliency and service levels are always increasing. Service-level agreements (SLAs) and uptime requirements are becoming more stringent, and there is an ever-increasing risk of disruptions and costs associated with downtime and data loss. Hewlett Packard Enterprise and Commvault have teamed up to provide a solution that not only protects your data but also enables fast restores when things go wrong. This combined solution is great for databases and workloads that have short backup windows and require fast recovery times.

Data has become the lifeblood of every organization. It is essential to manage that data well and to have a strategy for not only backing up and protecting that data but also recovering it quickly and efficiently in the event of any disruption.

The HPE Alletra Storage MP X10000 and Commvault Cloud Backup and Recovery software protect your business to help ensure you can quickly recover your critical data and applications when the unexpected happens. This solution provides data protection for any workload, including structured databases and performance-oriented, unstructured workloads.

The HPE Alletra Storage MP X10000 intelligent storage platform provides flash-based performance with NVMe drives and 100GbE networking. The distinctive characteristic of this innovative all-flash, shared everything, disaggregated storage platform is that data is made available through the S3-compatible object storage protocol that enables low latency and high performance on both backup and restore operations. This allows the best possible recovery point objectives (RPOs) and recovery time objectives (RTOs) to protect your data.

Commvault Cloud Backup and Recovery software is a comprehensive data protection package, and together with HPE Alletra Storage MP X10000, is optimized to deliver uncompromising high performance through the S3 protocol. To achieve the highest performance, Commvault enables S3 access directly between the host and storage. This performance-optimized configuration is enhanced by Commvault Storage Accelerator, which creates a direct S3 communication path between the host and the HPE Alletra Storage MP X10000.



Tested configuration

The test configuration was designed to verify that the S3 protocol is not a limiting factor for backup and restore performance. The source data being backed up and restored was contained on an HPE Alletra Storage Server 4100 in a bare-metal (non-virtualized) configuration running Linux®. This source server contained seven NVMe drives in a RAID-0 software striped configuration and a single port connected to the 100GbE network.

The test workload was able to easily saturate the source host storage bandwidth in both backup and restore tests while only using a small portion of the available bandwidth of the HPE Alletra Storage MP X10000 in its smallest configuration. The physical NVMe disks in the source server were consistently running at 100% utilization during the backup and restore operations. This demonstrates that the S3 protocol does not limit the performance of the backup or restore operations. Because the HPE Alletra Storage MP X10000 is based on a shared network storage design that permits ample flexibility and ease of use, multiple hosts can be added to increase the aggregate workload for backup and restore activities and eventually use the entire I/O capability of the current configuration.

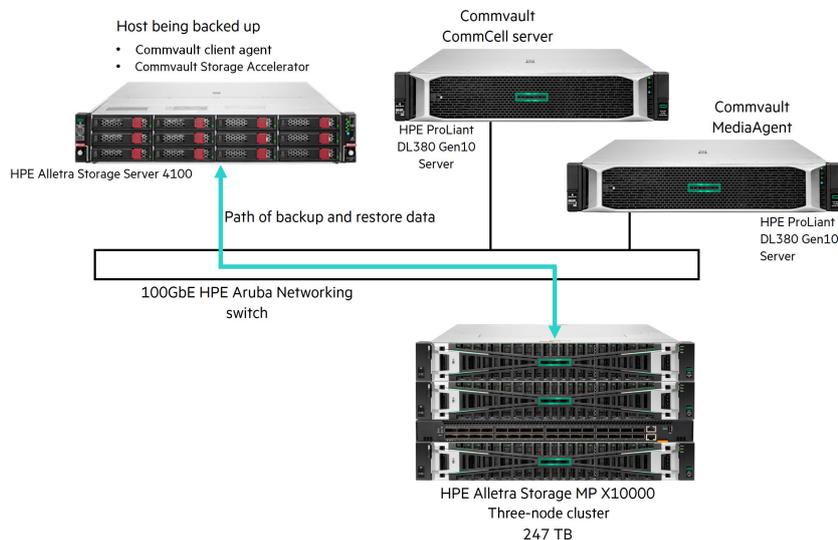


Figure 1. Diagram of the tested environment



Another important characteristic of the HPE Alletra Storage MP X10000 is its easy scalability to achieve the desired capacity and performance goals without downtime and without requiring any configuration change to the connected clients. This ability is enabled by the innovative disaggregated scale-out architecture that allows performance and capacity to scale independently, without compromising high availability or the performance of all-flash NVMe storage.

The Commvault client agent and Commvault Storage Accelerator applications were installed on the host being backed up. Network connections were provided by an HPE Aruba Networking 100 Gb Ethernet switch, as shown in Figure 1. While the backup and restore operations were orchestrated by Commvault, the Commvault MediaAgent only handled metadata and was not in the datapath for backups or restores. The Commvault CommCell server was used to initiate the backup and restore operations. With the advantage of Commvault Storage Accelerator, data was transferred directly from the host being backed up, to the HPE Alletra Storage MP X10000 object storage platform.



The size of the source dataset was 9.96 TiB (10 TB). A full backup was performed, followed by a full restore operation. The source data was compressible at a ratio of 2:1, producing a data size on the backup target of 4.98 TB. The goal of this testing was to characterize the performance of the HPE Alletra Storage MP X10000 using the S3 protocol. For that reason, performance was tested in the worst-case scenario, with client-side deduplication and compression disabled. This doubled the normal amount of network traffic and generated unnecessary workload for the storage system. This test was designed to build confidence that the HPE Alletra Storage MP X10000 could easily saturate the server with no client-side compression and double the normal bandwidth, and would therefore be equally fast in every situation, including cases where data is uncompressible.

Additionally, compression was enabled on the HPE Alletra Storage MP X10000 to help maximize the workload and further exercise the worst-case scenario. For production configurations, HPE recommends that client-side compression and deduplication be enabled to help minimize LAN traffic and the overall workload.

Table 1 contains the results of this fast backup and restore testing. It is important to note that throughput for the backup and restore operations is an average value over the time required to complete the backup or restore job. This job duration includes a ramp-up and ramp-down period at the beginning and end of the job where there is minimal or no data being transferred. During the time when backup and restore operations were actively transferring data, the NVMe disks used for data in the source host were consistently running at 100% utilization as shown in Figure 2 and Figure 3. At the same time, the load on the HPE Alletra Storage MP X10000 was just a fraction of its maximum capability.

Table 1. Backup and restore performance to saturate the host under test, using a small percentage of HPE Alletra Storage MP X10000 resources

Operation	Backup	Restore
Average throughput	29 TB/hr (> 8 GB/s)	16 TB/hr (4.4 GB/s)
Duration	21 minutes	38 minutes

Note

These performance numbers represent the limit of the source host that was being backed up and restored, not the limit of the HPE Alletra Storage MP X10000 or the S3 protocol.



Figure 2 shows an excerpt of the iostat output of the source server, captured during a backup operation. The virtual volume used for data (dm-1) and the associated physical NVMe drives were consistently running at 100% utilization during the time the backup was running. Similarly, Figure 3 contains an excerpt of the iostat output of the source server during a restore operation. Again, the virtual volume and associated NVMe drives were running at 100% utilization during the time the restore was in progress. These results clearly demonstrate that the HPE Alletra Storage MP X10000 was able to easily saturate the available storage bandwidth of the source server.

Device	r/s	rkB/s	rrqm/s	%rrqm	r_await	rareq-sz	%util
dm-1	95412.00	12067456.00	0.00	0.00	0.15	126.48	100.00
nvme0c0n1	13479.00	1725312.00	147.00	1.08	0.16	128.00	100.00
nvme1c1n1	13474.00	1724672.00	151.00	1.11	0.16	128.00	100.00
nvme2c2n1	13475.00	1724800.00	160.00	1.17	0.17	128.00	100.00
nvme3c3n1	13473.00	1724544.00	157.00	1.15	0.16	128.00	100.00
nvme5c5n1	13470.00	1724160.00	186.00	1.36	0.16	128.00	100.00
nvme6c6n1	13463.00	1723264.00	156.00	1.15	0.16	128.00	100.00
nvme7c7n1	13467.00	1723776.00	177.00	1.30	0.16	128.00	100.00

Figure 2. Excerpt of the iostat output of the host under test during a backup, showing that NVMe disk utilization is at 100%

Device	w/s	wkB/s	wrqm/s	%wrqm	w_await	wareq-sz	%util
dm-1	41329.00	5207460.00	0.00	0.00	0.08	126.00	100.00
nvme0c0n1	5811.00	743808.00	90.00	1.53	0.09	128.00	100.00
nvme1c1n1	5813.00	744000.00	97.00	1.64	0.09	127.99	100.00
nvme2c2n1	5811.00	743808.00	85.00	1.44	0.09	128.00	100.00
nvme3c3n1	5818.00	744640.00	99.00	1.67	0.09	127.99	100.00
nvme5c5n1	5818.00	744704.00	106.00	1.79	0.09	128.00	100.00
nvme6c6n1	5812.00	743936.00	88.00	1.49	0.09	128.00	100.00
nvme7c7n1	5809.00	743484.00	80.00	1.36	0.09	127.99	100.00

Figure 3. Excerpt of the iostat output of the host under test during a restore, showing that NVMe disk utilization is at 100%

The HPE Alletra Storage MP X10000 is designed to reach its maximum throughput whether the number of concurrent streams is limited, or quite high. The number of streams used should boost performance without compromising client-server resources. In this test, 28 parallel streams were used, with a block size of 4096 kB.





Direct backup to HPE Alletra Storage MP X10000 that is optimized for performance

When backup and restore times matter, the HPE Alletra Storage MP X10000 and Commvault Cloud Backup and Recovery software help meet the need for a fast, flexible, on-premises backup and restore solution. This combination enables fast backups with flash media acceleration of fragmented reads and rapid restores from virtual synthetic full backups.

The HPE Alletra Storage MP X10000 provides peace of mind with shared storage in a high availability configuration that is not only fast for backup activities but is exceptionally fast on every type of restore activity as well. Although it was not measured in this test, this NVMe solution performs exceptionally well with demanding random I/O such as large granular restores and the massive instant VM recoveries that are necessary for recovering from a ransomware infection. When your organization is equipped with unconditionally fast restores for any possible workload, it is more resilient and better prepared to continue operating when the unexpected happens.

Learn more at

[HPE.com/us/en/Alletra-Storage-MP-X10000](https://hpe.com/us/en/Alletra-Storage-MP-X10000)

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