

SQL Server deployment using HPE Alletra Storage MP B10000

HPE Alletra Storage MP B10000 delivers cloud agility while maintaining simplicity and 100% availability for your mission-critical applications



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Executive summary

The expectations around Microsoft SQL Server implementations are growing to include more efficient edge-to-cloud provisioning and management, improved performance, and the ability to pay as your data grows.

This paper demonstrates a SQL Server database solution provisioned using [HPE Alletra Storage MP B10000](#). This implementation uses HPE mission-critical storage that has [100% availability guaranteed](#) and sub-millisecond response times.

Best practices considerations and guidance are included, along with configuration information. Guidance is focused on installation and SQL Server storage provisioning options used with [HPE Alletra Storage MP B10000](#).

Target audience: This technical paper is intended for IT decision-makers, infrastructure administrators, database specialists, and others who are interested in learning how to provision a SQL Server solution using HPE Alletra Storage MP B10000 with 100% data availability guaranteed. It is intended for those with a working knowledge of SQL Server database administration and deployment.

Powering HPE Storage Solutions for SQL Server



Figure 1. HPE Alletra Storage MP B10000 for SQL Server provides high performance and 100% availability options



Solution overview

HPE Alletra Storage MP B10000 provides cost-effective, high-performance storage for SQL Server database deployments.

Figure 2 shows the SQL Server solution built using HPE Alletra Storage MP B10000.

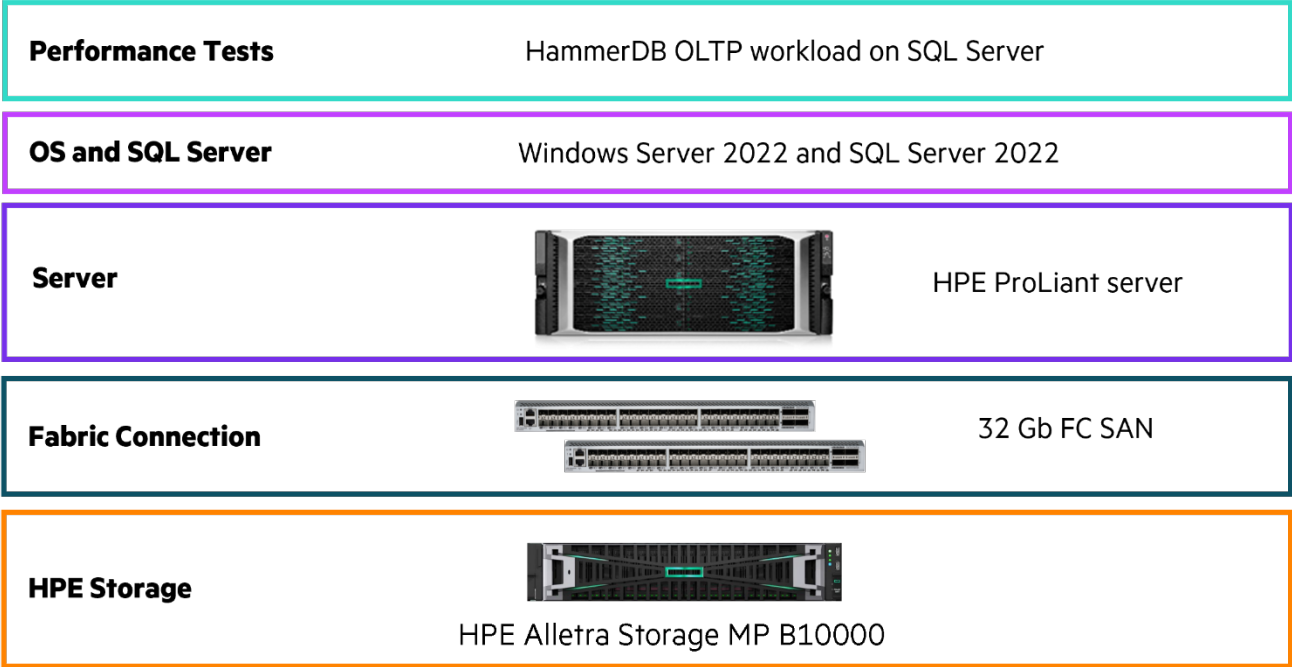


Figure 2. Platform architectural view of the SQL Server application environment

Solution components

This section lists important solution components for this solution.

Microsoft SQL Server

SQL Server was installed for the HammerDB TPROC-C OLTP transactional workload in a Windows Server 2022 OS that was installed on a bare-metal [HPE ProLiant](#) server.

SQL Server 2022 is the most cloud-connected version yet, with Azure-enabled business continuity, hybrid cloud analytics, and Azure Purview-integrated governance.

The new SQL Server 2022 supports Azure analytics capabilities connected with on-premises data, as well as bi-directional HA/DR to Azure SQL. This, plus continued performance and security innovations and new as-a-service consumption models, is expected to make this version especially appealing to IT organizations everywhere, driving the refresh of their most important transactional and analytical databases on-premises.

HPE Alletra Storage MP B10000

[HPE GreenLake](#) is the edge-to-cloud platform that brings the cloud to users and the cloud experience everywhere. HPE Alletra Storage MP B10000 was used for this SQL Server implementation and is listed in the DSCC Block Storage area as the **HPE Alletra Storage MP B10000** tier.

Businesses can deploy in their own data centers or a co-location and can manage all their infrastructure—all their data centers, edge, and cloud—from one easy-to-access HPE GreenLake interface. HPE GreenLake reduces the high up-front costs by giving users the option to use a pay-as-you-go* model.

* May be subject to minimums or reserve capacity may apply.



HPE GreenLake uses the [Data Services Cloud Console \(DSCC\)](#) to deliver a suite of cloud services.

These two videos, [HPE Alletra Storage MP B10000 Technical Demo](#) and [HPE Alletra Storage MP B10000 Technical Demo](#) provide guided tours of the block storage application functionality.

HPE Alletra Storage MP

HPE Alletra Storage MP brings mission-critical storage to the midrange —delivering enterprise-class resiliency, performance, and scalability at an affordable price. Powered by the new HPE Alletra Storage MP hardware platform, HPE Alletra Storage MP B10000 is the industry's first disaggregated, scale-out block storage with 100% availability guaranteed.



Figure 3. HPE Alletra Storage MP delivers mission-critical storage to midrange SQL Server application deployments

The [HPE Alletra Storage MP—The future of storage](#) video provides a great description of the groundbreaking new way HPE is defining cloud storage for both block and file storage.

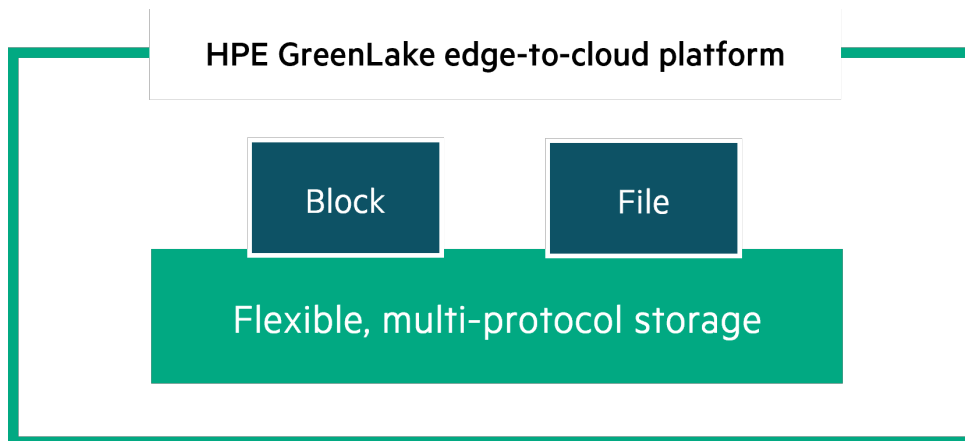


Figure 4. Either block or file storage options are available to run on the same flexible HPE GreenLake multi-protocol storage

Note

HPE Alletra Storage MP B10000 is cloud native and requires cloud connectivity for initial onboarding and setup. The onboarding process is described in the [HPE Alletra Storage MP B10000—Onboarding to DSCC](#) video. For additional onboarding and setup guidance, see [HPE Welcome Center](#).

During the volume creation process described later, the HPE Alletra Storage MP will show as HPE Alletra Storage MP B10000.



HPE Service and Support

A key benefit of HPE GreenLake is the HPE Service and Support option. To assist in keeping SQL Server environments running optimally with help and services, consult the “Service and Support” section of the [HPE Alletra Storage MP B10000 QuickSpecs](#). A few of the available HPE Services include:

- HPE Installation and Startup Service
- HPE Tech Care Service
- HPE Data Migration
- HPE Support Center

Data migration

HPE Alletra Storage MP provides an excellent cost-effective, high-performance, and 100% data-available migration path for SQL Server applications running on older [HPE 3PAR storage](#) needing a storage refresh. This short video explains [three reasons to refresh your Microsoft workloads on-prem](#) using the HPE Alletra Storage MP B10000 solution.

HPE 3PAR OS supports online, minimally disruptive, or offline migration to HPE Alletra Storage MP. The built-in Peer Motion feature of HPE Alletra Storage MP B10000 UI enables efficient migration of hosts, host sets, virtual volumes, and virtual volume sets. For migration support information, consult the Single Point of Connectivity Knowledge (SPOCK) site. The “HPE 3PAR to HPE Alletra Storage MP B10000 Peer Motion Data Migration Host Support Matrix” is found at [SPOCK Home](#) → Software → **Array SW: HPE Alletra Storage MP B10000** → **HPE Alletra Storage MP B10000 Peer Motion Host Support matrix**.

Configuration guidance

This section provides storage provisioning help. Follow best practices guidance from Microsoft and Hewlett Packard Enterprise for optimal performance of Microsoft SQL Server.

See the [HPE Alletra Storage MP B10000: Microsoft Windows Server Implementation Guide](#) for important configuration information. To download the full document, click the PDF icon in the upper right and select “Export all content”.

Prerequisites

Prerequisites include:

- Onboard the storage as described in the [Note](#) of the “HPE Alletra Storage MP” section above.
- Make sure Fibre Channel (FC) zones are set correctly for server and storage connectivity, so server WWNs display correctly in DSCC Data Ops Manager.
- Install the Windows Server 2022 operating system on the server.

Navigating the Data Services Cloud Console

HPE Alletra Storage MP B10000 provides a simple as-a-service storage provisioning experience from within DSCC and streamlines data management of storage.

[Figure 5](#) shows a sample DSCC screen view. The tiles launch users into the various available service areas. The user view can vary depending on available services and user permissions.



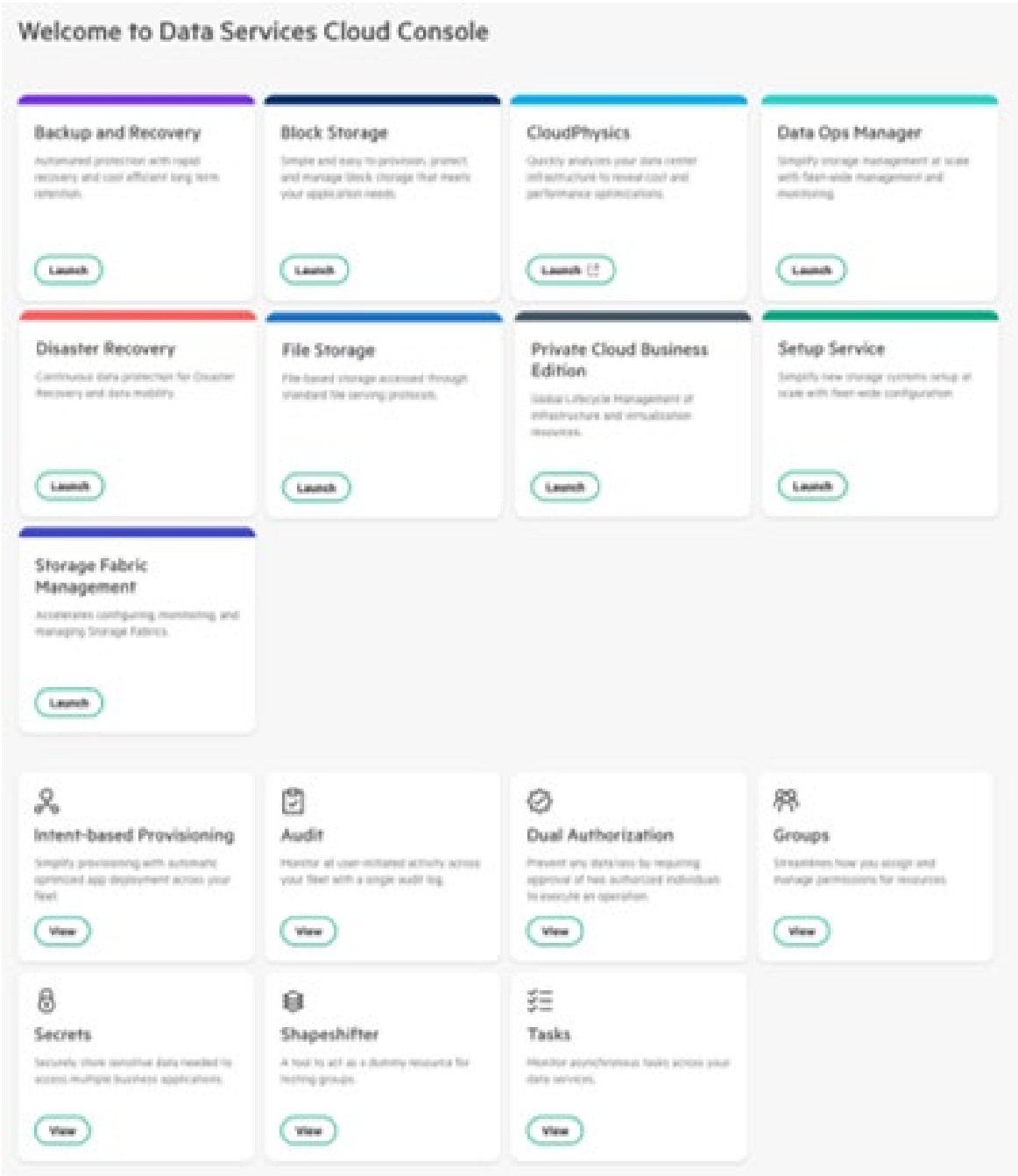


Figure 5. Example HPE GreenLake Data Services Cloud Console service selection screen

This paper focuses on block storage for SQL Server, so the **Block Storage** and **Data Ops Manager** areas were used to provision and monitor storage. The **Intent-based Provisioning** tile is a quick link into the Block Storage provisioning area. Intent-based provisioning enables users to select their storage and workload options to easily provision storage. For example, users can select the type of database storage needed—whether Microsoft SQL Server, Oracle® Database log, or VMware ESXi™—and DSCC’s intelligence automatically recommends the best-fit storage array for their application.

Table 1 shows the services and functionality available in the different areas. While some pages are similar in each of these two service areas, the ability to perform configuration or provisioning tasks may only be available in one of the areas. The idea behind this design is that a storage admin would be the one using **Data Ops Manager** to set up hosts, ports, and other admin tasks, while an application user would use the **Block Storage** area to provision the application storage.



Table 1. DSCC services used in this solution and operations available

Data Services Cloud Console service	View	Provision or configure	Type of user	Description
Block Storage				
Dashboard	Yes		App user	Storage dashboard view
Storage	Yes	Yes	App user	View and provisioning storage
Data Access	Yes		App user	View hosts and host groups
Tasks	Yes		App user	View recent and running tasks
Data Ops Manager				
Dashboard	Yes		Storage admin	Storage dashboard view
System	Yes		Storage admin	View storage information and performance
Storage	Yes		Storage admin	View storage
Data Access	Yes	Yes	Storage admin	Add and configure hosts and host groups for storage provisioning
Tasks	Yes		Storage admin	View recent and running tasks
Intent-based Provisioning				
Link to Block Storage provisioning		Yes	App user	Same as Block Storage → Storage → +

Storage provisioning process

The storage provisioning process involves both configuring servers and then assigning storage volumes. Figure 6 provides a view of the HPE GreenLake storage provisioned to the SQL Server host group using redundant paths.

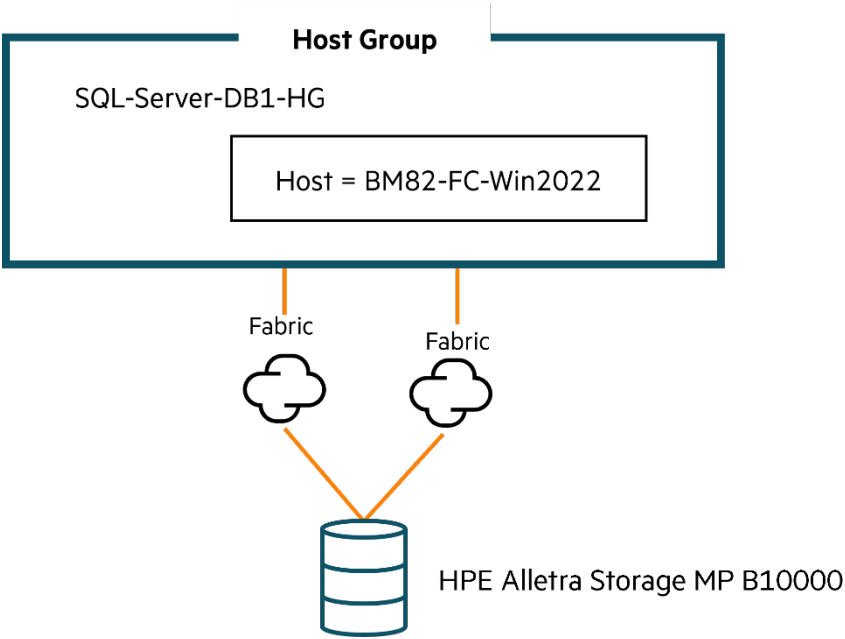


Figure 6. Host group with SQL Server host and storage provisioned to the host group

An overview of the process is to create a host group that contains the server, and then provision the storage to the host group with the server. Host groups contain one or more servers, but in this case the host group contains only the single server. These tasks are performed using the HPE GreenLake web interface:

- 1. Create a host group containing the SQL Server host (use DSCC → Data Ops Manager).
- 2. Provision storage volumes to the host group (use DSCC → Block Storage).



Two short videos that show the process for SQL Server are: [HPE GreenLake Data Services Cloud Console How to Add an iSCSI host \(showing FC too\)](#) and [Self-service SQL Server Volume management for DBAs for HPE Alletra Storage MP B10000 as a Service](#).

The step-by-step guidance to accomplish the above two tasks is shown below for this solution.

Create the host group

The first step to provision storage is to create a host group of SQL Server hosts. As noted in [Table 1](#), this operation is performed by the storage administrator using the HPE GreenLake **Data Ops Manager** tile.

In this solution, only one host will be added, but if this was a SQL Server failover cluster solution, then all the cluster hosts would be added to the same host group.

First, navigate to the DSCC, Data Ops Manager, Data Access area:

- 1. From the Data Services Cloud Console, click **Data Ops Manager**.
- 2. Select **Data Access** from the drop-down menu on the left.
- 3. Select the **Host Groups** tab (the default view).

Next, create a host group and add the host’s FC port WWNs to it:

- 1. Click the **Add (+ icon)** to add a Host Group.
- 2. Enter a **Host Group Name**.
- 3. Click the **+ Create** selector found below the Available Hosts list.
 - a. Enter a **Host Name**, select a Protocol (**FC** in this case), select the **Windows Server** operating system, then click **Next**.
 - b. Select the correct server FC port WWNs from the Available Initiators list. If a WWN is missing, confirm the FC zoning.
 - c. Click **Next**, confirm the settings, and then click **Done**.
- 4. In the Create Host Group area, confirm the newly created host is in the Selected Hosts list.
- 5. Click **Next** and then **Done**.

The list of host groups and hosts will be updated to reflect the new information after the task completes. Figure 7 shows the newly created SQL Server host group that is now ready for storage provisioning.

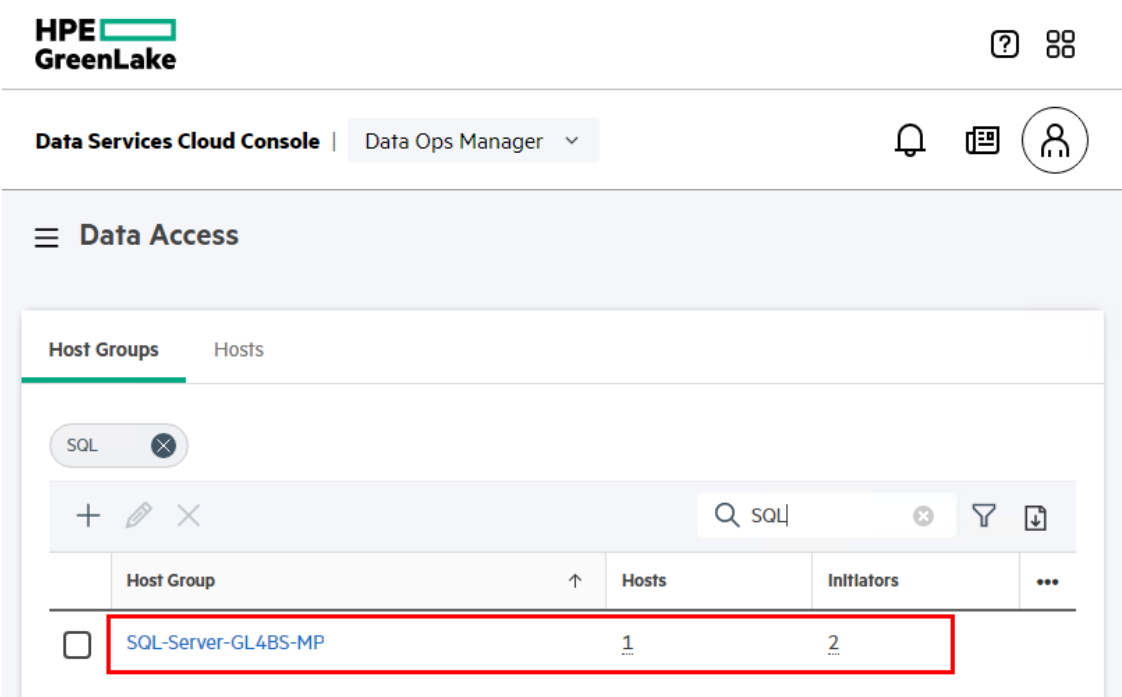


Figure 7. The SQL Server host group created and ready for storage provisioning

Intent-based storage provisioning

Three different volumes are provisioned that include: data, tempdb, and transaction logs. The volumes were provisioned separately based on the sizes desired.

First, the data volume is provisioned. All volumes will be presented to the previously created SQL Server host group (see the [Create the host group](#) section).

As an application user, start the intent-based storage provisioning wizard either directly from the DSCC **Intent-based Provisioning** tile or from the DSCC **Block Storage** tile area (Figure 8). The provisioning wizard will start in the **General** wizard screen and guides the user through a workflow as shown in [Figure 9](#); the display might look a little different depending on the browser screen size.

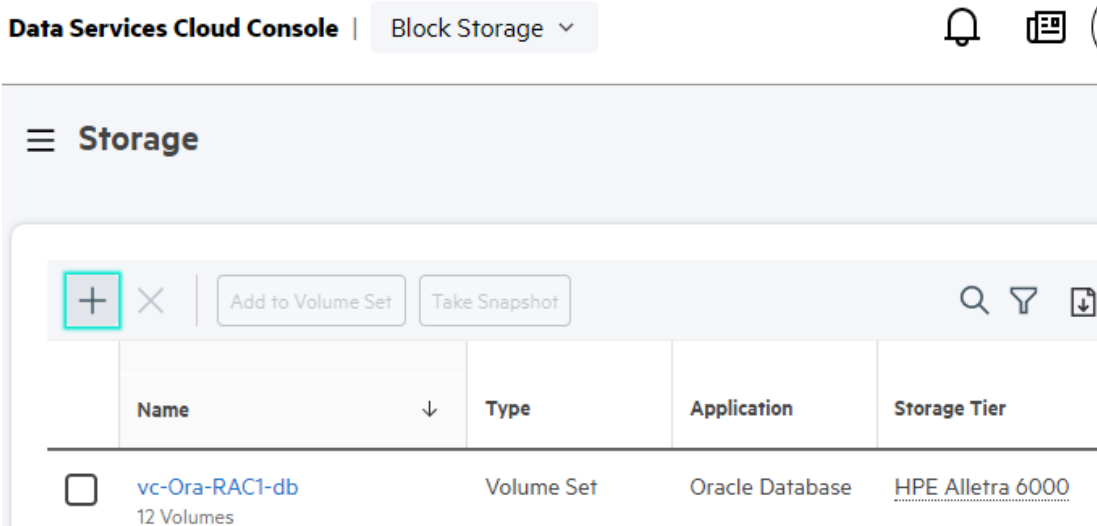


Figure 8. Click the “+” icon to open the intent-based provisioning wizard from the Block Storage area

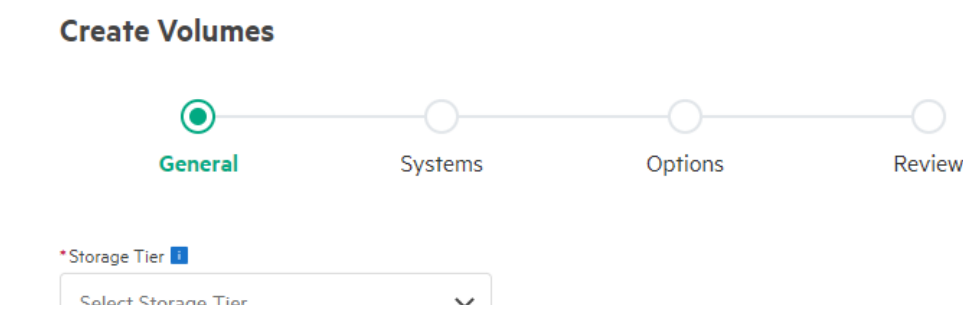


Figure 9. Starting the storage provisioning wizard



The “General” screen

Figure 10 shows the first intent-based storage provisioning screen after applying the settings for the SQL Server data disk.

General

* Storage Tier 

HPE GreenLake for Block Storage



Cloud Native, Extreme Performance, 100% available, sub milli second latency guaranteed for Mission critical workloads

* What type of workload do you need? 

Microsoft SQL Server



Data Reduction - Compression Enabled, Deduplication Enabled [Change Settings](#) 

* Name of the Volume(s) 

bm82-sql-data

* How many volumes do you want to create?

1

* How much storage is needed on each volume?

2

TiB



Which group of hosts need access to this storage?

SQL-Server-DB1-HG



* Protection policy 

15-minute snapshots | Business hours |



High frequency local snapshots on weekdays expire in 1 day

Figure 10. Intent-based storage provisioning “General” screen (1 of 4)

The selections used for the **General** screen are:

- Storage Tier = **HPE Alletra Storage MP B10000**
- Workload = **Microsoft SQL Server**
- Name of the Volumes(s) = “bm82-sql-data”
- Number of Volumes = 1
- Volume Size = 2 TiB
- Host Group = “SQL-Server-DB1-HG”
- Protection policy = **15-minute snapshots**

Additional detailed information is available by hovering over the small blue info square of a selection field and clicking the **Learn More** link. [Figure 11](#) shows the Storage Tier information screen after clicking the **Theater mode** icon in the upper right.



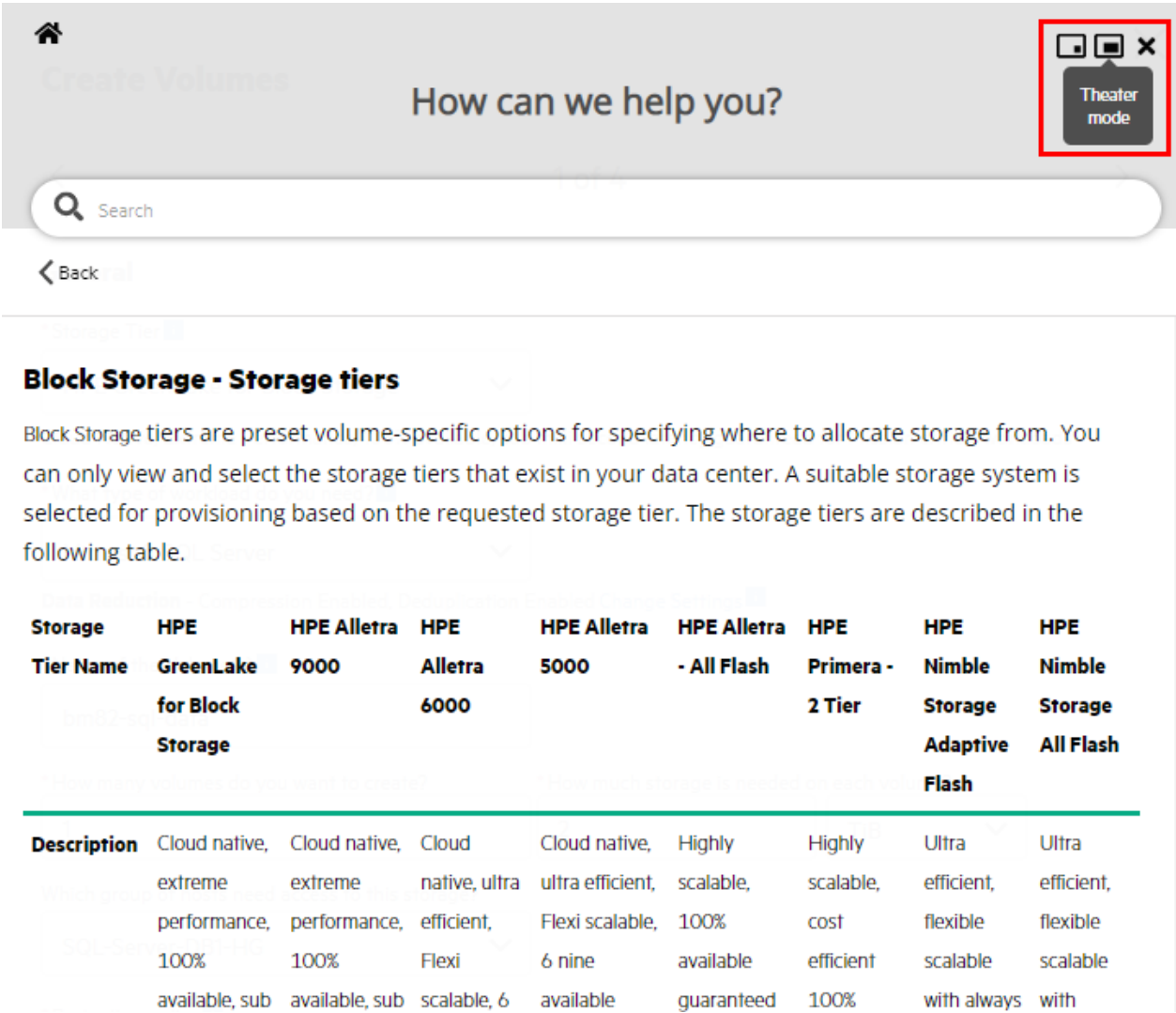


Figure 11. A portion of the storage tiers information screen

Note

The **Protection policy** setting is tied to the creation of an application set and shown in [The “Options” screen](#) **Volume Set Name** field. Hewlett Packard Enterprise recommends¹ that you assign volumes from the same single instance to a single application set (aka volume set). If no snapshot protection is wanted, then select **No protection** for the Protection policy field.

Depending on the size of the browser window, either click **Continue** or the right facing chevron (“>”) to proceed.

The “Systems” screen

Figure 12 shows the second wizard screen—the **Systems** screen—where the built-in intelligence will suggest a best fit location for your application.

In this example, the default mission-critical HPE Alletra Storage MP is selected. The [HPE Alletra Storage MP B10000 Technical Demo](#) shows this screen about midway into the video. The video shows several additional available array selections, and the **Search other systems** link is demonstrated.

Click **Continue** or the right facing chevron (“>”) to proceed.

¹ [Best Practices for Architecting Microsoft SQL Server on HPE Storage](#)



Systems

* Choose the system you want to use.

1 recommended system(s) ordered by available headroom.

4UW0004

Model

HPE Alletra Storage MP

Capacity

13.4 TiB
free of 13.4 TiB

Headroom Availability

High

Recommended

Don't like what you see? Search other systems

Figure 12. Intent-based storage provisioning “Systems” screen (2 of 4)

The “Options” screen

The Options screen is shown in Figure 13.

The default **Volume Set Name** value is the initial name of the volume in the first wizard screen. Change this name to be more reflective of the collection of volumes for the SQL Server instance. In this example the set name was changed to reflect the application usage, which is “sql-hammerdb1.”

Also shown in the figure is the easily changed **Auto LUN ID**.

Additional array selections may be available based on the storage selected in the previous **Systems** screen.

Options

*Volume Set Name

sql-hammerdb1

Priority Level 



☐ Space Warning

Host Group 

SQL-Server-DB1-HG



Hosts and Initiators

☐ Auto LUN IDs 

Assign LUN ID from

10

Figure 13. Intent-based storage provisioning “Options” screen (3 of 4)

Click **Continue** or the right facing chevron (“>”) to proceed to the **Review** screen.



The “Review” screen

Confirm the settings in the **Review** screen or go back to make any adjustments. Click the **Submit** button to provision storage to the SQL Server host.

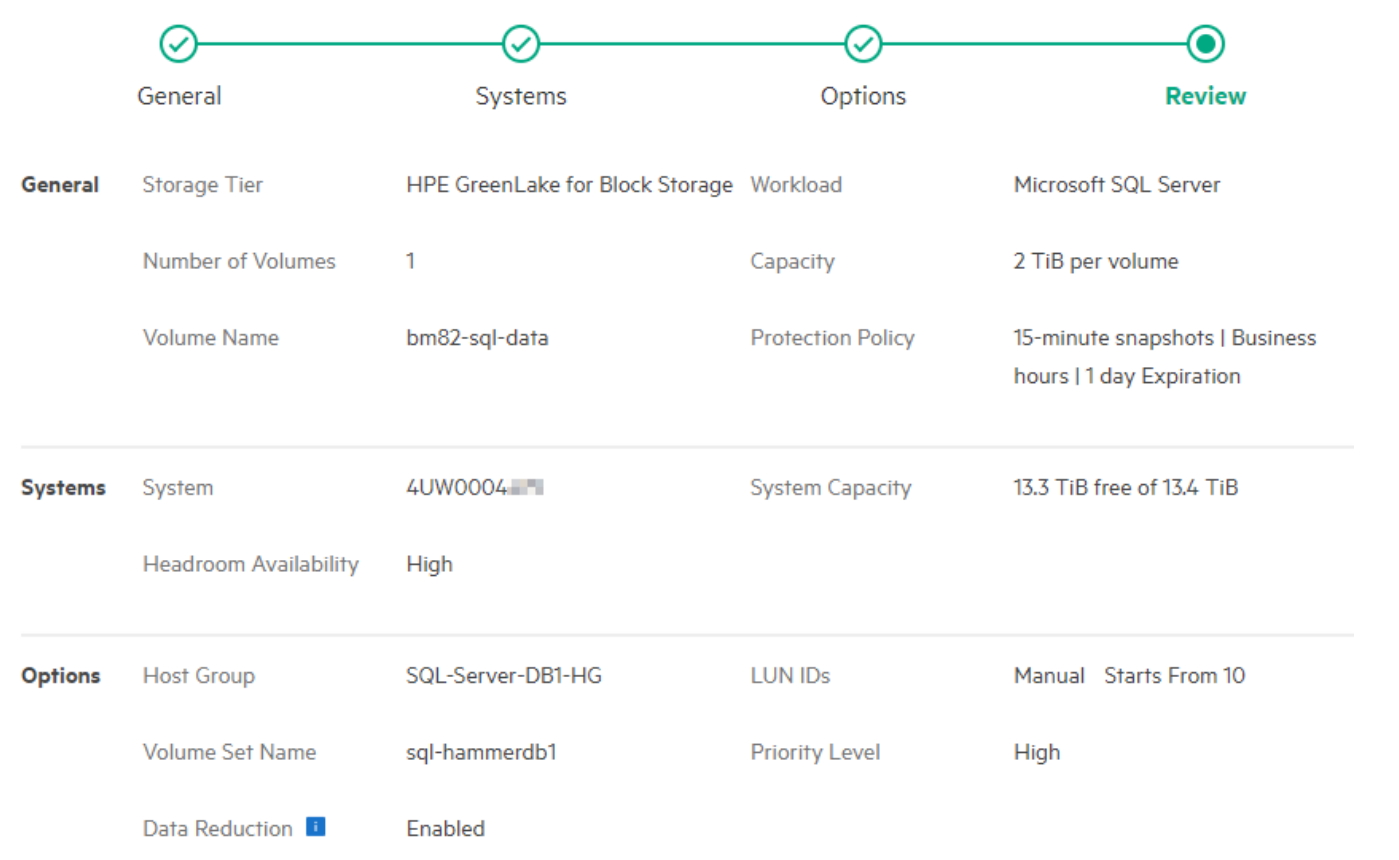


Figure 14. Intent-based storage provisioning “Review” screen (4 of 4)

Provision additional volumes

After provisioning the SQL Server data volume, provision the tempdb and log volumes

Provision additional storage from the same **Block Storage → Storage** area. Refresh the browser interface if the newly created volume set is not seen.

- 1. Select the newly created volume set (Figure 15). You can filter the display if desired.

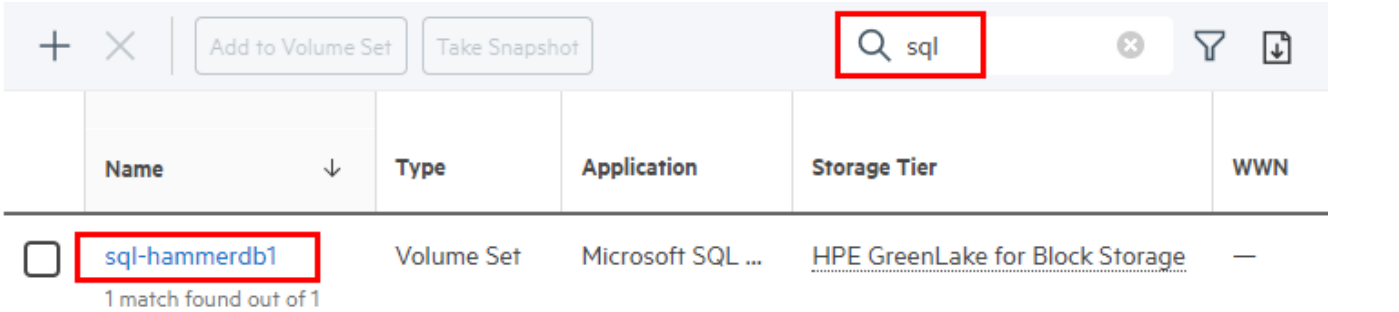


Figure 15. Start provisioning additional volumes by selecting the newly created volume set

- 2. Select **Create New Volumes** from the **Add Volumes to Volume Set** wizard (Figure 16).



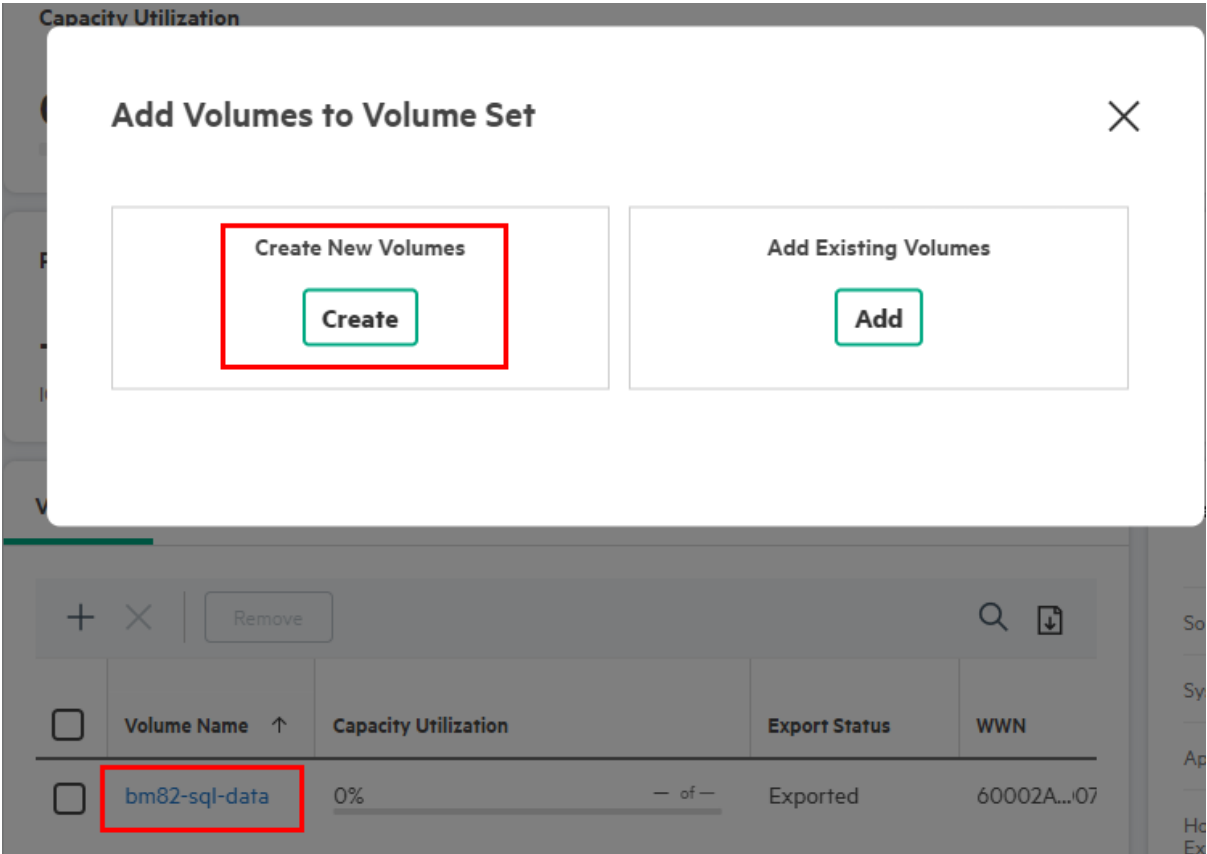


Figure 16. Click the Create New Volumes “Create” button

3. Enter the new volume information and click **Submit** (Figure 17).

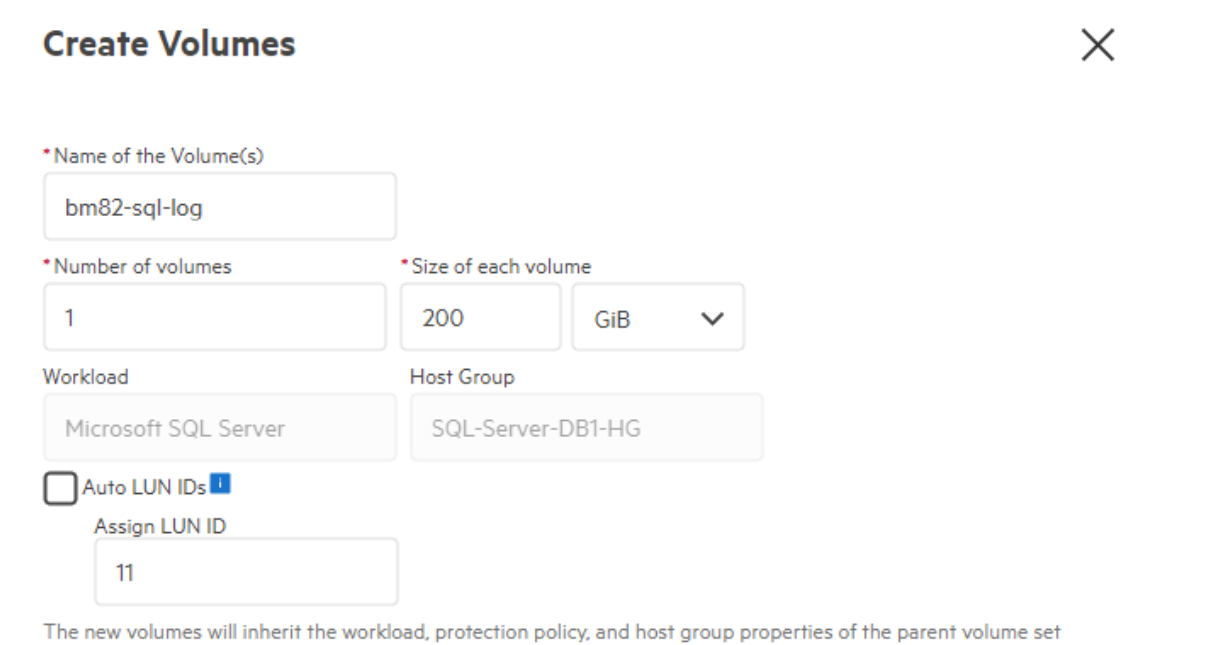


Figure 17. Intent-based “Create Volumes” screen

4. Repeat the above steps for additional volumes.



Multipath

Enable the **Multipath I/O** feature on the Windows Server. After applying the multipath feature, the **MPIO properties** dialog will report **3PARdataVV** in the MPIO Devices area as shown in Figure 18. Follow the guidance in the [HPE Alletra Storage MP B10000: Microsoft Windows Server Implementation Guide](#) for additional details.

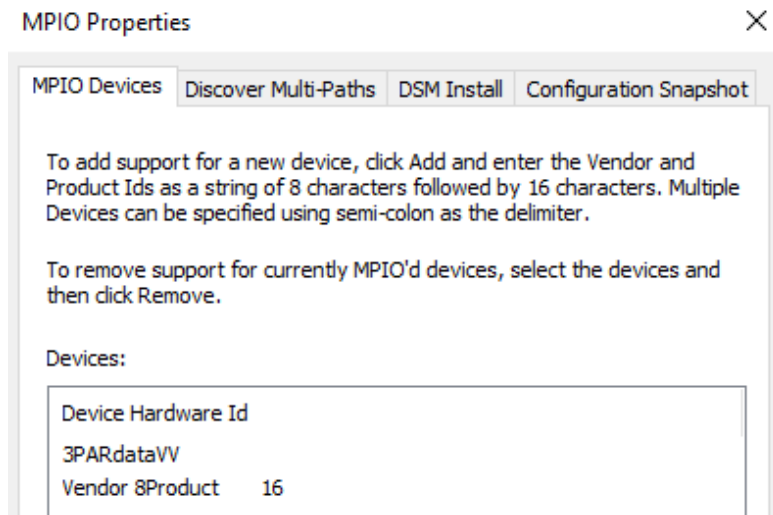


Figure 18. "MPIO Properties" dialog screen

Path Verify Enabled

Enable the **Path Verify Enabled** checkbox in the disk MPIO settings area.

1. Start the Disk Management interface by entering `diskmgmt.msc` at the Windows Run prompt.
2. Right-click a newly provisioned HPE Alletra Storage MP B10000 disk and then click **Properties**.
3. Select the **MPIO** tab.
4. Click the **Details** box and select the **Path Verify Enabled** checkbox as shown in Figure 19.

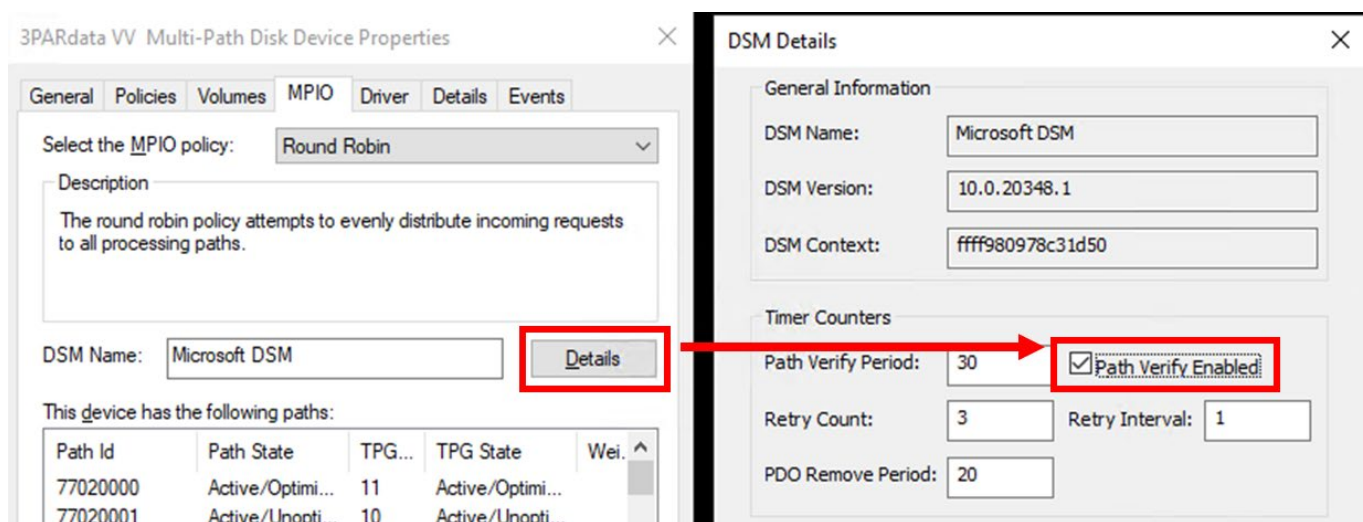


Figure 19. MPIO setting of "Path Verify Enabled"

The HPE Alletra Storage MP uses SCSI ALUA (Asymmetric Logical Unit Access). The SCSI paths from the storage LUN's owning node are exposed as Active Optimized, while the other paths report the LUN as Active Non-Optimized. Use the `mpclaim -s -d` command (without quotes) to view path information. Paths will be listed as Active/Optimized and Active/Unoptimized.



Disk formatting

Prior to formatting the newly provisioned storage, disable the delete notifications for all volumes behavior and then re-enable it after the volumes have been formatted. Run the “fsutil behavior set disabledeletenotify 1” command prior to the format operation, and then run the “fsutil behavior set disabledeletenotify 0” command after formatting is complete.

See the [HPE Alletra Storage MP B10000: Microsoft Windows Server Implementation Guide](#) for additional information.

SQL Server database installation

SQL Server was installed following [Hewlett Packard Enterprise and SQL Server guidance](#).

SQL Server database testing

The free [HammerDB](#) load generator was used to confirm the solution after the installation completed. Figure 20 shows the HammerDB transaction counter graph running against the SQL Server database.

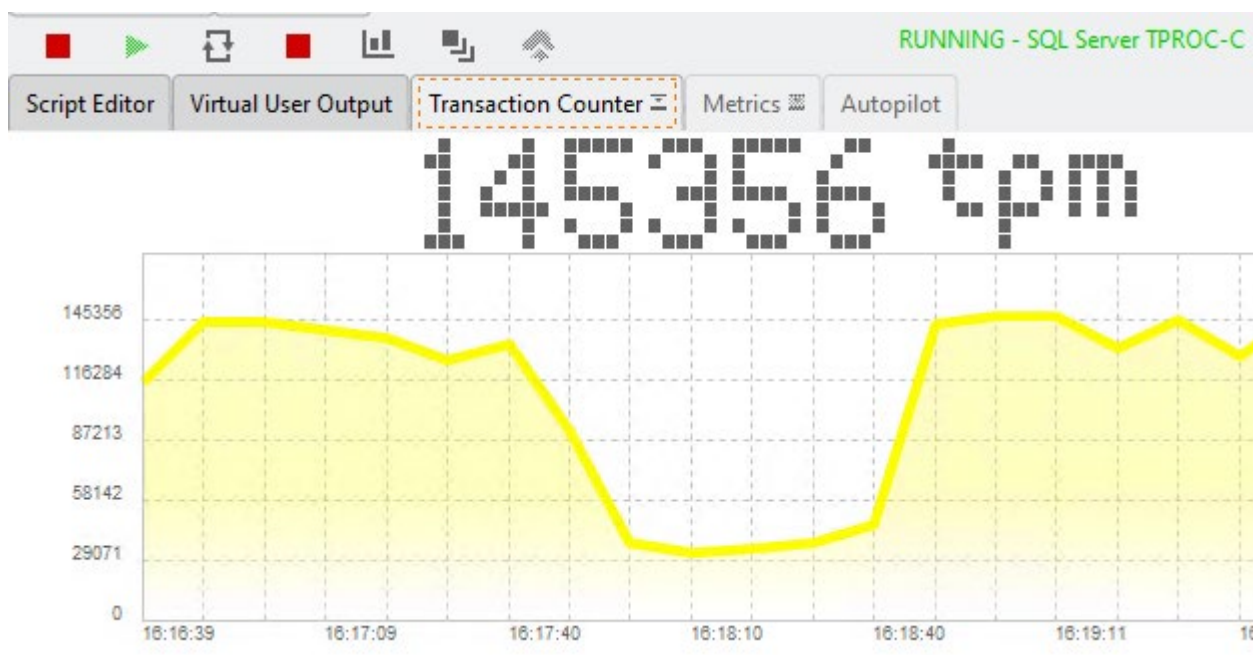


Figure 20. HammerDB test graph showing the SQL Server database under load

HPE GreenLake analytics

Overall performance information can be seen in the Dashboard views to help ensure your storage is running optimally.

Individual volume performance data can be viewed from either the **Block Storage** area or the **Data Ops Manager** area.

To view overall volume set (aka application set) performance information from the Block Storage area, navigate to **Storage**, and select a particular volume set. [Figure 21](#) shows the performance information while running a simple HammerDB validation test on the “sql-hammerdb1” volume set.

To drill down on an individual volume’s performance and view its graphed data, from the same area, click a volume.



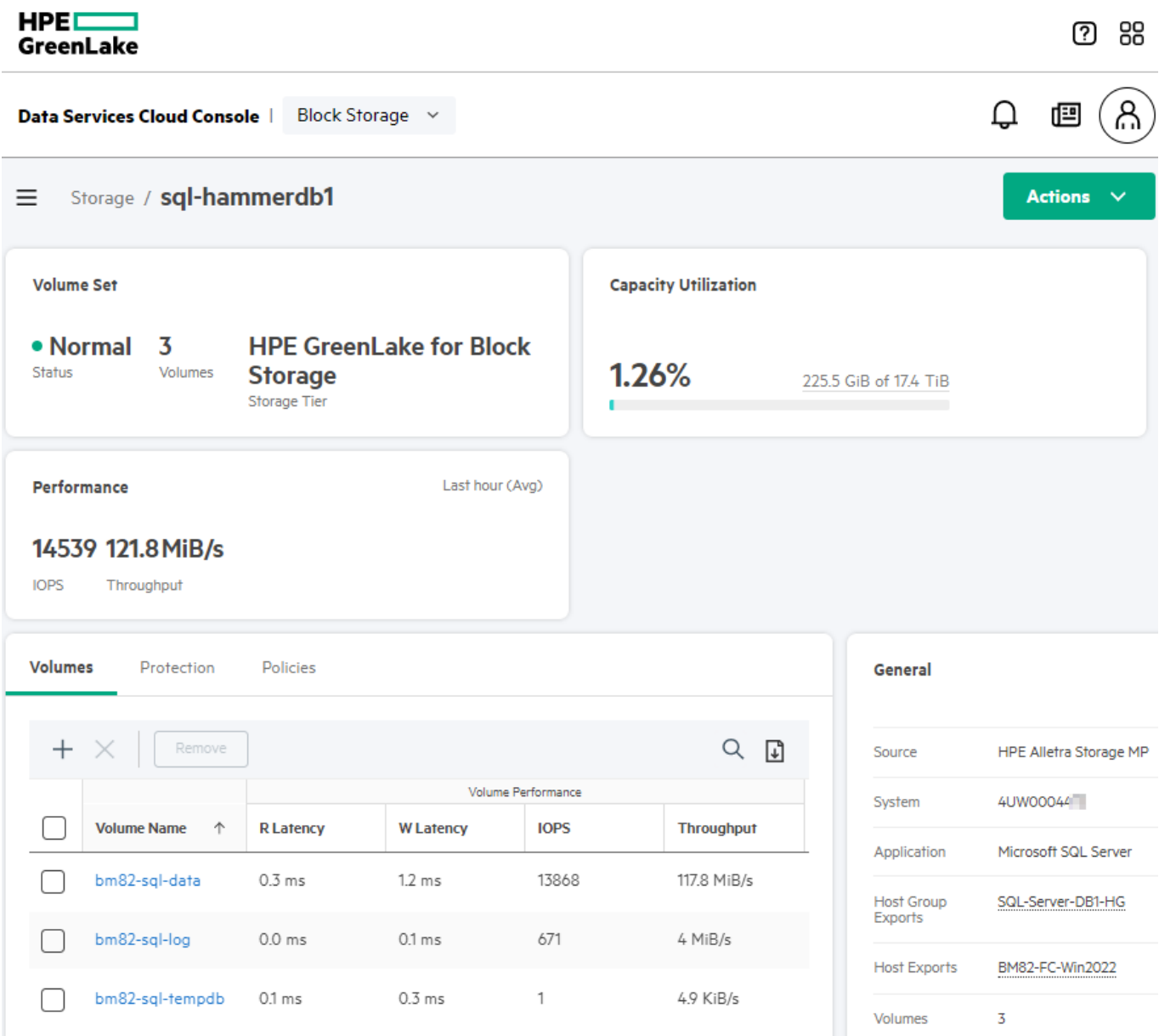


Figure 21. “sql-hammerdb1” volume set performance information during a simple validation test

Comprehensive storage system graphs can be viewed by navigating to **Data Ops Manager → Systems**, selecting a storage system, and then clicking the **Performance** tab, as shown in [Figure 22](#).



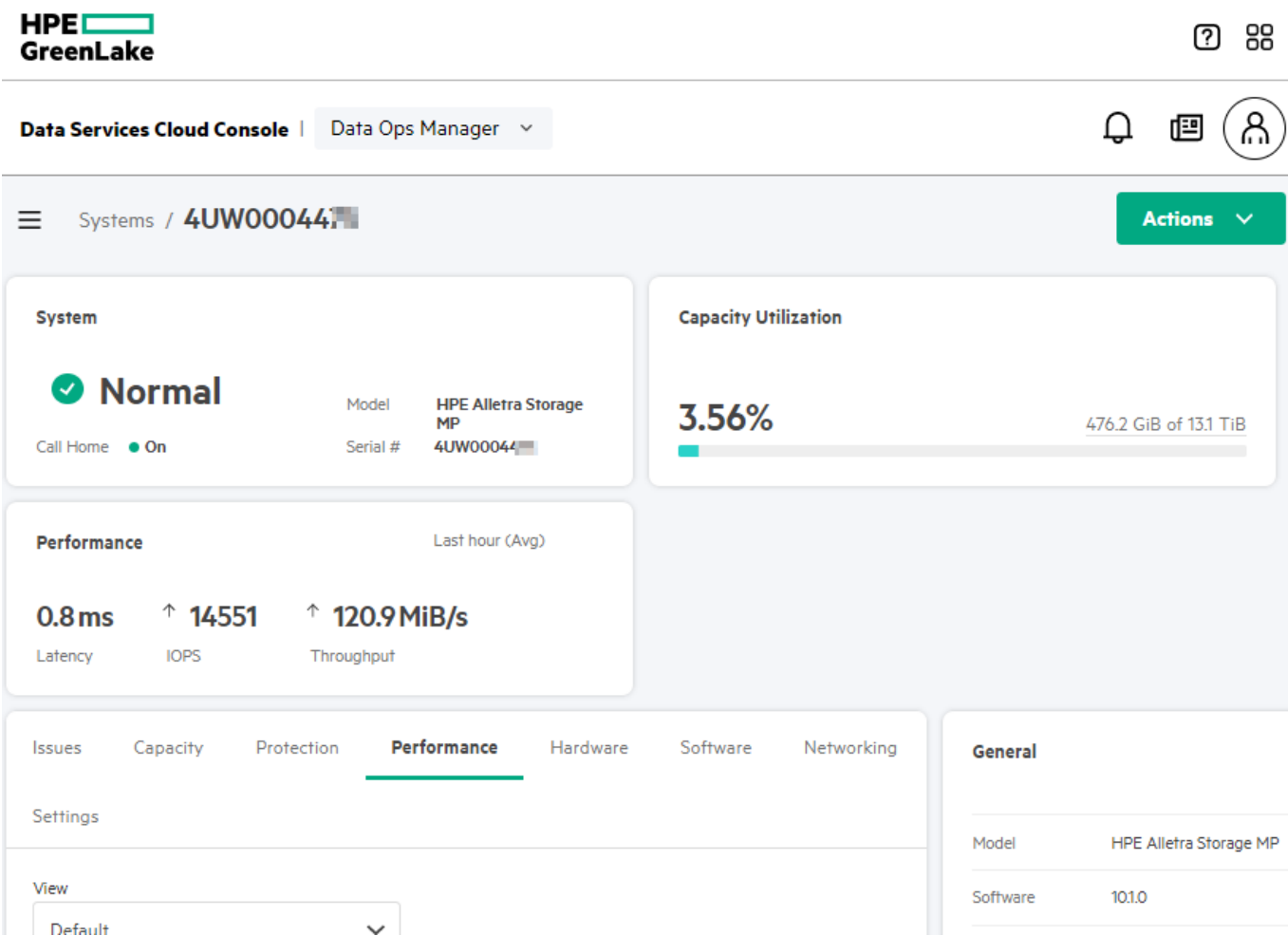


Figure 22. HPE Alletra Storage MP B10000 system-wide performance graphs view

Summary

This paper demonstrates a SQL Server single-instance database solution provisioned using HPE Alletra Storage MP B10000.

HPE Alletra Storage MP B10000 is an as-a-service block storage solution that integrates smoothly with enterprise database solutions, such as Microsoft SQL Server. HPE Alletra Storage MP B10000 brings cloud agility with pay-as-you-grow storage provisioning flexibility to a hybrid cloud-solution environment for mission-critical 100% or business-critical six 9s data availability.

The administration of HPE Alletra Storage MP B10000 provides an easy user experience for managing complex solutions. The task of provisioning storage can be assigned to anyone in the organization who has only basic provisioning knowledge. When customers need digital transformation, HPE GreenLake enables them to put their data in the right place at the right time and gives them the advantage over their competition.

Using HPE Alletra Storage MP B10000 provides quick storage provisioning for SQL Server database installations using intent-based provisioning. There are several advantages over other provisioning methods, including:

- Easily manage the storage infrastructure for multiple storage types from a single pane of glass
- Easily configure hosts and host groups from the same interface used to manage storage
- Easily set storage performance-tuning parameters
- Automatically have DSCC updates applied and managed by HPE for hassle-free maintenance



Resources, contacts, or additional links

[HPE Storage solutions for SQL Server databases](#)

[Best Practices for Architecting Microsoft SQL Server on HPE Storage](#)

[HPE Alletra Storage MP B10000 for Mission Critical Databases \(video\)](#)

[HPE GreenLake](#)

[HPE InfoSight Welcome Center](#)

[HPE Alletra Storage MP B10000 MP QuickSpecs](#)

[HPE Alletra Storage MP B10000 QuickSpecs](#)

[HPE Single Point of Connectivity Knowledge \(SPOCK\) for HPE Storage Products](#)

[Microsoft SQL Server documentation and guidance](#)

Learn more at

[HPE.com/us/en/storage/alletra.html](https://hpe.com/us/en/storage/alletra.html)

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