

# Deployment considerations for VMware vSphere Virtual Volumes on HPE Alletra Storage MP B10000



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## Executive summary

At one time, hybrid cloud computing was a desirable concept but an elusive solution to deploy, with incomplete products that did not work well together or across clouds. Today, that situation has changed.

Virtualization has led to a major transformation in the data center over the past ten years. However, the benefits of virtualization could be amplified through more granular control of applications and tighter alignment with the software-defined data center. The challenge with server virtualization today is the disconnect between what a hypervisor wants to control—a specific VM—and what storage systems control, which is an entire LUN or datastore that usually contains many virtual machines (VMs).

In response to this disconnect, VMware® and key storage vendors like Hewlett Packard Enterprise have designed and developed a novel storage architecture for VMware vSphere®. This storage architecture from VMware, called VMware vSphere® Virtual Volumes™ (hereafter referred to as “vVols”), is designed to provide simplified storage management and more-granular VM control.

Hewlett Packard Enterprise has partnered with VMware to define, develop, and test vVols. HPE was selected as the Fibre Channel reference platform for the VMware engineering team. Through that partnership, HPE provides a tightly integrated experience that does not require an additional plug-in or software piece to enable vVols and to support the VMware VASA 3.0 specification.

vVols eliminate the need to provision large VMware vSphere® Virtual Machine File System (VMFS) datastores. Instead, storage provisioning happens automatically through the integration on a per-VM basis. Each VM, and specifically each virtual disk and configuration of a VM, is assigned its own unique vVol, which is equivalent to a storage LUN. With tight integration with [HPE Alletra Storage MP B10000](#), customers can deploy vVols (in parallel with VMFS, where necessary) with confidence.

## Benefits of VMware vSphere Virtual Volumes with HPE Alletra Storage MP B10000

HPE Alletra Storage MP B10000 delivers proven hardware-assisted integration with vSphere. vVols allow HPE Alletra Storage MP B10000 to extend that integration even further by enabling vSphere to better leverage the native strengths and capabilities of HPE Alletra Storage MP B10000 through storage policies. The combination of HPE Alletra Storage MP B10000 and vVols delivers the following benefits:

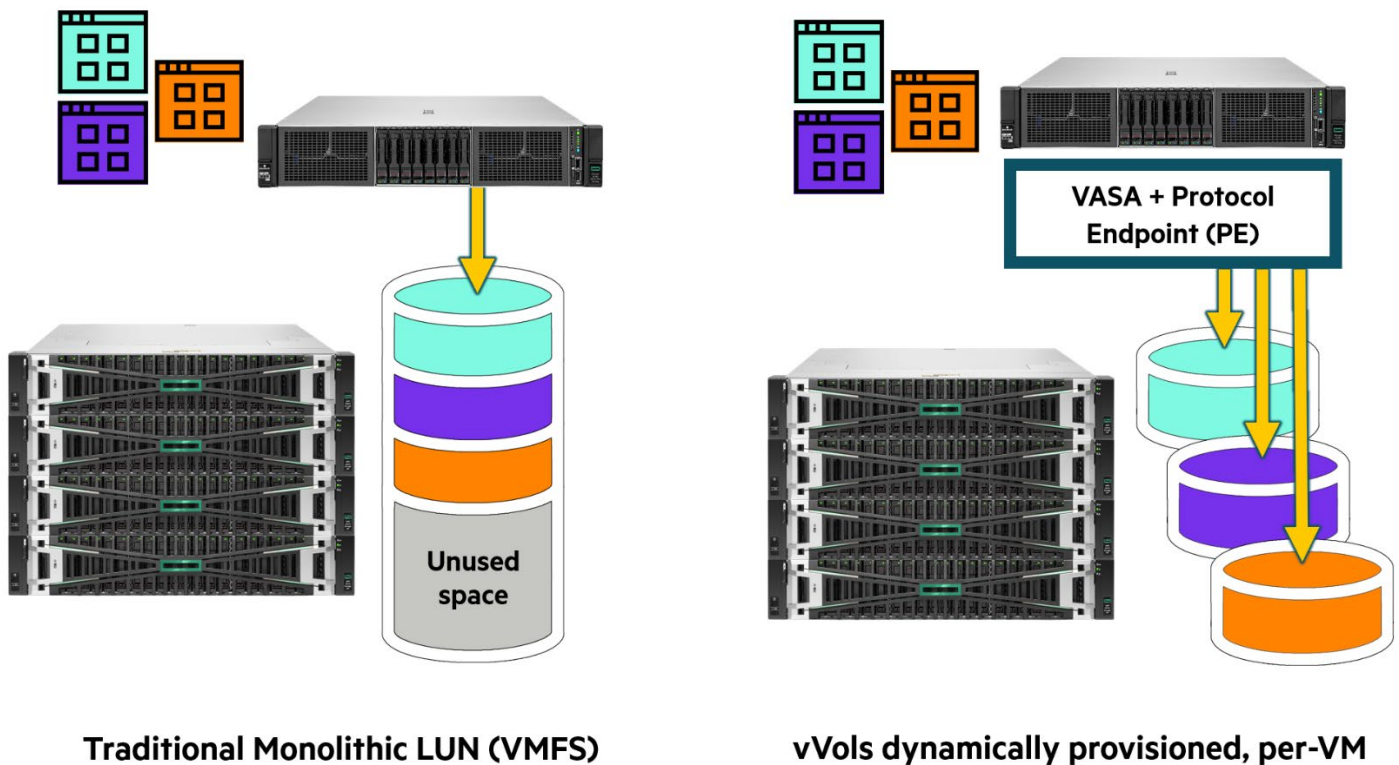
- **Greater application control:** Before the availability of vVols with VMFS, a storage array had no visibility into the VM disk (VMDK) files on a VMFS volume; therefore, storage array features such as QoS and snapshots could be performed only on an entire VMFS volume. Now, any storage array feature that is supported by vVols can be implemented at the individual VM level to provide the best possible efficiency and control of storage resources. Your applications benefit directly from this new, fine-grained level of interaction with critical storage resources.
- **Enhanced performance:** vVols enable vSphere to offload more tasks to storage that can be performed faster and more efficiently at the storage layer. Strong storage integration makes it possible to complete common tasks directly on the array to minimize data movement and improve application performance.
- **Reduced capacity requirements:** With vVols, you use only the space that VMs need on a storage array—avoiding the requirement to allocate large chunks of disk space to VMFS volumes. When VMs are deleted or moved, automatic space reclamation prevents wasted space and helps the array maintain a thin footprint.
- **Simplified management:** VMware Storage Policy Based Management (SPBM) eliminates common storage management tasks such as provisioning and managing LUNs. Using policies to automatically provision LUNs at the time of VM creation means that no pre-provisioning of datastores is required, and administrative costs are reduced by eliminating repetitive tasks. A single storage container is created on the storage array, and from that point on, it is managed by the vSphere administrator instead of the storage administrator, bringing down barriers between team silos.

vVols offers many advantages over the traditional VMFS storage architecture because it shifts the alignment between vSphere and storage arrays to the VM level instead of the LUN level. With vVols, storage resources are dynamic without any pre-allocation of storage into silos, which is common with VMFS. Many of the storage operations that are commonly performed by vSphere such as VM snapshots and thin provisioning shift to being performed exclusively by the storage array. This takes the burden of storage I/O-intensive operations off the vSphere host and places it on the storage array, which is equipped to handle it efficiently. At the same time, the management of storage array operations such as provisioning and snapshots shifts to the vSphere side and all storage related tasks are managed using vSphere interfaces and tools.



In summary, vVols offer the following features, functions, and benefits, as shown in Figure 1:

- vVols are the future of VMware, although VMFS and NFS will still be supported. Moving forward, the majority of development efforts will be focused on vVols and VMware vSAN™.
- vVols allow array capabilities such as QoS, replication, data reduction, snapshots, and encryption to be assigned on a per-VM basis.
- vVols allow for dynamic provisioning from the vSphere console. LUNs are allocated and de-allocated on a per-VM basis without intervention from the storage administrator.
- Statistics are gathered on a per-VM basis as opposed to an entire LUN (VMFS/NFS datastore).
- Troubleshooting is more specific. Gathering statistics enables granular (per VM) performance information.
- Space reclamation is dynamic. After a VM is deleted, the space is automatically recovered.
- All volumes are automatically thin provisioned.
- Snapshot policy is now granular as opposed to affecting an entire datastore.
- vVols supports SCSI-3 reservations, allowing clustering between VMs without using raw device mappings (RDMs).



**Figure 1.** VMs with dynamic, individual storage allocations instead of a large block (VMFS) mapping

### Enabling vSphere vVols on HPE Alletra Storage MP B10000

In this section, procedures for the following three tasks to enable vSphere vVols on the array are provided. These operations are performed in the HPE Alletra Storage MP B10000 UI, whether graphical or command-line.

1. Configuration of the VASA certificate
2. Create a vSphere vVols storage container
3. Enable the VASA provider

#### Before you begin

- **Time synchronization** is very important for the proper operation of vSphere vVols. Be sure to synchronize system time among all the vSphere hosts, VMware vCenter Servers®, and any HPE storage systems.



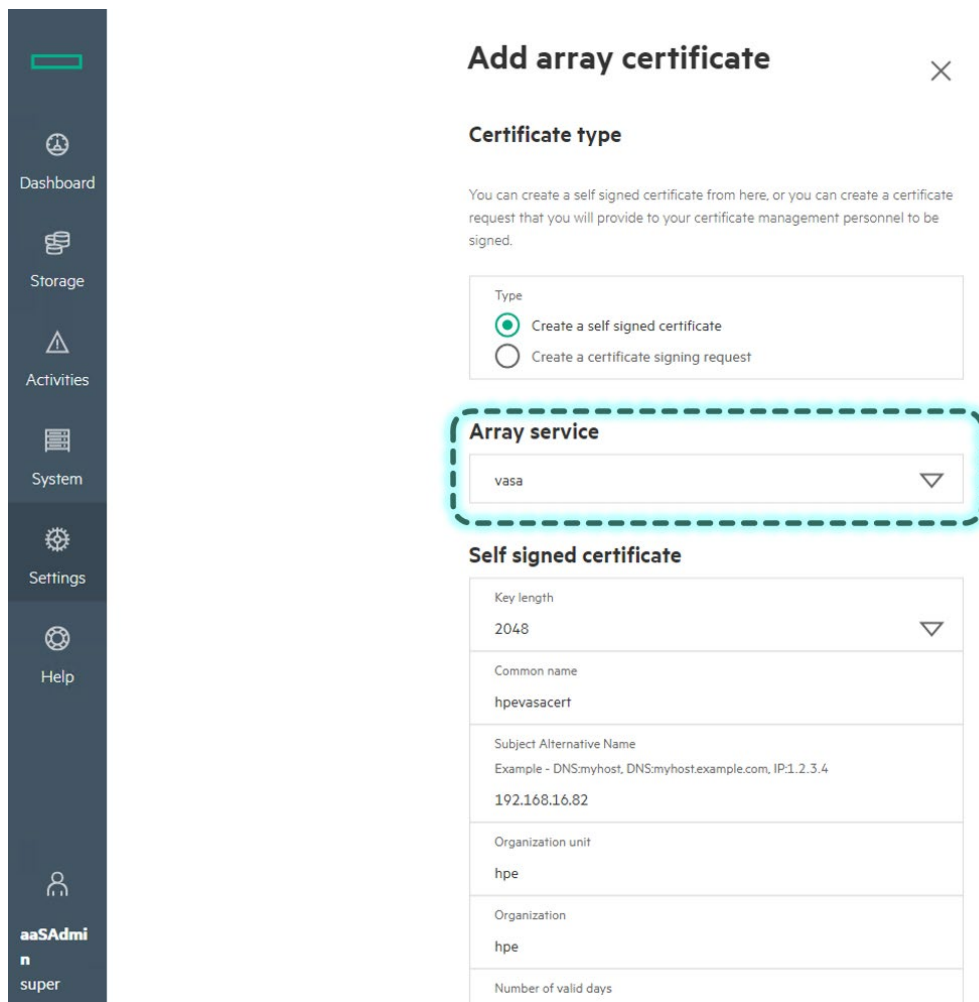
- **User:** An [array user](#) with a sufficient role (that is, “edit” role, at a minimum) is required for enabling the VASA provider and adding the array to vSphere.
- **Zone your hosts:** Make sure that all paths are zoned. Note that FC SAN support for vVols is available in ArrayOS v10.3 and that iSCSI SAN support arrives in ArrayOS v10.4.
- **Host Set:** Create or update a [Host Set](#) on the array that contains your hosts.

**Note**

vVols and traditional VMFS datastores can safely coexist within a vSphere environment on the same HPE Alletra Storage MP B10000 array. You can migrate any existing VMs from VMFS to vVols and back at any time using VMware vSphere® Storage vMotion®.

**Create a VASA certificate**

This guide assumes the use of a self-signed certificate provided by the array. This is backward compatible with vSphere 8.0 and earlier releases. The [certificate can be created](#) with the array CLI or UI. Here is an example of creation in the UI, specifically selecting **vasa** from the **Array service** drop-down menu:



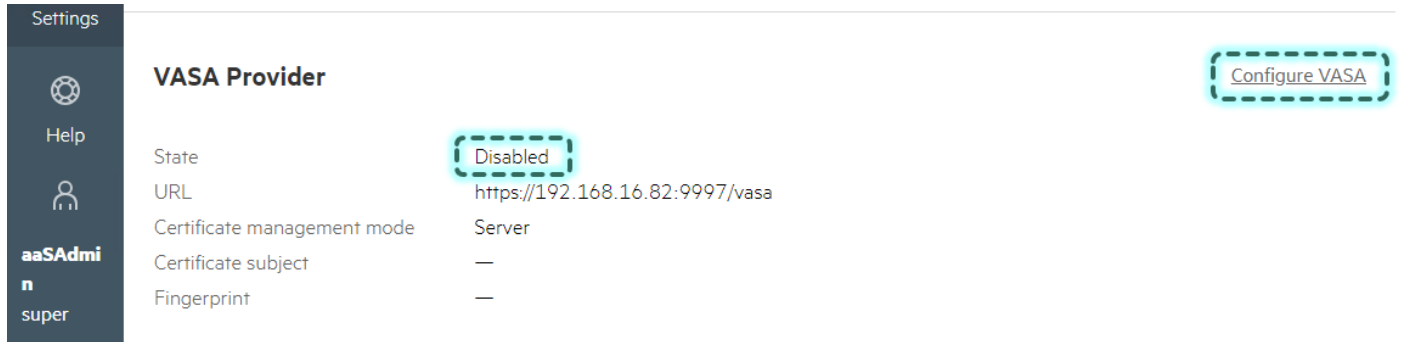
**Note**

VASA 5 and vSphere 8.0 Update 1 (and later) uses a stricter authentication mechanism and will not support self-signed certificates. This can be overridden but is intended only for backward compatibility or bootstrapping purposes.

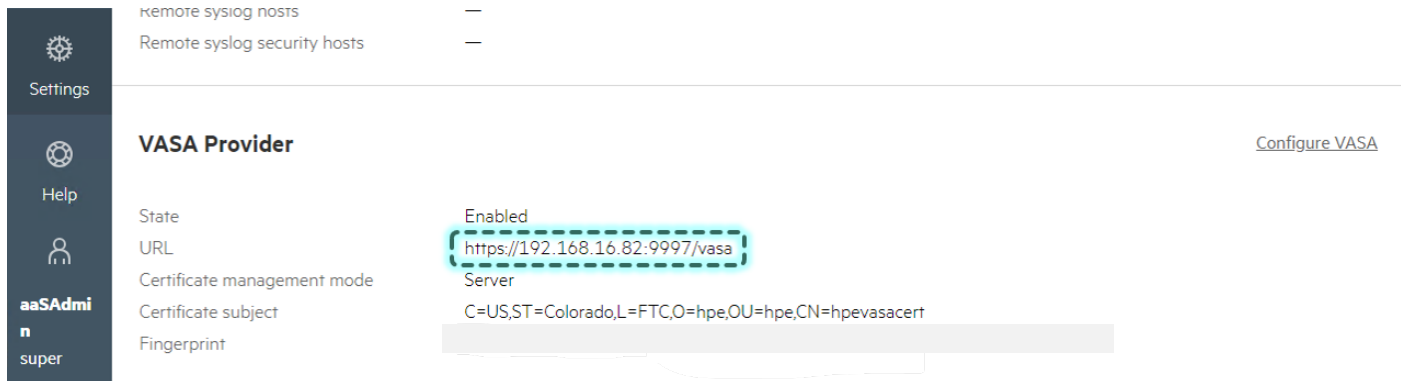


### Enable the VASA service provider

With a VASA certificate in place, the VASA service provider can be enabled. From the array UI, navigate to **Settings** → **Network services**. Scroll down until you reach **VASA Provider**. Confirm the state of the VASA provider. If it shows as **Disabled**, click **Configure VASA**:



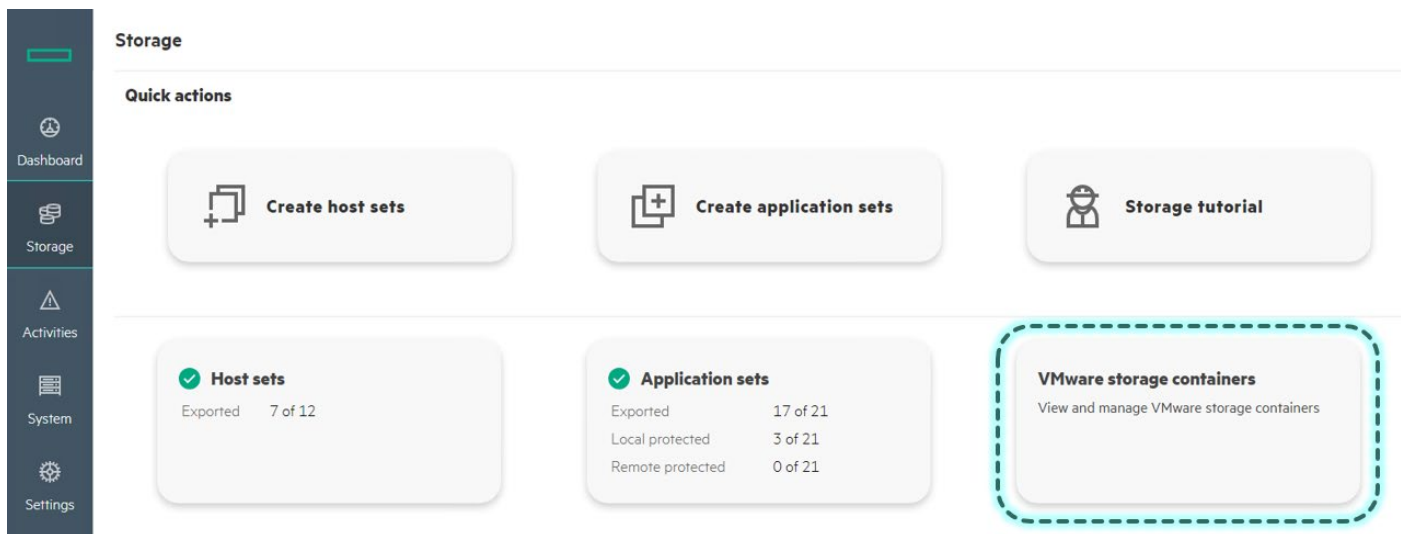
After the VASA provider is enabled, take note of the URL:



This will be used later in VMware vCenter® when adding the array.

### Create the storage container on the array

The final step to perform on the array is to create the storage container. Navigate to the **Storage** section and click the **VMware storage containers** tile:



When defining the storage container, the user has the option to export to all hosts or to a particular Host Set, as seen here:

**(optional) Perform the above steps via CLI**

The above steps can also be accomplished by using the array’s command line interface. Here are some examples:

1. Create the self-signed VASA certificate on the array:

```
# createcert vasa -selfsigned -CN <common name> -SAN DNS:<FQDN>
```

2. Start the VASA Provider (can also use the showvasa command to obtain the provider URL):

```
# startvasa
```

3. Create the VASA CPG, mark it as a storage container, and export the protocol endpoints (PEs) to a host—all done via one command:

```
# createvvolsc -attach <host> <storage-container-name>
```

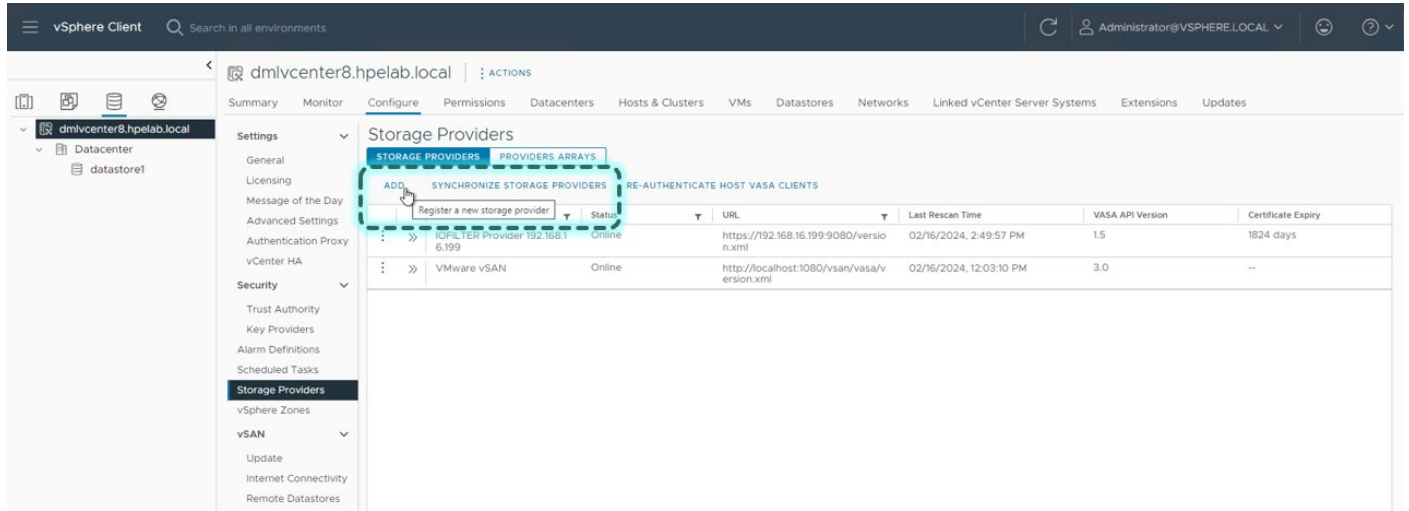
**Adding and managing the HPE Alletra Storage MP B10000 array in VMware vSphere**

In this section, the HPE Alletra Storage MP B10000 storage array is added to VMware vSphere as a storage provider, and then a vVols datastore is provisioned and a storage policy is created.



### Add HPE Alletra MP as a storage provider in VMware vSphere Client

From the VMware vSphere Client, navigate to **Configure** → **Storage Providers**, and select **ADD** from the main page:



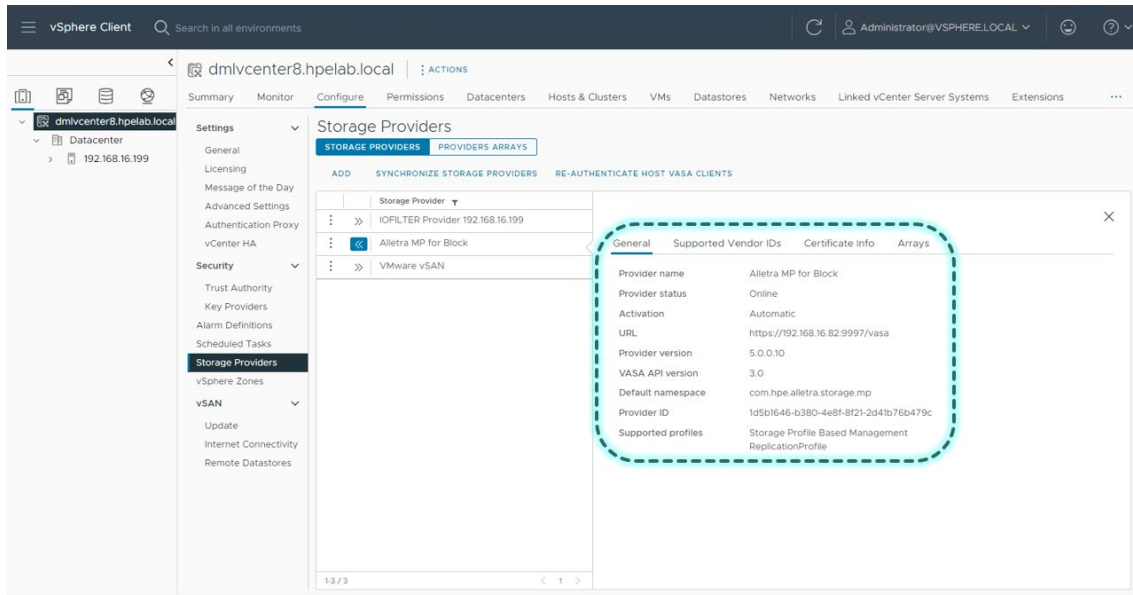
Next, supply the credentials and VASA URL from earlier in the configuration. Also verify that the certificate fingerprint matches the fingerprint from the self-signed certificate earlier in the guide.

The 'New Storage Provider' dialog box is shown. It has a title bar with 'New Storage Provider | dmlvcenter8.hpelab.local x'. The fields are: Name: Alletra MP for Block; URL: https://192.168.16.82:9997/vasa; User name: aaSAdmin; Password: [masked]. There is a checkbox for 'Use storage provider certificate' which is unchecked. Below it is a 'Certificate location' field with a 'BROWSE...' button. At the bottom, there are 'CANCEL' and 'OK' buttons.

The 'Security Alert' dialog box is shown. It has a title bar with 'Security Alert x'. The message is: 'Unable to verify the authenticity of the specified host. The SHA1 thumbprint of the certificate is: [redacted]'. Below the message, there is a warning icon and the following certificate details: Issuer: CN=hpevasacert, OU=hpe, O=hpe, L=FTC, ST=Colorado, C=US; Subject: CN=hpevasacert, OU=hpe, O=hpe, L=FTC, ST=Colorado, C=US; Valid from: 02/15/2024, 4:18:03 PM; Valid to: 02/14/2027, 4:18:03 PM. The dialog asks: 'Do you wish to proceed connecting anyway? Choose "Yes" if you trust the host. The above information will be remembered until the host is removed from the inventory. Choose "No" to cancel connecting to the host at this time.' At the bottom right, there are 'NO' and 'YES' buttons.



Here is an example of the “Storage Providers” details for the “Alletra MP for Block” platform:

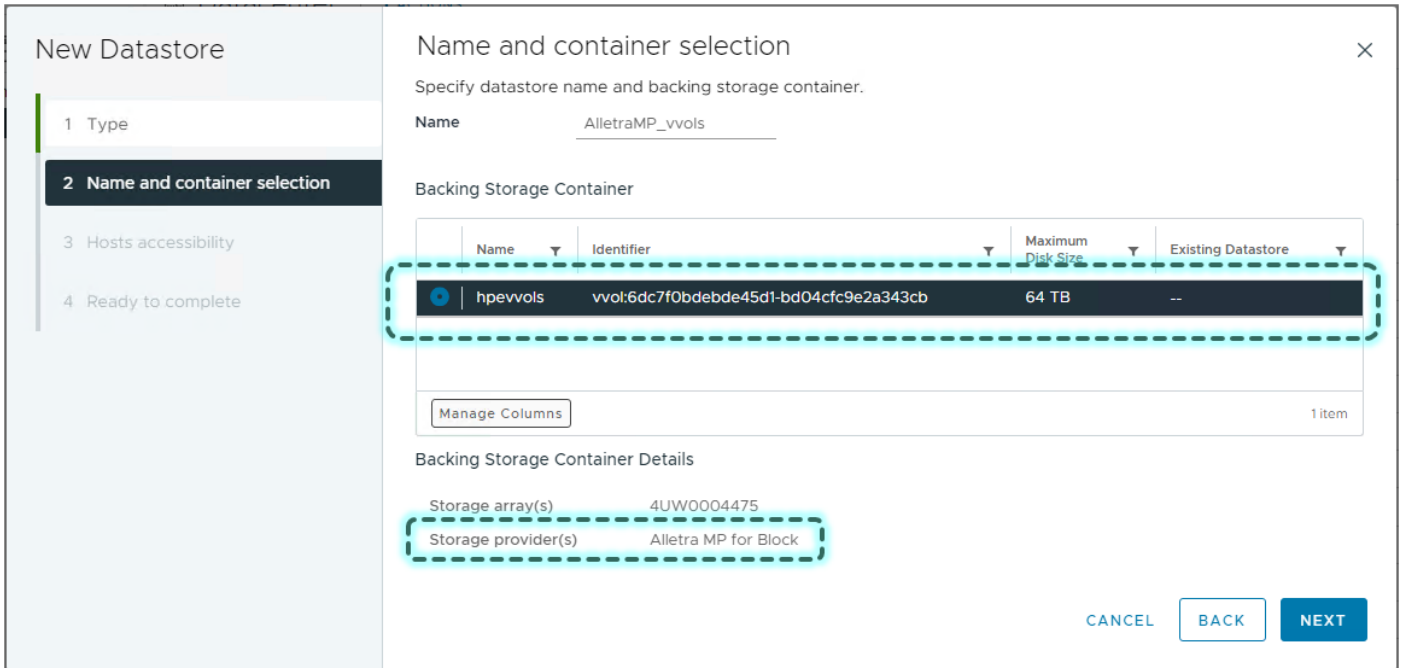


### Create a vVols datastore

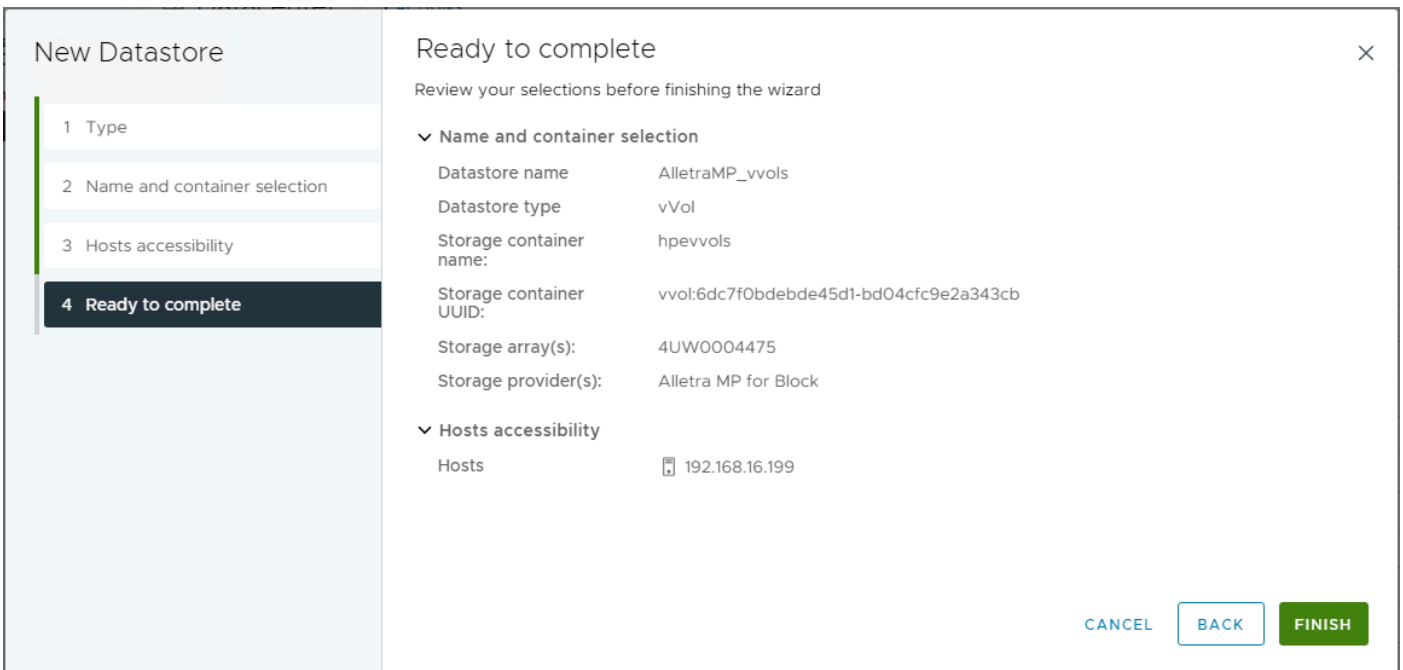
Creating a vVols datastore starts out much in the same way as provisioning a typical VMFS datastore, just be sure to choose **vVol** for the type:



In step 2 of the wizard, instead of choosing a specific LUN, specify the array (storage provider) and storage container that were created earlier:



Finally, specify the hosts that you are presenting the vVols datastore to. This should match the Host Set that was used when defining the storage container on the array.



### Create a storage policy utilizing HPE Alletra Storage MP B10000

At this point, VMs can be provisioned on the vVols datastore, named "AlletraMP\_vvols" in the screenshots above. You can now take advantage of array-based features at the VM level using storage policy-based management.



As an example, VM snapshots can be taken on a daily cadence by using storage array snapshots. First, define a policy implementing daily snapshots, and then apply it to a virtual volume on the vVols datastore. Follow these steps to create a storage policy:

1. From the VMware vCenter UI, navigate to **Menu → Policies and Profiles**.

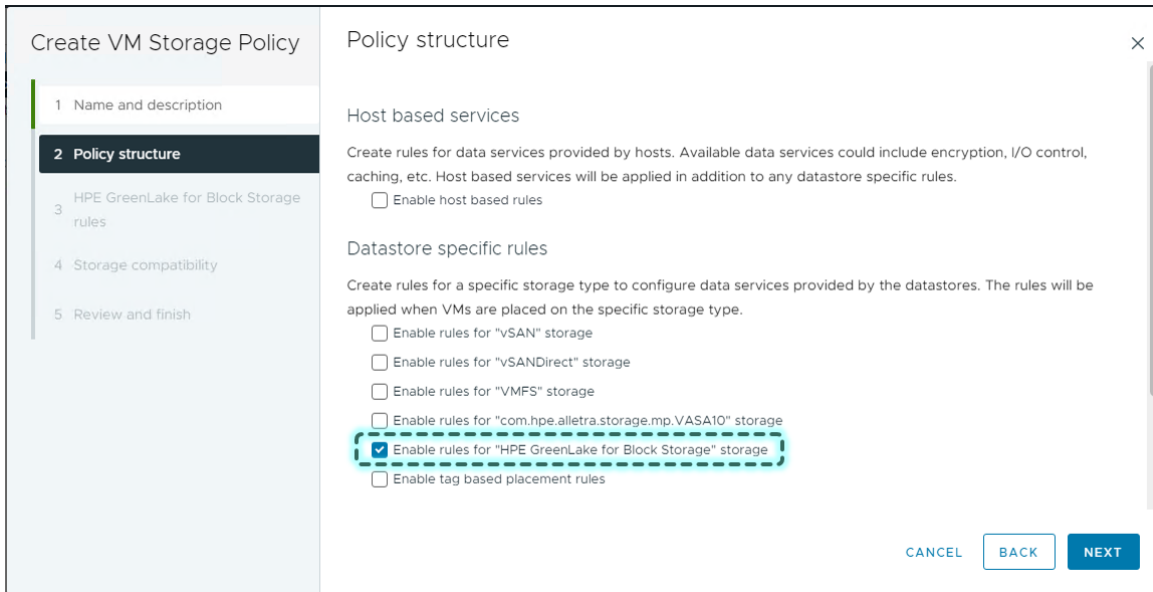
2. From the **Navigator** pane, be sure **VM Storage Policies** is selected.

3. In the **VM Storage Policies** tab, click **CREATE**.

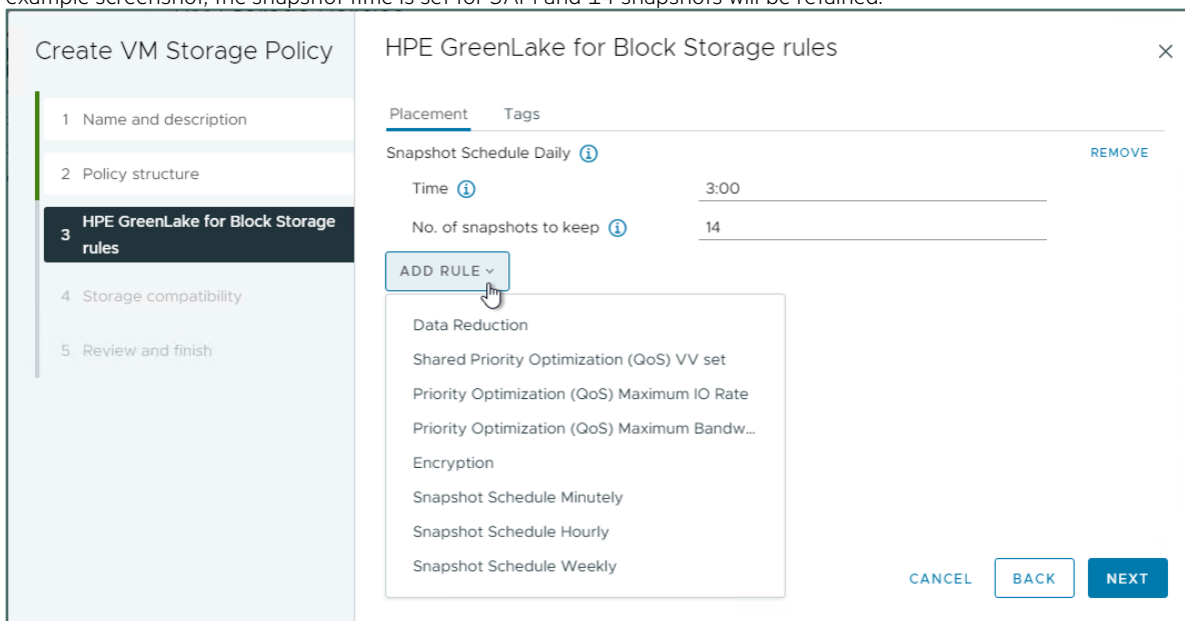
The Create wizard opens, and the remaining steps are completed in it.

4. In the **Name** and **Description** fields, specify the name of the policy and optionally provide a description.

5. In the **Policy Structure** stage, check the box titled **Enable rules for “HPE Alletra Storage MP B10000” storage** and click **NEXT**.



6. In the **HPE Alletra Storage MP B10000 rules** stage, select **Snapshot Schedule Daily** from the **ADD RULE** drop-down list. In the example screenshot, the snapshot time is set for 3AM and 14 snapshots will be retained:



**Note**

The **ADD RULE** list includes rules for data reduction, priority optimization, encryption, as well as other snapshot cadences. For each policy created, at least one rule must be defined.



7. In the **Storage Compatibility** field, make sure the vVols datastore(s) are displayed in the **COMPATIBLE** list:

Name	Datacenter	Type	Free Space	Capacity	Warnings
AlletraMP_vvols	Datacenter	vVol	1.55 TB	19.20 TB	

8. Review your selections and click **Finish**.

With a storage policy in place, it can be assigned to new or existing volumes. Note that when applying the policy to a pre-existing volume, a compliance operation will need to take place.

### Deploying vVols on HPE Alletra Storage MP B10000

With the storage provider added and storage policy defined, vVols can be assigned to new or existing virtual machines.

#### Creating a new VM using vVols and a storage policy

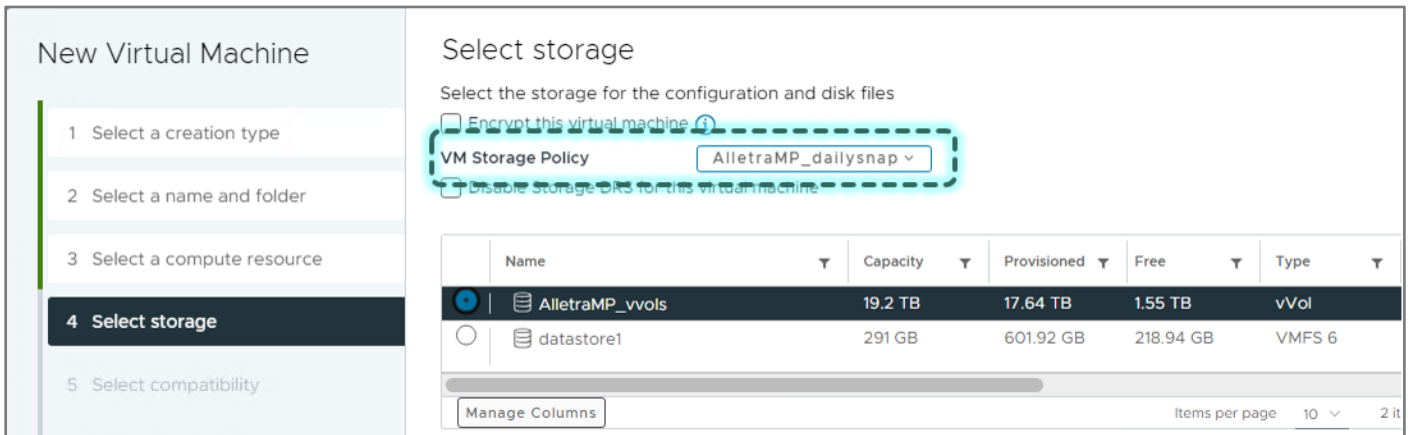
Creating a VM using vVols is no different from creating traditional storage. The only difference is to select a vVols datastore when selecting storage. However, with vVols, you also have the option to select a VM storage policy. To create a new VM using a VM storage policy, follow these steps:

1. In the vSphere Client, navigate to **Home → Inventory**.
2. Right-click a host or data center and select **New Virtual Machine...** During VM creation, the first few steps are no different from using a traditional VMFS datastore.
3. When you need to select the storage, you have the option to select a vVols storage container on the HPE Alletra Storage MP B10000 system. These can be easily identified based on the **Type** column that shows the storage options as either **VMFS 6** or **vVol**:

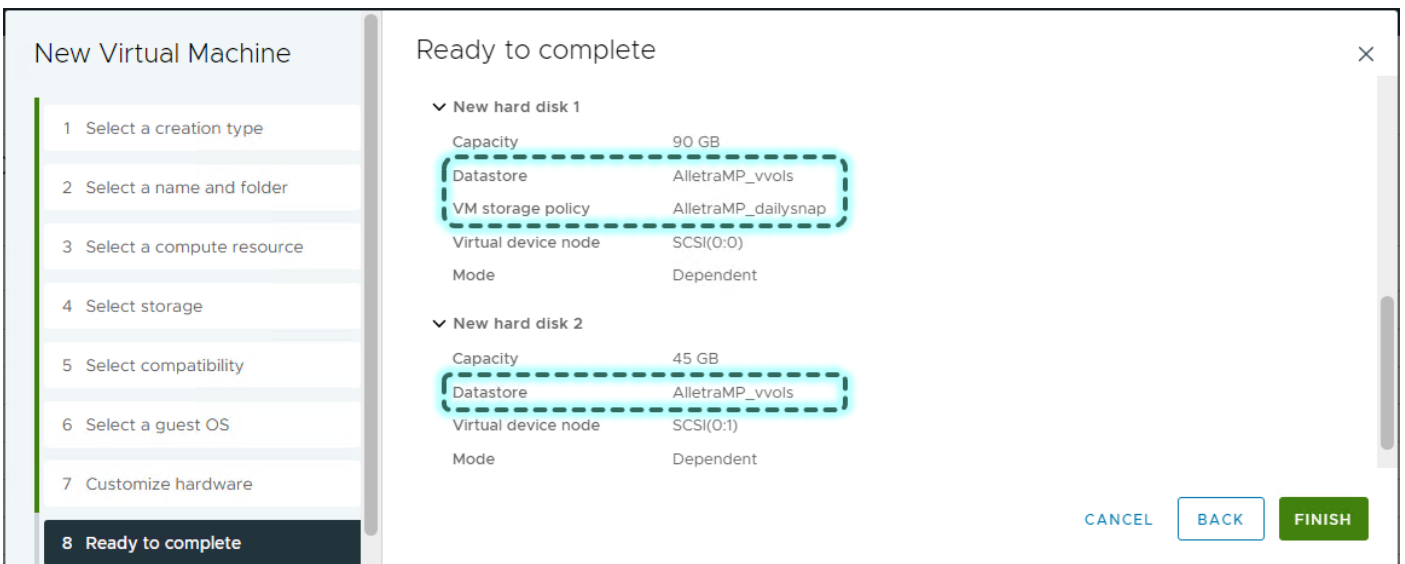
Name	Capacity	Provisioned	Free	Type
AlletraMP_vvols	19.2 TB	17.64 TB	1.55 TB	vVol
datastore1	291 GB	601.92 GB	218.94 GB	VMFS 6



- You have the option to assign a VM storage policy. From the drop-down menu at the top of the screen, select the VM storage policy to use for the new VM.



- A final look at the VM summary highlights the configuration granularity available; the first virtual disk is on the vVols datastore and will have the daily snapshot policy applied, while the second virtual disk is also on the vVols datastore but does not have a specific policy applied.



## Summary

vSphere vVols are beneficial for companies who need to increase the granular control and visibility of VMs on their storage arrays. vVols make VMs more efficient by allowing them to perform per-VM actions on their storage. vVols help data center administrators to implement Storage Policy Based Management (SPBM) and ensure that VMs and their applications receive QoS and availability required by the business needs.

vVols enable vSphere to offload additional tasks that can be done faster and more efficiently at the storage layer. The tight storage integration enables HPE Alletra Storage MP B10000 to present unique capabilities and complete common tasks, such as snapshots, directly on the array to help minimize data movement and improve performance. With VMware SPBM, tedious tasks are eliminated, reducing administration costs of a virtualization infrastructure by using policies to automatically provision LUNs at the time of VM creation—with no pre-provisioning of datastores required.



## Appendix A

### Terminology associated with vVols

vSphere vVols introduce many new storage concepts and terminology. Familiarize yourself with these terms to better understand the vVols architecture. Table 1 provides a description of the most commonly used terms.

**Table 1.** Terminology of vVols

Virtual Volume term	Description
<b>Virtual Volume</b>	A vVol is a container that encapsulates VM files, virtual disks, and their derivatives. A single VM is made up of several vVols, including one for configuration data, one for each virtual disk that a VM has, one for VM swap, and additional ones for the memory and data from any VM snapshots. vVols are created automatically for any VM operations, which include creating, powering on, cloning, and snapshotting VMs.
<b>VASA Provider</b>	A VASA Provider is the software component that mediates out-of-band communication (control path) for vVols traffic between vCenter Server, VMware ESXi™ hosts, and a storage array. The VASA Provider passes information about storage topology, capabilities, and status to vCenter Server and ESXi hosts. A VASA Provider can either reside within a storage array or be external on a physical server or virtual machine.
<b>Protocol endpoint (PE)</b>	ESXi hosts do not have direct access to vVols on a storage array and instead must use a logical I/O proxy that is referred to as a PE to communicate with vVols. The PE serves as the datapath between ESXi hosts to VMs and their respective vVols. Storage arrays that support multiple storage I/O paths and storage protocols (Fibre Channel, iSCSI, NFS) can have multiple PEs that point to the same storage container.
<b>Storage container</b>	Instead of using LUNs that are configured on the storage array, vVols use storage containers: a pool of raw storage capacity that becomes a logical grouping of vVols. All vVols are created inside the storage container. Storage containers are not visible via the in-band datapath. The VASA Provider manages storage containers and reports their existence to the vCenter Server and ESXi hosts via the out-of-band control path.
<b>Storage policy</b>	The storage policy is a set of rules that define QoS requirements for VMs based on the different capabilities provided by the physical storage array. These can be used to perform placement decisions, admission control, QoS compliance monitoring, and dynamic resource allocation management of storage resources.
<b>Storage capability</b>	The VASA Provider provides capability information from the storage array to vSphere in the form of specific attributes about physical storage resources. This can include capabilities of the HPE Alletra MP array, such as data reduction, priority optimization, encryption, snapshots, and more. These capabilities can be unique to a specific system and are used in storage policies to define levels of service that can be used to set performance, capacity, and availability requirements for VMs.



## Resources

New release! HPE Alletra Storage MP B10000

[community.hpe.com/t5/around-the-storage-block/new-release-hpe-greenlake-for-block-storage-with-hpe-alletra/ba-p/7214571](https://community.hpe.com/t5/around-the-storage-block/new-release-hpe-greenlake-for-block-storage-with-hpe-alletra/ba-p/7214571)

HPE Alletra Storage MP B10000 UI 2.3 User Guide

[support.hpe.com/hpesc/public/docDisplay?docId=sd00003947en\\_us](https://support.hpe.com/hpesc/public/docDisplay?docId=sd00003947en_us)

HPE Alletra Storage MP B10000 and VMware vSphere 8 deployment considerations

[hpe.com/psnow/doc/a00136180enw](https://hpe.com/psnow/doc/a00136180enw)

HPE Alletra Storage MP B10000 QuickSpecs

[hpe.com/psnow/doc/a50006985enw.pdf](https://hpe.com/psnow/doc/a50006985enw.pdf)

## Learn more at

[HPE.com/us/en/alletra-storage-mp-b10000.html](https://HPE.com/us/en/alletra-storage-mp-b10000.html)

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