Storage

Element Software

NetApp
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Volumes

The NetApp Element storage system provisions storage using volumes. Volumes are block devices accessed over the network by iSCSI or Fibre Channel clients.

Element storage enables you to create, view, edit, delete, clone, backup or restore volumes for user accounts. You can also manage each volume on a cluster, and add or remove volumes in volume access groups.

Persistent volumes

Persistent volumes allow management node configuration data to be stored on a specified storage cluster, rather than locally with a VM, so that data can be preserved in the event of management node loss or removal. Persistent volumes are an optional yet recommended management node configuration.

An option to enable persistent volumes is included in the installation and upgrade scripts when deploying a new management node. Persistent volumes are volumes on an Element software-based storage cluster that contain management node configuration information for the host management node VM that persists beyond the life of the VM. If the management node is lost, a replacement management node VM can reconnect to and recover configuration data for the lost VM.

Persistent volumes functionality, if enabled during installation or upgrade, automatically creates multiple volumes. These volumes, like any Element software-based volume, can be viewed using the Element software web UI, NetApp Element Plug-in for vCenter Server, or API, depending on your preference and installation. Persistent volumes must be up and running with an iSCSI connection to the management node to maintain current configuration data that can be used for recovery.

Persistent volumes that are associated with management services are created and assigned to a new account during installation or upgrade. If you are using persistent volumes, do not modify or delete the volumes or their associated account

Virtual volumes (vVols)

vSphere Virtual Volumes is a storage paradigm for VMware that moves much of the storage management for vSphere from the storage system to VMware vCenter. With Virtual Volumes (vVols), you can allocate storage according to the requirements of individual virtual machines.

Bindings

The NetApp Element cluster chooses an optimal protocol endpoint, creates a binding that associates the ESXi host and virtual volume with the protocol endpoint, and returns the binding to the ESXi host. After it is bound, the ESXi host can perform I/O operations with the bound virtual volume.

Protocol endpoints

VMware ESXi hosts use logical I/O proxies known as protocol endpoints to communicate with virtual volumes. ESXi hosts bind virtual volumes to protocol endpoints to perform I/O operations. When a virtual machine on the host performs an I/O operation, the associated protocol endpoint directs I/O to the virtual volume with which it

is paired.

Protocol endpoints in a NetApp Element cluster function as SCSI administrative logical units. Each protocol endpoint is created automatically by the cluster. For every node in a cluster, a corresponding protocol endpoint is created. For example, a four-node cluster will have four protocol endpoints.

iSCSI is the only supported protocol for NetApp Element software. Fibre Channel protocol is not supported. Protocol endpoints cannot be deleted or modified by a user, are not associated with an account, and cannot be added to a volume access group.

Storage containers

Storage containers are logical constructs that map to NetApp Element accounts and are used for reporting and resource allocation. They pool raw storage capacity or aggregate storage capabilities that the storage system can provide to virtual volumes. A VVol datastore that is created in vSphere is mapped to an individual storage container. A single storage container has all available resources from the NetApp Element cluster by default. If more granular governance for multi-tenancy is required, multiple storage containers can be created.

Storage containers function like traditional accounts and can contain both virtual volumes and traditional volumes. A maximum of four storage containers per cluster is supported. A minimum of one storage container is required to use VVols functionality. You can discover storage containers in vCenter during VVols creation.

VASA provider

To make vSphere aware of the vVol feature on the NetApp Element cluster, the vSphere admin must register the NetApp Element VASA Provider with vCenter. The VASA provider is the out-of-band control path between vSphere and the Element cluster. It is responsible for executing requests on the Element cluster on behalf of vSphere, such as creating VMs, making VMs available to vSphere, and advertising storage capabilities to vSphere.

The VASA provider runs as part of the cluster master in Element software. The cluster master is a highly available service that fails over to any node in the cluster as needed. If the cluster master fails over, the VASA provider moves with it, ensuring high availability for the VASA provider. All provisioning and storage management tasks use the VASA provider, which handles any changes needed on the Element cluster.

For Element 12.5 and earlier, do not register more than one NetApp Element VASA provider to a single vCenter instance. Where a second NetApp Element VASA provider is added, this renders all VVOL datastores inaccessible.

VASA support for up to 10 vCenters is available as an upgrade patch if you have already registered a VASA provider with your vCenter. To install, follow the directions in the VASA39 manifest and download the .tar.gz file from the NetApp Software Downloads site. The NetApp Element VASA provider uses a NetApp certificate. With this patch, the certificate is used unmodified by vCenter to support multiple vCenters for VASA and VVols use. Do not modify the certificate. Custom SSL certificates are not supported by VASA.

Find more information

- SolidFire and Element Software Documentation
- NetApp Element Plug-in for vCenter Server

Volume access groups

By creating and using volume access groups, you can control access to a set of volumes. When you associate a set of volumes and a set of initiators with a volume access group, the access group grants those initiators access to that set of volumes.

Volume access groups in NetApp SolidFire storage enable iSCSI initiator IQNs or Fibre Channel WWPNs to access a collection of volumes. Each IQN that you add to an access group can access each volume in the group without using CHAP authentication. Each WWPN that you add to an access group enables Fibre Channel network access to the volumes in the access group.

Volume access groups have the following limits:

- A maximum of 128 initiators per volume access group.
- A maximum of 64 access groups per volume.
- An access group can be made up of a maximum of 2000 volumes.
- An IQN or WWPN can belong to only one volume access group.
- For Fibre Channel clusters, a single volume can belong to a maximum of four access groups.

Initiators

Initiators enable external clients access to volumes in a cluster, serving as the entry point for communication between clients and volumes. You can use initiators for CHAP-based rather than account-based access to storage volumes. A single initiator, when added to a volume access group, allows volume access group members to access all storage volumes added to the group without requiring authentication. An initiator can belong to only one access group.

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