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Storage VM administration

Manage storage VMs in BlueXP

A storage VM is a virtual machine running within ONTAP that provides storage and data services to your clients. You might know this as an SVM or a vserver. Cloud Volumes ONTAP is configured with one storage VM by default, but some configurations support additional storage VMs.

Supported number of storage VMs

Multiple storage VMs are supported with certain configurations. Go to the Cloud Volumes ONTAP Release Notes to verify the supported number of storage VMs for your version of Cloud Volumes ONTAP.

Work with multiple storage VMs

BlueXP supports any additional storage VMs that you create from System Manager or the CLI.

For example, the following image shows how you can choose a storage VM when you create a volume.

![Image of storage VM choice in BlueXP]

And the following image shows how you can choose a storage VM when replicating a volume to another system.
Modify the name of the default storage VM

BlueXP automatically names the single storage VM that it creates for Cloud Volumes ONTAP. From System Manager, CLI, or API, you can modify the name of the storage VM if you have strict naming standards. For example, you might want the name to match how you name the storage VMs for your ONTAP clusters.

Create data-serving storage VMs for Cloud Volumes ONTAP in AWS

A storage VM is a virtual machine running within ONTAP that provides storage and data services to your clients. You might know this as an SVM or a vserver. Cloud Volumes ONTAP is configured with one storage VM by default, but some configurations support additional storage VMs.

To create additional data-serving storage VMs, you need to allocate IP addresses in AWS and then run ONTAP commands based on your Cloud Volumes ONTAP configuration.

Supported number of storage VMs

Multiple storage VMs are supported with specific Cloud Volumes ONTAP configurations starting with the 9.7 release. Go to the Cloud Volumes ONTAP Release Notes to verify the supported number of storage VMs for your version of Cloud Volumes ONTAP.

All other Cloud Volumes ONTAP configurations support one data-serving storage VM and one destination storage VM used for disaster recovery. You can activate the destination storage VM for data access if there’s an outage on the source storage VM.

Verify limits for your configuration

Each EC2 instance supports a maximum number of private IPv4 addresses per network interface. You need to verify the limit before you allocate IP addresses in AWS for the new storage VM.

Steps
1. Go the Storage limits section in the Cloud Volumes ONTAP Release Notes.
2. Identify the maximum number of IP addresses per interface for your instance type.
3. Make note of this number because you’ll need it in the next section when you allocate IP addresses in AWS.

Allocate IP addresses in AWS

Private IPv4 addresses must be assigned to port e0a in AWS before you create LIFs for the new storage VM.

Note that an optional management LIF for a storage VM requires a private IP address on a single node system and on an HA pair in a single AZ. This management LIF provides a connection to management tools like SnapCenter.

Steps
1. Log in to AWS and open the EC2 service.
2. Select the Cloud Volumes ONTAP instance and click Networking.
   
   If you’re creating a storage VM on an HA pair, select node 1.
3. Scroll down to Network interfaces and click the Interface ID for port e0a.

   ![Network Interfaces](image)

4. Select the network interface and click Actions > Manage IP addresses.
5. Expand the list of IP addresses for e0a.
6. Verify the IP addresses:
   a. Count the number of allocated IP addresses to confirm that the port has room for additional IPs.

      You should have identified the maximum number of supported IP addresses per interface in the previous section of this page.

   b. Optional: Go to the CLI for Cloud Volumes ONTAP and run `network interface show` to confirm that each of these IP addresses are in use.

      If an IP address isn’t in use, then you can use it with the new storage VM.
7. Back in the AWS Console, click **Assign new IP address** to assign additional IP addresses based on the amount that you need for the new storage VM.
   
   ◦ Single node system: One unused secondary private IP is required.
   
   An optional secondary private IP is required if you want to create a management LIF on the storage VM.
   
   ◦ HA pair in a single AZ: One unused secondary private IP is required on node 1.
   
   An optional secondary private IP is required if you want to create a management LIF on the storage VM.
   
   ◦ HA pair in multiple AZs: One unused secondary private IP is required on each node.

8. If you’re allocating the IP address on an HA pair in a single AZ, enable **Allow secondary private IPv4 addresses to be reassigned**.

9. Click **Save**.

10. If you have an HA pair in multiple AZs, then you’ll need to repeat these steps for node 2.

### Create a storage VM on a single node system

These steps create a new storage VM on a single node system. One private IP address is required to create a NAS LIF and another optional private IP address is needed if you want to create a management LIF.

**Steps**

1. Create the storage VM and a route to the storage VM.

   ```bash
   vserver create -rootvolume-security-style unix -rootvolume root_svm_2 -snapshot-policy default -vserver svm_2 -aggregate aggr1
   network route create -destination 0.0.0.0/0 -vserver svm_2 -gateway subnet_gateway
   ```

2. Create a NAS LIF.

   ```bash
   network interface create -auto-revert true -vserver svm_2 -service -policy default-data-files -home-port e0a -address private_ip_x -netmask node1Mask -lif ip_nas_2 -home-node cvo-node
   ```

   Where `private_ip_x` is an unused secondary private IP on e0a.

3. Optional: Create a storage VM management LIF.
network interface create -auto-revert true -vserver svm_2 -service -policy default-management -home-port e0a -address private_ip_y -netmask node1Mask -lif ip_svm_mgmt_2 -home-node cvo-node

Where private_ip_y is another unused secondary private IP on e0a.

4. Assign one or more aggregates to the storage VM.

vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

**Create a storage VM on an HA pair in a single AZ**

These steps create a new storage VM on an HA pair in a single AZ. One private IP address is required to create a NAS LIF and another optional private IP address is needed if you want to create a management LIF.

Both of these LIFs get allocated on node 1. The private IP addresses can move between nodes if failures occur.

**Steps**

1. Create the storage VM and a route to the storage VM.

vserver create -rootvolume-security-style unix -rootvolume root_svm_2 -snapshot-policy default -vserver svm_2 -aggregate aggr1

network route create -destination 0.0.0.0/0 -vserver svm_2 -gateway subnet_gateway

2. Create a NAS LIF on node 1.

network interface create -auto-revert true -vserver svm_2 -service -policy default-data-files -home-port e0a -address private_ip_x -netmask node1Mask -lif ip_nas_2 -home-node cvo-node

Where private_ip_x is an unused secondary private IP on e0a of cvo-node1. This IP address can be relocated to the e0a of cvo-node2 in case of takeover because the service policy default-data-files indicates that IPs can migrate to the partner node.

3. Optional: Create a storage VM management LIF on node 1.
network interface create -auto-revert true -vserver svm_2 -service -policy default-management -home-port e0a -address private_ip_y -netmask node1Mask -lif ip_svm_mgmt_2 -home-node cvo-node1

Where `private_ip_y` is another unused secondary private IP on e0a.

4. Assign one or more aggregates to the storage VM.

```bash
vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2
```

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

5. If you’re running Cloud Volumes ONTAP 9.11.1 or later, modify the network service policies for the storage VM.

Modifying the services is required because it ensures that Cloud Volumes ONTAP can use the iSCSI LIF for outbound management connections.
Create a storage VM on an HA pair in multiple AZs

These steps create a new storage VM on an HA pair in multiple AZs.

A floating IP address is required for a NAS LIF and is optional for a management LIF. These floating IP addresses don’t require you to allocate private IPs in AWS. Instead, the floating IPs are automatically configured in the AWS route table to point to a specific node’s ENI in the same VPC.

In order for floating IPs to work with ONTAP, a private IP address must be configured on every storage VM on each node. This is reflected in the steps below where an iSCSI LIF is created on node 1 and on node 2.

Steps
1. Create the storage VM and a route to the storage VM.
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vserver create -rootvolume-security-style unix -rootvolume root_svm_2 -snapshot-policy default -vserver svm_2 -aggregate aggr1</td>
<td>Create a SVM with specified settings.</td>
</tr>
<tr>
<td>network route create -destination 0.0.0.0/0 -vserver svm_2 -gateway subnet_gateway</td>
<td>Create a route for intrasite traffic.</td>
</tr>
<tr>
<td>2. Create a NAS LIF on node 1.</td>
<td></td>
</tr>
<tr>
<td>network interface create -auto-revert true -vserver svm_2 -service -policy default-data-files -home-port e0a -address floating_ip -netmask node1Mask -lif ip_nas_floating_2 -home-node cvo-node1</td>
<td>Create a NAS LIF with specified settings.</td>
</tr>
<tr>
<td>◦ The floating IP address must be outside of the CIDR blocks for all VPCs in the AWS region in which you deploy the HA configuration. 192.168.209.27 is an example floating IP address. Learn more about choosing a floating IP address.</td>
<td></td>
</tr>
<tr>
<td>◦ -service-policy default-data-files indicates that IPs can migrate to the partner node.</td>
<td></td>
</tr>
<tr>
<td>3. Optional: Create a storage VM management LIF on node 1.</td>
<td></td>
</tr>
<tr>
<td>network interface create -auto-revert true -vserver svm_2 -service -policy default-management -home-port e0a -address floating_ip -netmask node1Mask -lif ip_svm_mgmt_2 -home-node cvo-node1</td>
<td>Create a storage VM management LIF with specified settings.</td>
</tr>
<tr>
<td>4. Create an iSCSI LIF on node 1.</td>
<td></td>
</tr>
<tr>
<td>network interface create -vserver svm_2 -service-policy default-data-blocks -home-port e0a -address private_ip -netmask node1Mask -lif ip_node1_iscsi_2 -home-node cvo-node1</td>
<td>Create an iSCSI LIF with specified settings.</td>
</tr>
<tr>
<td>◦ This iSCSI LIF is required to support LIF migration of the floating IPs in the storage VM. It doesn’t have to be an iSCSI LIF, but it can’t be configured to migrate between nodes.</td>
<td></td>
</tr>
<tr>
<td>◦ -service-policy default-data-block indicates that an IP address does not migrate between nodes.</td>
<td></td>
</tr>
<tr>
<td>◦ private_ip is an unused secondary private IP address on eth0 (e0a) of cvo_node1.</td>
<td></td>
</tr>
<tr>
<td>5. Create an iSCSI LIF on node 2.</td>
<td></td>
</tr>
<tr>
<td>network interface create -vserver svm_2 -service-policy default-data-blocks -home-port e0a -address private_ip -netmaskNode2Mask -lif ip_node2_iscsi_2 -home-node cvo-node2</td>
<td>Create an iSCSI LIF with specified settings.</td>
</tr>
</tbody>
</table>
This iSCSI LIF is required to support LIF migration of the floating IPs in the storage VM. It doesn’t have to be an iSCSI LIF, but it can’t be configured to migrate between nodes.

-service-policy default-data-block indicates that an IP address does not migrate between nodes.

private_ip is an unused secondary private IP address on eth0 (e0a) of cvo_node2.

6. Assign one or more aggregates to the storage VM.

```
vs
```
Create data-serving storage VMs for Cloud Volumes ONTAP in Azure

A storage VM is a virtual machine running within ONTAP that provides storage and data services to your clients. You might know this as an SVM or a vserver. Cloud Volumes ONTAP is configured with one storage VM by default, but additional storage VMs are supported when running Cloud Volumes ONTAP in Azure.

To create additional data-serving storage VMs, you need to allocate IP addresses in Azure and then run ONTAP commands to create the storage VM and data LIFs.
To perform additional NIC-related tasks, you can assign a network contributor role or custom role with appropriate permissions in Azure. For more information on these NIC-related permissions, see the Microsoft Azure documentation.

**Supported number of storage VMs**

Multiple storage VMs are supported with specific Cloud Volumes ONTAP configurations starting with the 9.9.0 release. Go to the Cloud Volumes ONTAP Release Notes to verify the supported number of storage VMs for your version of Cloud Volumes ONTAP.

All other Cloud Volumes ONTAP configurations support one data-serving storage VM and one destination storage VM used for disaster recovery. You can activate the destination storage VM for data access if there's an outage on the source storage VM.

**Allocate IP addresses in Azure**

You need to allocate IP addresses in Azure before you create a storage VM and allocate LIFs.

**Single node system**

IP addresses must be assigned to nic0 in Azure before you create a storage VM and allocate LIFs.

You'll need to create an IP address for data LIF access and another optional IP address for a storage VM (SVM) management LIF. This management LIF provides a connection to management tools like SnapCenter.

**Steps**

1. Log in to the Azure portal and open the Virtual machine service.
2. Click the name of the Cloud Volumes ONTAP VM.
3. Click Networking.
4. Click the name of the network interface for nic0.
5. Under Settings, click IP configurations.
6. Click Add.
7. Enter a name for the IP configuration, select Dynamic, and then click OK.
8. Click the name of the IP configuration that you just created, change the Assignment to Static, and click Save.

   It's best to use a static IP address because a static IP ensures that the IP address won't change, which can help to prevent unnecessary outages to your application.

If you want to create an SVM management LIF, repeat these steps to create an additional IP address.

**After you finish**

Copy the private IP addresses that you just created. You'll need to specify those IP addresses when you create LIFs for the new storage VM.

**HA pair**

How you allocate IP addresses for an HA pair depends on the storage protocol that you're using.
iSCSI

iSCSI IP addresses must be assigned to nic0 in Azure before you create a storage VM and allocate LIFs. IPs for iSCSI are assigned to nic0 and not the load balancer because iSCSI uses ALUA for failover.

You’ll need to create the following IP addresses:

- One IP address for iSCSI data LIF access from node 1
- One IP address for iSCSI data LIF access from node 2
- An optional IP address for a storage VM (SVM) management LIF

  This management LIF provides a connection to management tools like SnapCenter.

Steps

1. Log in to the Azure portal and open the Virtual machine service.
2. Click the name of the Cloud Volumes ONTAP VM for node 1.
3. Click Networking.
4. Click the name of the network interface for nic0.
5. Under Settings, click IP configurations.
6. Click Add.
7. Enter a name for the IP configuration, select Dynamic, and then click OK.
8. Click the name of the IP configuration that you just created, change the Assignment to Static, and click Save.

   It’s best to use a static IP address because a static IP ensures that the IP address won’t change, which can help to prevent unnecessary outages to your application.

9. Repeat these steps on node 2.
10. If you want to create an SVM management LIF, repeat these steps on node 1.

NFS

IP addresses that you use for NFS are allocated in the load balancer so that the IP addresses can migrate to the other node in case failover events occur.

You’ll need to create the following IP addresses:

- One IP address for NAS data LIF access from node 1
- One IP address for NAS data LIF access from node 2
- An optional IP address for a storage VM (SVM) management LIF

  The iSCSI LIFs are required for DNS communication. An iSCSI LIF is used for this purpose because it doesn’t migrate on failover.

  This management LIF provides a connection to management tools like SnapCenter.

Steps

1. In the Azure portal, open the Load balancers service.
2. Click the name of the load balancer for the HA pair.

3. Create one frontend IP configuration for data LIF access from node 1, another for data LIF access from node 2, and another optional frontend IP for a storage VM (SVM) management LIF.
   a. Under **Settings**, click **Frontend IP configuration**.
   b. Click **Add**.
   c. Enter a name for the frontend IP, select the subnet for the Cloud Volumes ONTAP HA pair, leave **Dynamic** selected, and in regions with Availability Zones, leave **Zone-redundant** selected to ensure that the IP address remains available if a zone fails.
   d. Click the name of the frontend IP configuration that you just created, change the **Assignment** to **Static**, and click **Save**.

   It’s best to use a static IP address because a static IP ensures that the IP address won’t change, which can help to prevent unnecessary outages to your application.

4. Add a health probe for each frontend IP that you just created.
   a. Under the load balancer’s **Settings**, click **Health probes**.
   b. Click **Add**.
   c. Enter a name for the health probe and enter a port number that’s between 63005 and 65000. Keep the default values for the other fields.

   It’s important that the port number is between 63005 and 65000. For example, if you are creating three health probes, you could enter probes that use the port numbers 63005, 63006, and 63007.
5. Create new load balancing rules for each frontend IP.
   a. Under the load balancer’s **Settings**, click **Load balancing rules**.
   b. Click **Add** and enter the required information:
      - **Name**: Enter a name for the rule.
      - **IP Version**: Select **IPv4**.
      - **Frontend IP address**: Select one of the frontend IP addresses that you just created.
      - **HA Ports**: Enable this option.
      - **Backend pool**: Keep the default Backend pool that was already selected.
      - **Health probe**: Select the health probe that you created for the selected frontend IP.
      - **Session persistence**: Select **None**.
      - **Floating IP**: Select **Enabled**.
6. Ensure that the network security group rules for Cloud Volumes ONTAP allows the load balancer to send TCP probes for the health probes that were created in step 4 above. Note that this is allowed by default.

**SMB**

IP addresses that you use for SMB data are allocated in the load balancer so that the IP addresses can migrate to the other node in case failover events occur.

You'll need to create the following IP addresses in the load balancer:

- One IP address for NAS data LIF access from node 1
- One IP address for NAS data LIF access from node 2
- One IP address for an iSCSI LIF on node 1 in each VM’s respective NIC0
- One IP address for an iSCSI LIF on node 2

The iSCSI LIFs are required for DNS and SMB communication. An iSCSI LIF is used for this purpose because it doesn’t migrate on failover.

- An optional IP address for a storage VM (SVM) management LIF

  This management LIF provides a connection to management tools like SnapCenter.
Steps
1. In the Azure portal, open the Load balancers service.
2. Click the name of the load balancer for the HA pair.
3. Create the required number of frontend IP configurations for the data and SVM LIFs only:
   
   A frontend IP should only be created under the NIC0 for each corresponding SVM. For more information on how to add the IP address to the SVM NIC0, see "Step 7 [hyperlink]"
   
   a. Under Settings, click Frontend IP configuration.
   b. Click Add.
   c. Enter a name for the frontend IP, select the subnet for the Cloud Volumes ONTAP HA pair, leave Dynamic selected, and in regions with Availability Zones, leave Zone-redundant selected to ensure that the IP address remains available if a zone fails.
   
   ![Microsoft Azure](image)
   
   d. Click the name of the frontend IP configuration that you just created, change the Assignment to Static, and click Save.

   It's best to use a static IP address because a static IP ensures that the IP address won't change, which can help to prevent unnecessary outages to your application.

4. Add a health probe for each frontend IP that you just created.
   
   a. Under the load balancer’s Settings, click Health probes.
   b. Click Add.
   c. Enter a name for the health probe and enter a port number that's between 63005 and 65000. Keep the default values for the other fields.

   It’s important that the port number is between 63005 and 65000. For example, if you are creating three health probes, you could enter probes that use the port numbers 63005, 63006, and 63007.
5. Create new load balancing rules for each frontend IP.
   
   a. Under the load balancer’s **Settings**, click **Load balancing rules**.
   
   b. Click **Add** and enter the required information:
      
      - **Name**: Enter a name for the rule.
      - **IP Version**: Select **IPv4**.
      - **Frontend IP address**: Select one of the frontend IP addresses that you just created.
      - **HA Ports**: Enable this option.
      - **Backend pool**: Keep the default Backend pool that was already selected.
      - **Health probe**: Select the health probe that you created for the selected frontend IP.
      - **Session persistence**: Select **None**.
      - **Floating IP**: Select **Enabled**.
6. Ensure that the network security group rules for Cloud Volumes ONTAP allows the load balancer to send TCP probes for the health probes that were created in step 4 above. Note that this is allowed by default.

7. For iSCSI LIFs, add the IP address for NIC0.
   a. Click the name of the Cloud Volumes ONTAP VM.
   b. Click **Networking**.
   c. Click the name of the network interface for nic0.
   d. Under Settings, click **IP configurations**.
   e. Click **Add**.
f. Enter a name for the IP configuration, select Dynamic, and then click **OK**.

g. Click the name of the IP configuration that you just created, change the Assignment to Static, and click **Save**.

It’s best to use a static IP address because a static IP ensures that the IP address won’t change, which can help to prevent unnecessary outages to your application.

**After you finish**
Copy the private IP addresses that you just created. You’ll need to specify those IP addresses when you create LIFs for the new storage VM.

**Create a storage VM and LIFs**

After you allocate IP addresses in Azure, you can create a new storage VM on a single node system or on an
HA pair.

**Single node system**

How you create a storage VM and LIFs on a single node system depends on the storage protocol that you’re using.
iSCSI
Follow these steps to create a new storage VM, along with the required LIFs.

Steps
1. Create the storage VM and a route to the storage VM.

   vserver create -vserver <svm-name> -subtype default -rootvolume <root-volume-name> -rootvolume-security-style unix

   network route create -destination 0.0.0.0/0 -vserver <svm-name> -gateway <ip-of-gateway-server>

2. Create a data LIF:

   network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif <lif-name> -home-node <name-of-node1> -data-protocol iscsi

3. Optional: Create a storage VM management LIF.

   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask-length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default

4. Assign one or more aggregates to the storage VM.

   vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2

   This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

NFS
Follow these steps to create a new storage VM, along with the required LIFs.

Steps
1. Create the storage VM and a route to the storage VM.
SMB

Follow these steps to create a new storage VM, along with the required LIFs.

Steps

1. Create the storage VM and a route to the storage VM.

   `vserver create -vserver svm_2 -subtype default -rootvolume <root-volume-name> -rootvolume-security-style unix`

   `network route create -destination 0.0.0.0/0 -vserver svm_2 -gateway <ip-of-gateway-server>`

2. Create a data LIF:

   `network interface create -vserver svm_2 -lif <lif-name> -role data -data-protocol cifs,nfs -address <nas-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy disabled -firewall-policy data -home-port e0a -auto -revert true -failover-group Default`

3. Optional: Create a storage VM management LIF.

   `network interface create -vserver svm_2 -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default`

4. Assign one or more aggregates to the storage VM.

   `vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2`

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.
network route create -destination 0.0.0.0/0 -vserver <svm-name> -gateway <ip-of-gateway-server>

2. Create a data LIF:

   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nas-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy disabled -firewall-policy data -home-port e0a -auto -revert true -failover-group Default

3. Optional: Create a storage VM management LIF.

   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default

4. Assign one or more aggregates to the storage VM.

   vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2

   This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

**HA pair**

How you create a storage VM and LIFs on an HA pair depends on the storage protocol that you’re using.
iSCSI
Follow these steps to create a new storage VM, along with the required LIFs.

Steps
1. Create the storage VM and a route to the storage VM.

   vserver create -vserver <svm-name> -subtype default -rootvolume
   <root-volume-name> -rootvolume-security-style unix

   network route create -destination 0.0.0.0/0 -vserver <svm-name>
   -gateway <ip-of-gateway-server>

2. Create data LIFs:
   a. Use the following command to create an iSCSI LIF on node 1.

      network interface create -vserver <svm-name> -home-port e0a
      -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif
      <lif-name> -home-node <name-of-node1> -data-protocol iscsi

   b. Use the following command to create an iSCSI LIF on node 2.

      network interface create -vserver <svm-name> -home-port e0a
      -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif
      <lif-name> -home-node <name-of-node2> -data-protocol iscsi

3. Optional: Create a storage VM management LIF on node 1.

   network interface create -vserver <svm-name> -lif <lif-name> -role
   data -data-protocol none -address <svm-mgmt-ip-address> -netmask
   -length <length> -home-node <name-of-node1> -status-admin up
   -failover-policy system-defined -firewall-policy mgmt -home-port e0a
   -auto-revert false -failover-group Default

   This management LIF provides a connection to management tools like SnapCenter.

4. Assign one or more aggregates to the storage VM.

   vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2

   This step is required because the new storage VM needs access to at least one aggregate before you
You can create volumes on the storage VM.

5. If you’re running Cloud Volumes ONTAP 9.11.1 or later, modify the network service policies for the storage VM.
   a. Enter the following command to access advanced mode.

   ::> set adv -con off

   Modifying the services is required because it ensures that Cloud Volumes ONTAP can use the iSCSI LIF for outbound management connections.

   ```
   network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service data-fpolicy-client
   network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-ad-client
   network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-dns-client
   network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-ldap-client
   network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-nis-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service data-fpolicy-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-ad-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-dns-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-ldap-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-nis-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service data-fpolicy-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-ad-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-dns-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-ldap-client
   network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-nis-client
   ```

   **NFS**

   Follow these steps to create a new storage VM, along with the required LIFs.
Steps

1. Create the storage VM and a route to the storage VM.

```
vserver create -vserver <svm-name> -subtype default -rootvolume <root-volume-name> -rootvolume-security-style unix
network route create -destination 0.0.0.0/0 -vserver <svm-name> -gateway <ip-of-gateway-server>
```

2. Create data LIFs:
   a. Use the following command to create a NAS LIF on node 1.

```
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nfs-cifs-ip-address> -netmask-length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy data -home -port e0a -auto-revert true -failover-group Default -probe-port <port-number-for-azure-health-probe1>
```

   b. Use the following command to create a NAS LIF on node 2.

```
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nfs-cifs-ip-address> -netmask-length <length> -home-node <name-of-node2> -status-admin up -failover-policy system-defined -firewall-policy data -home -port e0a -auto-revert true -failover-group Default -probe-port <port-number-for-azure-health-probe2>
```

3. Create iSCSI LIFs to provide DNS communication:
   a. Use the following command to create an iSCSI LIF on node 1.

```
network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif <lif-name> -home-node <name-of-node1> -data-protocol iscsi
```

   b. Use the following command to create an iSCSI LIF on node 2.

```
network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif <lif-name> -home-node <name-of-node2> -data-protocol iscsi
```
4. Optional: Create a storage VM management LIF on node 1.

```
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default -probe-port <port-number-for-azure-health-probe3>
```

This management LIF provides a connection to management tools like SnapCenter.

5. Optional: Create a storage VM management LIF on node 1.

```
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default -probe-port <port-number-for-azure-health-probe3>
```

This management LIF provides a connection to management tools like SnapCenter.

6. Assign one or more aggregates to the storage VM.

```
vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2
```

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

7. If you’re running Cloud Volumes ONTAP 9.11.1 or later, modify the network service policies for the storage VM.

   a. Enter the following command to access advanced mode.

```
::> set adv -con off
```

Modifying the services is required because it ensures that Cloud Volumes ONTAP can use the iSCSI LIF for outbound management connections.
SMB

Follow these steps to create a new storage VM, along with the required LIFs.

Steps

1. Create the storage VM and a route to the storage VM.

```
vserver create -vserver <svm-name> -subtype default -rootvolume <root-volume-name> -rootvolume-security-style unix

network route create -destination 0.0.0.0/0 -vserver <svm-name> -gateway <ip-of-gateway-server>
```
2. Create NAS data LIFs:
   a. Use the following command to create a NAS LIF on node 1.

   ```
   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nfs-cifs-ip-address> -netmask-length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy data -home-port e0a -auto-revert true -failover-group Default -probe-port <port-number-for-azure-health-probe1>
   ```

   b. Use the following command to create a NAS LIF on node 2.

   ```
   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nfs-cifs-ip-address> -netmask-length <length> -home-node <name-of-node2> -status-admin up -failover-policy system-defined -firewall-policy data -home-port e0a -auto-revert true -failover-group Default -probe-port <port-number-for-azure-health-probe2>
   ```

3. Create iSCSI LIFs to provide DNS communication:
   a. Use the following command to create an iSCSI LIF on node 1.

   ```
   network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif <lif-name> -home-node <name-of-node1> -data-protocol iscsi
   ```

   b. Use the following command to create an iSCSI LIF on node 2.

   ```
   network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -netmask-length <# of mask bits> -lif <lif-name> -home-node <name-of-node2> -data-protocol iscsi
   ```

4. Optional: Create a storage VM management LIF on node 1.

   ```
   network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask-length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default -probe-port <port-number-for-azure-health-probe3>
   ```
This management LIF provides a connection to management tools like SnapCenter.

5. Assign one or more aggregates to the storage VM.

```bash
vserver add-aggregates -vserver svm_2 -aggregates aggr1,aggr2
```

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

6. If you’re running Cloud Volumes ONTAP 9.11.1 or later, modify the network service policies for the storage VM.

   a. Enter the following command to access advanced mode.

   ```bash
   ::> set adv -con off
   ```

   Modifying the services is required because it ensures that Cloud Volumes ONTAP can use the iSCSI LIF for outbound management connections.
network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service data-fpolicy-client
network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-ad-client
network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-dns-client
network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-ldap-client
network interface service-policy remove-service -vserver <svm-name> -policy default-data-files -service management-nis-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service data-fpolicy-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-ad-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-dns-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-ldap-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-blocks -service management-nis-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service data-fpolicy-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-ad-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-dns-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-ldap-client
network interface service-policy add-service -vserver <svm-name> -policy default-data-iscsi -service management-nis-client

What's next?

After you create a storage VM on an HA pair, it’s best to wait 12 hours before you provision storage on that SVM. Starting with the Cloud Volumes ONTAP 9.10.1 release, BlueXP scans the settings for an HA pair’s load balancer at a 12-hour interval. If there are new SVMs, BlueXP will enable a setting that provides shorter unplanned failover.

Create data-serving storage VMs for Cloud Volumes ONTAP in Google Cloud

A storage VM is a virtual machine running within ONTAP that provides storage and data services to your clients. You might know this as an SVM or a vserver. Cloud Volumes ONTAP is configured with one storage VM by default, but some configurations support additional storage VMs.
**Supported number of storage VMs**

Multiple storage VMs are supported with specific Cloud Volumes ONTAP configurations in Google Cloud starting with the 9.11.1 release. Go to the Cloud Volumes ONTAP Release Notes to verify the supported number of storage VMs for your version of Cloud Volumes ONTAP.

All other Cloud Volumes ONTAP configurations support one data-serving storage VM and one destination storage VM used for disaster recovery. You can activate the destination storage VM for data access if there's an outage on the source storage VM.

**Create a storage VM**

If supported by your license, you can create multiple storage VMs on a single node system or on an HA pair. Note that you must use the BlueXP API to create a storage VM on an HA pair, while you can use the CLI or System Manager to create a storage VM on a single node system.

**Single node system**

These steps create a new storage VM on a single node system using the CLI. One private IP address is required to create a data LIF and another optional private IP address is needed if you want to create a management LIF.

**Steps**

1. In Google Cloud, go to the Cloud Volumes ONTAP instance and add an IP address to nic0 for each LIF.
You need one IP address for a data LIF and another optional IP address if you want to create a management LIF on the storage VM.

**Google Cloud documentation: Adding alias IP ranges to an existing instance**

2. Create the storage VM and a route to the storage VM.

```bash
vserver create -vserver <svm-name> -subtype default -rootvolume <root-volume-name> -rootvolume-security-style unix

network route create -destination 0.0.0.0/0 -vserver <svm-name> -gateway <ip-of-gateway-server>
```
3. Create a data LIF by specifying the IP address that you added in Google Cloud.

**iSCSI**

```bash
network interface create -vserver <svm-name> -home-port e0a -address <iscsi-ip-address> -lif <lif-name> -home-node <name-of-node1> -data -protocol iscsi
```

**NFS or SMB**

```bash
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol cifs,nfs -address <nfs-ip-address> -netmask -length <length> -home-node <name-of-node1> -status-admin up -failover-policy disabled -firewall-policy data -home-port e0a -auto -revert true -failover-group Default
```

4. Optional: Create a storage VM management LIF by specifying the IP address that you added in Google Cloud.

```bash
network interface create -vserver <svm-name> -lif <lif-name> -role data -data-protocol none -address <svm-mgmt-ip-address> -netmask-length <length> -home-node <name-of-node1> -status-admin up -failover-policy system-defined -firewall-policy mgmt -home-port e0a -auto-revert false -failover-group Default
```

5. Assign one or more aggregates to the storage VM.

```bash
vserver add-aggregates -vserver <svm-name> -aggregates <aggr1,aggr2>
```

This step is required because the new storage VM needs access to at least one aggregate before you can create volumes on the storage VM.

**HA pair**

You must use the BlueXP API to create a storage VM on a Cloud Volumes ONTAP system in Google Cloud. Using the API (and not System Manager or the CLI) is required because BlueXP configures the storage VM with the required LIF services, as well as an iSCSI LIF that’s required for outbound SMB/CIFS communication.

Note that BlueXP allocates the required IP addresses in Google Cloud and creates the storage VM with a data LIF for SMB/NFS access and an iSCSI LIF for outbound SMB communication.

**Required Google Cloud permissions**

The Connector requires specific permissions to create and manage storage VMs for Cloud Volumes ONTAP HA pairs. The required permissions are included in the policies provided by NetApp.
Steps
1. Use the following API call to create a storage VM:

   POST /occm/api/gcp/ha/working-environments/{WE_ID}/svm/

   The request body should include the following:

   ```
   { "svmName": "myNewSvm1" }
   ```

Manage storage VMs on HA pairs

The BlueXP API also supports renaming and deleting storage VMs on HA pairs.

Rename a storage VM

If needed, you can change the name of a storage VM at any time.

Steps
1. Use the following API call to rename a storage VM:

   PUT /occm/api/gcp/ha/working-environments/{WE_ID}/svm

   The request body should include the following:

   ```
   {
   "svmNewName": "newSvmName",
   "svmName": "oldSvmName"
   }
   ```

Delete a storage VM

If you no longer need a storage VM, you can delete it from Cloud Volumes ONTAP.

Steps
1. Use the following API call to delete a storage VM:

   DELETE /occm/api/gcp/ha/working-environments/{WE_ID}/svm/{SVM_NAME}

Set up SVM disaster recovery

BlueXP doesn’t provide any setup or orchestration support for storage VM (SVM) disaster recovery. You must use System Manager or the CLI.

If you set up SnapMirror SVM replication between two Cloud Volumes ONTAP systems, the replication must be between two HA pair systems or two single node systems. You can’t set up SnapMirror SVM replication between an HA pair and a single node system.
Refer to the following documents for CLI instructions.

- SVM Disaster Recovery Preparation Express Guide
- SVM Disaster Recovery Express Guide