Exercise 2: Managing Virtual Network Resources

In this exercise, you manage virtual network resources, including IPspaces, broadcast domains, and subnets. You create data LIFs and examine LIF failover groups.

Objectives

This exercise focuses on enabling you to do the following:

- Create an IPspace, broadcast domain, and subnet
- Create a subnet for the default IPspace
- Explore LIF failover groups
- Create data LIFs

Case Study

In the process of integrating the data centers of Dwurgle Enterprises with Zarrot Industries, it was found that both companies had chosen to use the same IP address ranges for their networks. Instead of reconfiguring the IP addresses on all the equipment from the Dwrugle data center, it was decided that the NetApp ONTAP IPspaces feature would be used.

When new data LIFs are created, the IT staff would prefer that the IP address are assigned automatically from a preconfigured pool. You create a pool of available IP addresses by creating a subnet.

Backups are copied to a remote Zarrot Industries site over 10Gbps Ethernet links. Mr. Zarrot does not want the backup traffic to interfere with the client traffic on the 25Gbps links. In a link failure, Mr. Zarrot wants the intercluster LIFs to fail over to only other 10Gbps links, so you define a LIF failover group.

With the acquisition of Dwurgle Enterprises, additional personnel and their systems need access to the NAS shares. To distribute the additional load across the cluster nodes and network ports, you create some additional logical network interfaces.

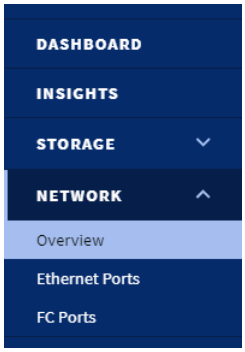
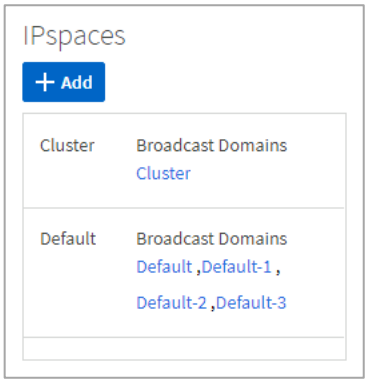
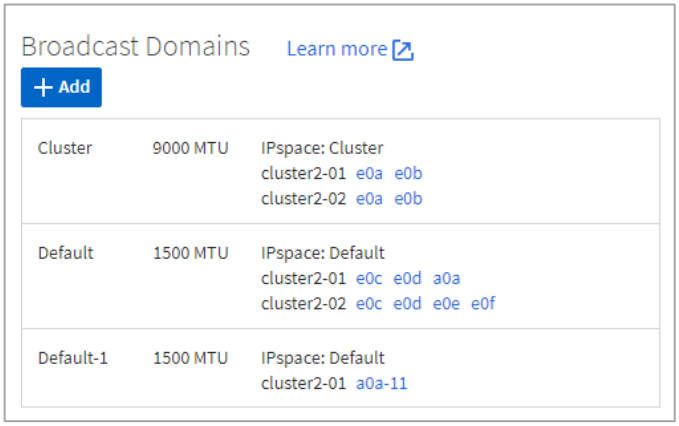
Lab Equipment

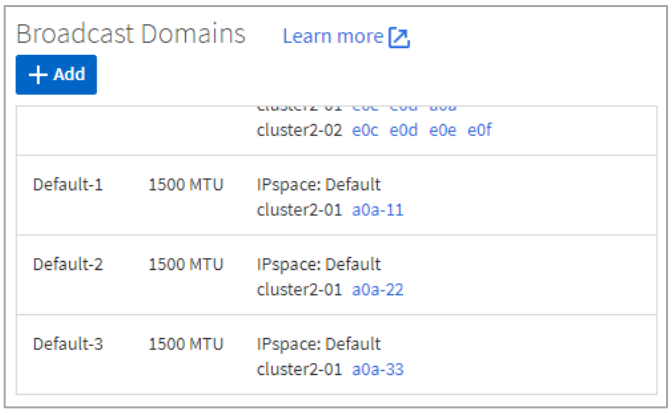
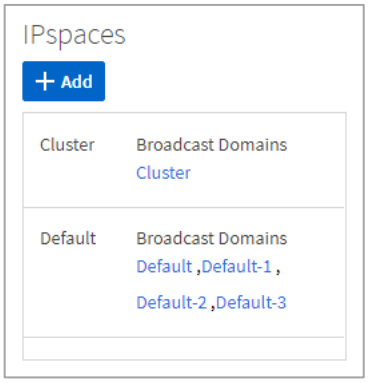
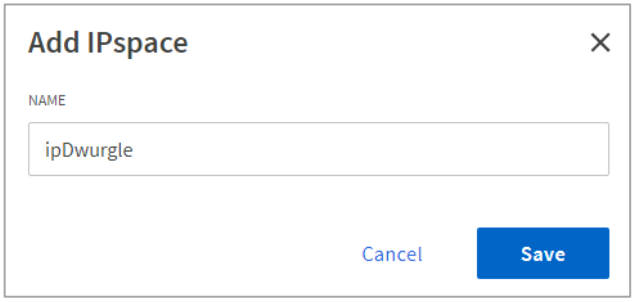
Use the following equipment to complete the exercise:

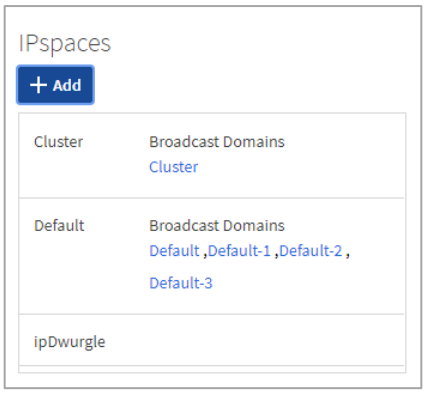
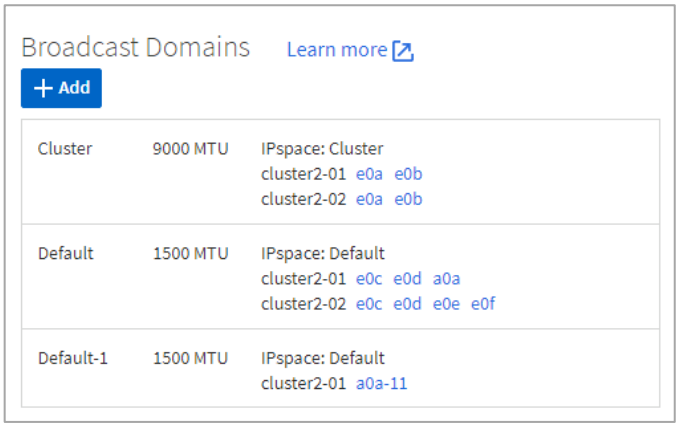
System	Host Name	IP Addresses	User Name	Password
Windows Server	jumphost	192.168.0.5	DEMO\Administrator	Netapp1!
ONTAP cluster-management LIF (cluster1)	cluster1	192.168.0.101	admin (case-sensitive)	Netapp1!
ONTAP cluster-management LIF (cluster2)	cluster2	192.168.0.102	admin (case-sensitive)	Netapp1!

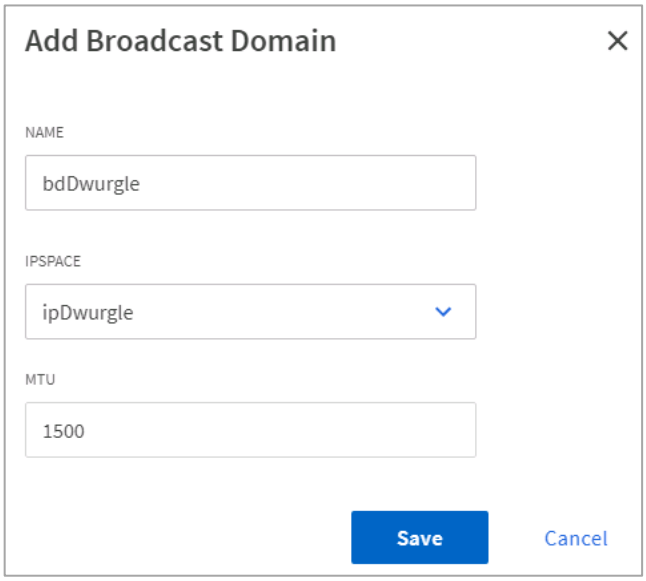
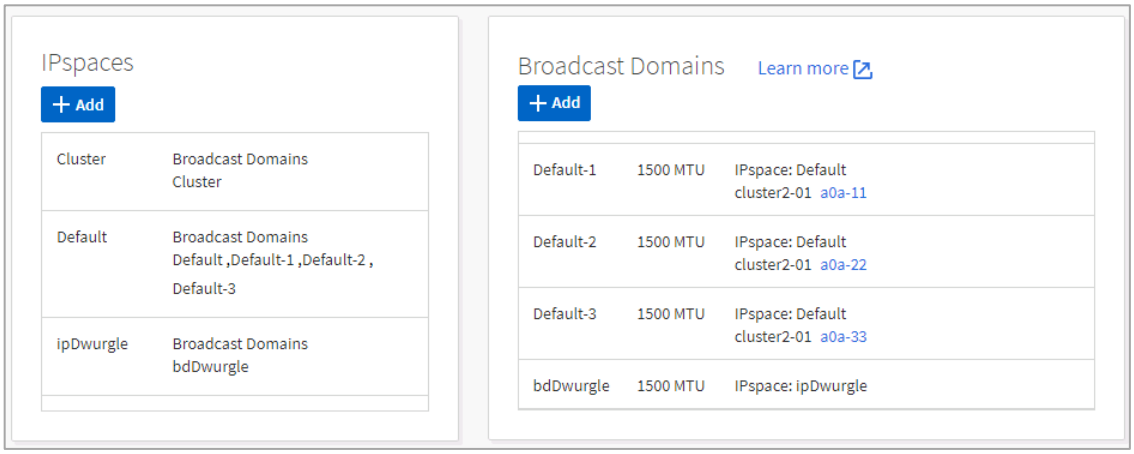
Task 1: Create an IPspace, Broadcast Domain, and Subnet

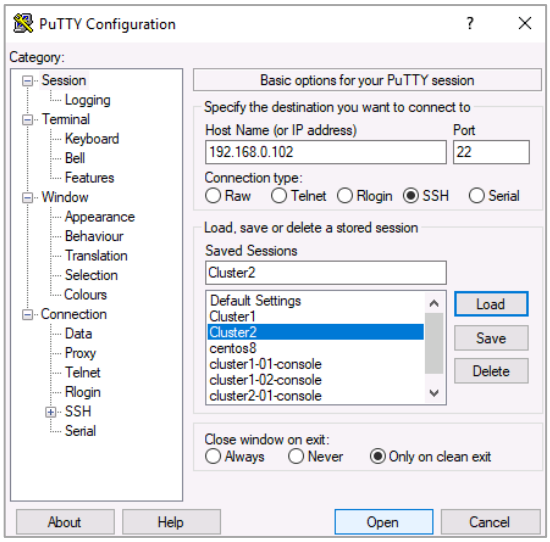
Step	Action
1-1	From the Windows Server desktop, access ONTAP System Manager on **cluster2**.
1-2	 Ensure that you are connected to the correct cluster for each exercise.

Step	Action
1-3	On the navigation menu, click **Network**, and then click **Overview**. 
1-4	In the IPspaces pane of the Network Overview page, observe the standard IPspaces and note the broadcast domains for each. 
1-5	Observe the contents of the Broadcast Domains pane and answer the following questions: Which ports are members of the Default broadcast domain? 

Step	Action
1-6	Scroll down in the Broadcast Domains pane and note the ports that belong to each broadcast domain. 
1-7	In the IPspaces pane of the Network Overview page, click the **Add** (“**+**”) button. 
1-8	Name the IPspace ipDwurgle and click **Save**. 

Step	Action
1-9	Verify that the new IPspace was created and that no broadcast domain has been assigned to it yet. 
1-10	Click **Dwurgle** in the Broadcast Domains pane. 

Step	Action
1-11	Create a broadcast domain for the ipDwurgle IPspace with the following settings: • Name: **bdDwurgle** • IPspace: **ipDwurgle** • MTU: **1500** 
1-12	Verify the bdDwurgle broadcast domain is assigned to the ipDwurgle IPspace. 
1-13	You can use ONTAP System Manager to move network ports to a different broadcast domain within the same IPspace. You must use the ONTAP CLI to more ports to a broadcast domain in a different IPspace.

Step	Action
1-14	From the Windows Server desktop, open a PuTTY session with the cluster management port of **cluster2**. 
1-15	Log into cluster2 using the following credentials: • User name: **admin** • Password: **Netapp1!**

1-16	Display the configuration of the IPspaces:
	`network ipspace show`
	Sample output:
	`cluster2::> ipspace show`
	
	`IPspace Vserver List Broadcast Domains`
	`---------- ---------- ----------`
	`-`
	`Cluster`
	`Cluster Cluster Cluster`
	`Default`
	`cluster2 Default, Default-1,`
	`Default-2, Default-3`
	`ipDwurgle`
	`ipDwurgle bdDwurgle`
	`3 entries were displayed.`

Step	Action

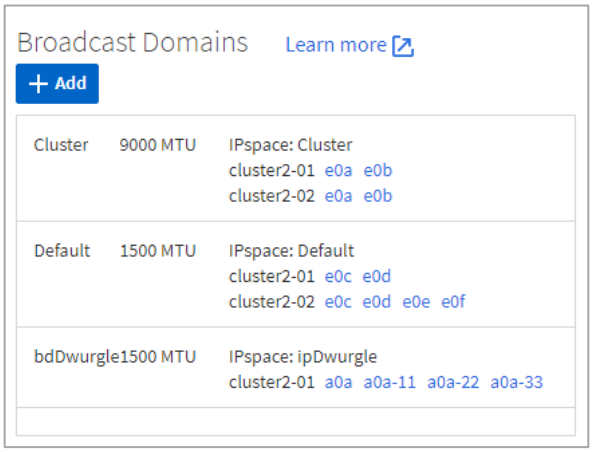
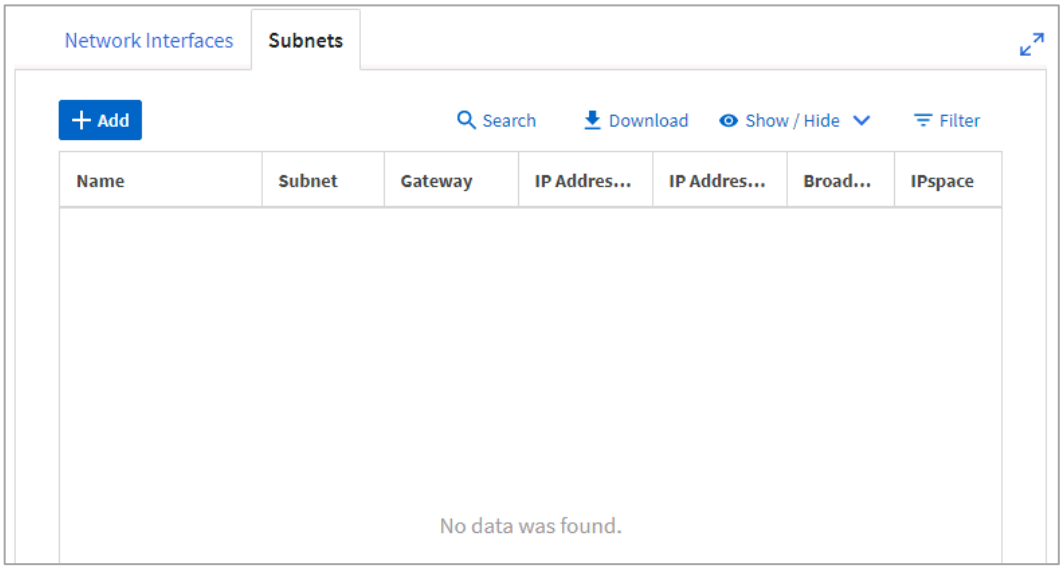
1-17	Display the configuration of the broadcast domains:
	network port broadcast-domain show
	Sample output:
	`cluster2::> broadcast-domain show`
	`  (network port broadcast-domain show)`
	`IPspace Broadcast                                                 Update`
	`Name    Domain Name    MTU  Port List                     Status Details`
	`------- ----------- ------  ------------------------------ --------------`
	`Cluster Cluster       9000`
	`                           cluster2-01:e0a                complete`
	`                           cluster2-01:e0b                complete`
	`                           cluster2-02:e0a                complete`
	`                           cluster2-02:e0b                complete`
	`Default Default       1500`
	`                           cluster2-01:a0a                complete`
	`                           cluster2-01:e0c                complete`
	`                           cluster2-01:e0d                complete`
	`                           cluster2-02:e0c                complete`
	`                           cluster2-02:e0d                complete`
	`                           cluster2-02:e0e                complete`
	`                           cluster2-02:e0f                complete`
	`        Default-1     1500`
	`                           cluster2-01:a0a-11             complete`
	`        Default-2     1500`
	`                           cluster2-01:a0a-22             complete`
	`        Default-3     1500`
	`                           cluster2-01:a0a-33             complete`
	`ipDwurgle bdDwurgle   1500`
	`                           -                              -`
	`6 entries were displayed.`

1-18	Delete the broadcast domains that System Manager created for the VLAN ports: **network port broadcast-domain delete Default-1** **network port broadcast-domain delete Default-2** **network port broadcast-domain delete Default-3**
1-19	Remove the interface group from the Default broadcast domain. **network port broadcast-domain remove-ports -ipspace Default -broadcast-domain Default -ports cluster2-01:a0a**
1-20	Assign the interface group name and all the VLAN ports to the **bdDwurgle** broadcast domain: **network port broadcast-domain add-ports -ipspace ipDwurgle -broadcast-domain bdDwurgle -ports cluster2-01:a0a, cluster2-01:a0a-11,cluster2-01:a0a-22,cluster2-01:a0a-33**

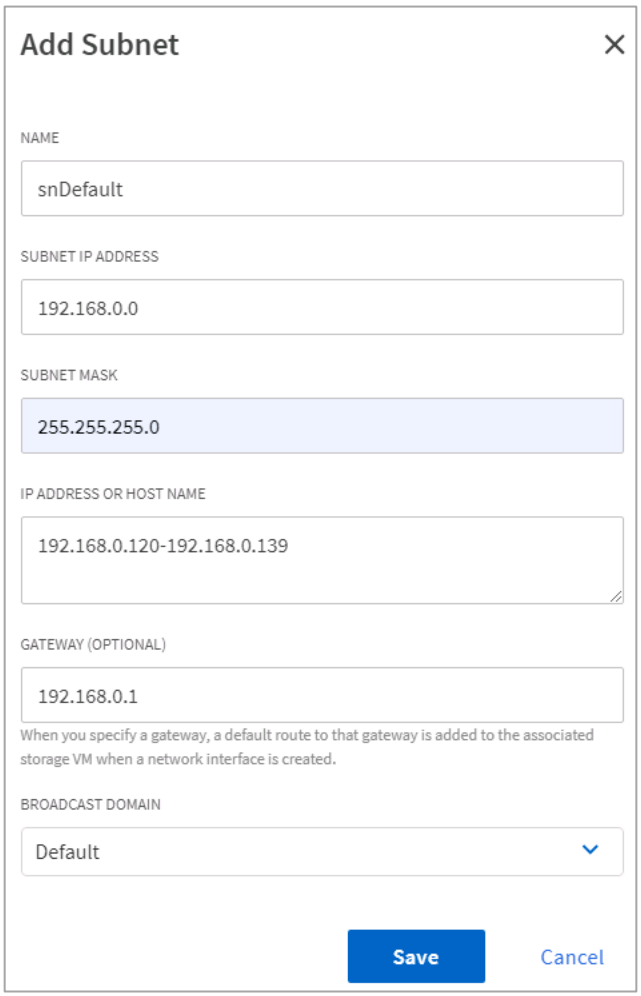
Step	Action
1-21	Display the configuration of the broadcast domains: **`network port broadcast-domain show`** Sample output:

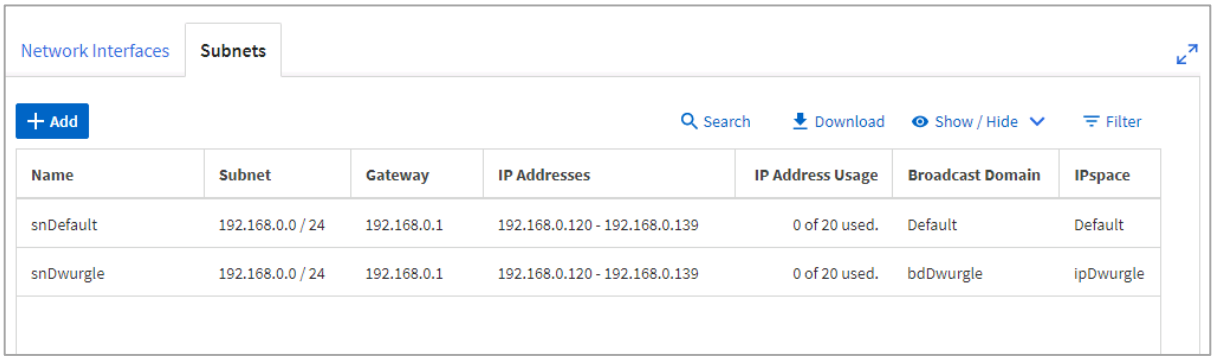
```
cluster2::> network port broadcast-domain show
IPspace Broadcast                                            Update
Name    Domain Name    MTU  Port List                       Status Details
------- ----------- ------  ------------------------------ --------------
Cluster Cluster       9000
                              cluster2-01:e0a                complete
                              cluster2-01:e0b                complete
                              cluster2-02:e0a                complete
                              cluster2-02:e0b                complete
Default Default       1500
                              cluster2-01:e0c                complete
                              cluster2-01:e0d                complete
                              cluster2-02:e0c                complete
                              cluster2-02:e0d                complete
                              cluster2-02:e0e                complete
                              cluster2-02:e0f                complete
ipDwurgle bdDwurgle   1500
                              cluster2-01:a0a                complete
                              cluster2-01:a0a-11             complete
                              cluster2-01:a0a-22             complete
                              cluster2-01:a0a-33             complete
3 entries were displayed.
```

Task 2: Create Subnets for Automatic IP Address Assignment

Step	Action
2-1	From ONTAP System Manager for cluster cluster2, in the navigation pane, click **Network**, and then click **Overview**.
2-2	Observe the configuration of the bdDwurgle broadcast domain. 
2-3	In the Network Interfaces pane, click the **Subnets** tab. 
2-4	Click **Add** to create a new subnet.

Step	Action
2-5	Create a new subnet for the bdDwurgle broadcast domain with the following settings: • Name: **snDwurgle** • Subnet IP: **192.168.0.0** • Subnet mask: **255.255.255.0** • IP Address: **192.168.0.120-192.168.0.139** • Gateway: **192.168.0.1** <default> • Broadcast Domain: **bdDwurgle** 
2-6	Click **Save**.
2-7	Click **Add** to create a second new subnet.

Step	Action
2-8	Create a new subnet for the Default broadcast domain with the following settings: • Name: **snDefault** • Subnet IP: **192.168.0.0** • Subnet mask: **255.255.255.0** • IP Address: **192.168.0.120-192.168.0.139** • Gateway: **192.168.0.1** <default> • Broadcast Domain: **Default** 
2-9	Click **Save**.

Step	Action
2-10	Examine the subnets that you created and answer the following questions: • What do you notice about the IP address ranges? _____ • Do the ranges overlap? _____ • Why is range overlap enabled or not enabled? _____ 

Name	Subnet	Gateway	IP Addresses	IP Address Usage	Broadcast Domain	IPspace
snDefault	192.168.0.0 / 24	192.168.0.1	192.168.0.120 - 192.168.0.139	0 of 20 used.	Default	Default
snDwurgle	192.168.0.0 / 24	192.168.0.1	192.168.0.120 - 192.168.0.139	0 of 20 used.	bdDwurgle	ipDwurgle

Task 3: Explore Failover Groups

Step	Action
3-1	Start a PuTTY session with cluster **cluster1**.
3-2	 Be sure to log in to the correct cluster.

3-3	Display information about broadcast domains:
	`network port broadcast-domain show`
	Sample output:
	`cluster1::> network port broadcast-domain show`
	`IPspace Broadcast Update`
	`Name Domain Name MTU Port List Status Details`
	`------- ----------- ------ ---------- ----------`
	`Cluster Cluster 9000`
	`cluster1-01:e0a complete`
	`cluster1-01:e0b complete`
	`cluster1-02:e0a complete`
	`cluster1-02:e0b complete`
	`Default Default 1500`
	`cluster1-01:e0c complete`
	`cluster1-01:e0d complete`
	`cluster1-01:e0e complete`
	`cluster1-01:e0f complete`
	`cluster1-01:e0g complete`
	`cluster1-01:e0h complete`
	`cluster1-02:e0c complete`
	`cluster1-02:e0d complete`
	`cluster1-02:e0e complete`
	`cluster1-02:e0f complete`
	`cluster1-02:e0g complete`
	`cluster1-02:e0h complete`
	`2 entries were displayed.`

3-4	Examine the broadcast domains and the ports that are included in each domain.
3-5	Notice that the groups and ports align with the broadcast domains that are defined during cluster setup.
3-6	Optional: Open a PuTTY session to cluster2 to compare the changes you made in the previous tasks.
3-7	Display the failover policies of the LIFs in the cluster: **`network interface show -failover`**
3-8	Answer the following questions: • Which policy is assigned to node management LIFs? _____ • Why? _____

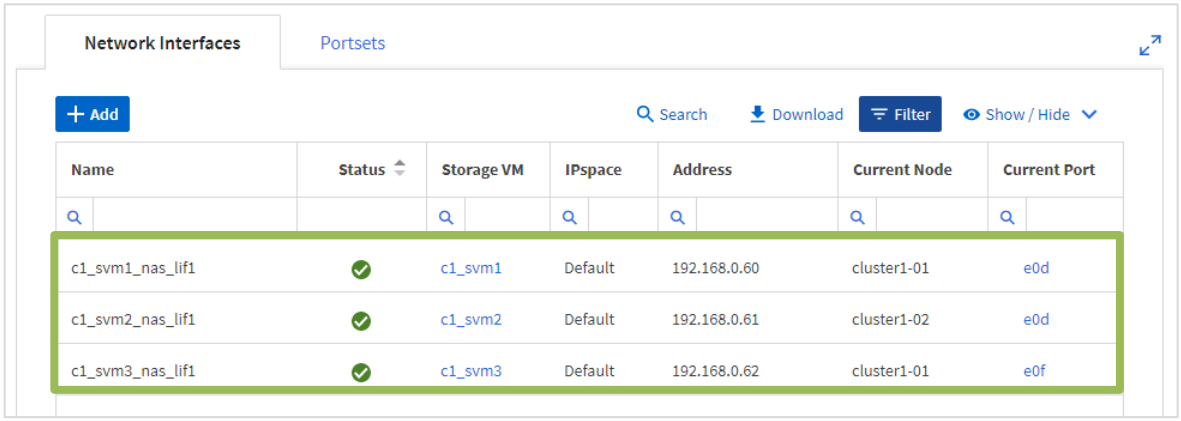
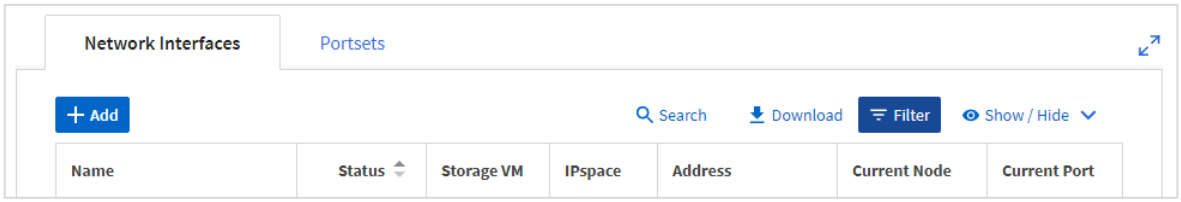
Step	Action
3-9	The default failover policy assigned to a data LIF at creation time can be changed.

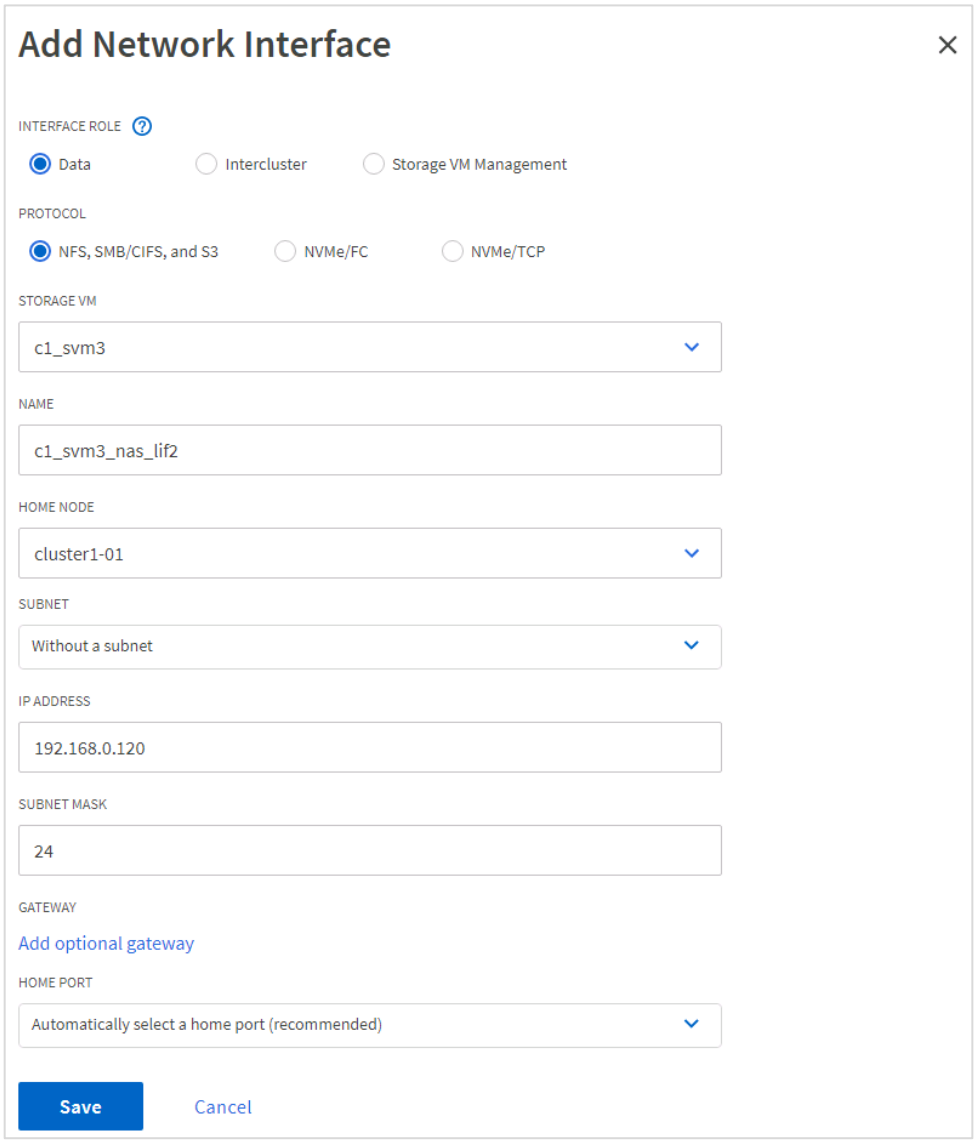
3-10	Examine the list of available failover policies:
	`network interface show -failover-policy ?`
	Sample output:
	`cluster1::> network interface show -failover-policy ?`
	`  disabled  Failover disabled`
	`  system-defined  Next failover target selected from targets defined by the failover group limited to the home-node and next-to-next node`
	`  local-only  Next failover target selected from targets defined by the failover group limited to the local node only`
	`  sfo-partner-only  Next failover target selected from targets defined by the failover group limited to the home-node and the SFO partner only`
	`  broadcast-domain-wide  Next failover target selected from targets defined by the failover group containing all of the ports in a broadcast domain`

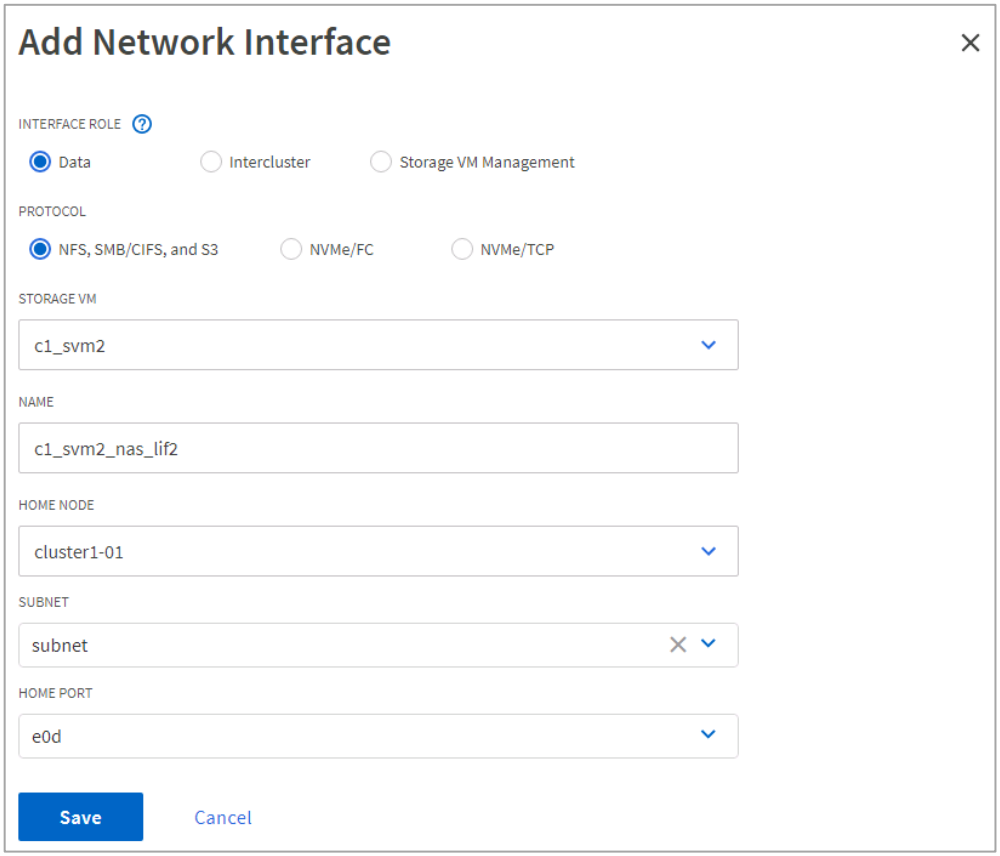
3-11	Examine the list of failover groups:
	`network interface failover-groups show`
	Sample output:
	`cluster1::> network interface failover-groups show`
	`  Failover`
	`Vserver  Group  Targets`
	`---------- ---------- ----------`
	`-`
	`Cluster`
	`  Cluster`
	`  cluster1-01:e0a, cluster1-01:e0b,`
	`  cluster1-02:e0a, cluster1-02:e0b`
	`cluster1`
	`  Default`
	`  cluster1-01:e0c, cluster1-01:e0d,`
	`  cluster1-01:e0e, cluster1-01:e0f,`
	`  cluster1-01:e0g, cluster1-01:e0h,`
	`  cluster1-02:e0c, cluster1-02:e0d,`
	`  cluster1-02:e0e, cluster1-02:e0f,`
	`  cluster1-02:e0g, cluster1-02:e0h`
	`2 entries were displayed.`

3-12	In the next task, you create NAS data LIFs with data storage VMs (storage virtual machines, also known as SVMs). Which failover policy do you expect to be assigned to a NAS data LIF?

Task 4: Create Data LIFs

Step	Action
4-1	From ONTAP System Manager for cluster **cluster1**, in the navigation pane, click **Network**, and then click **Overview**.
4-2	Be sure to log in to the correct cluster.
4-3	Notice that the cluster contains three data LIFs, one for each storage VM. 
4-4	Click **+Add**. 

Step	Action
4-5	Create a data LIF for NFS, SMB/CIF, and S3 on **c1_svm3** by using the following parameters: • Interface Role: **Data** (default) • Protocol: **NFS,SMB/CIFS, and S3** • Storage VM: **c1_svm3** • Name: **c1_svm3_nas_lif2** • Home Node: **cluster1-01** • Subnet: **Without a subnet** (default) • IP Address: **192.168.0.120** • Subnet Mask: **24** (default) • Home Port: **Automatically select a home port (recommended)** (default) 
4-6	Click **Save**.

Step	Action
4-7	Answer the following question: To which network port was the LIF assigned?
4-8	Click **+Add**.
4-9	Create a data LIF for NFS, SMB/CIF, and S3 on **c1_svm2** by using the following parameters: • Interface Role: **Data** (default) • Protocol: **NFS,SMB/CIFS, and S3** • Storage VM: **c1_svm2** • Name: **c1_svm2_nas_lif2** • Home Node: **cluster1-01** • Subnet: **subnet** (default) • Home Port: **e0d** 
4-10	Click **Save**.
4-11	Compare the Add Network interface page in the the previous step with the System Manager dialog box in Step 4-5.
4-12	Use PuTTY to log in to **cluster1**.

Step	Action

4-13	Display the data LIFs for c1_svm2:
	network interface show -vserver c1_svm2
	Sample output:
	`cluster1::> network interface show -vserver c1_svm2`
	`            Logical    Status     Network            Current       Current Is`
	`Vserver     Interface  Admin/Oper Address/Mask       Node          Port`
	`Home`
	`----------- ---------- ---------- ------------------ ------------- ------- --`
	`--`
	`c1_svm2`
	`            c1_svm2_nas_lif1 up/up 192.168.0.61/24   cluster1-02   e0d`
	`true`
	`            c1_svm2_nas_lif2 up/up 192.168.0.63/24   cluster1-01   e0d`
	`true`
	`2 entries were displayed.`

4-14	Which IP address was assigned to the c1_svm2_nas_lif2 LIF? Why?

4-15	Display the data service policy assigned to LIFs for c1_svm2:
	network interface show -vserver c1_svm2 -fields service-policy
	Sample output:
	`cluster1::> network interface show -vserver c1_svm2 -fields service-policy`
	`vserver lif              service-policy`
	`------- ---------------- ---------------`
	`c1_svm2 c1_svm2_nas_lif1 svm2-data-files`
	`c1_svm2 c1_svm2_nas_lif2 sm-custom-service-policy-nas-s3`
	`2 entries were displayed.`

4-16	Display the data service policies for c1_svm2: **network interface service-policy show -vserver c1_svm2**
4-17	Use the `network interface create` command to create a data LIF for svm1 with only the CIFS protocol permitted. **network interface create -vserver c1_svm1 -lif c1_svm1_nas_lif2 -data-protocol cifs -home-node cluster1-02 -home-port e0d -subnet-name subnet**

Step	Action

4-18	Display the data LIFs for c1_svm1:
	network interface show -vserver c1_svm1
	Sample output:
	`cluster1::> network interface show -vserver c1_svm1`
	`Logical Status Network Current Current Is`
	`Vserver Interface Admin/Oper Address/Mask Node Port Home`
	`c1_svm1`
	`c1_svm1_nas_lif1 up/up 192.168.0.60/24 cluster1-01 e0d true`
	`c1_svm1_nas_lif2 up/up 192.168.0.64/24 cluster1-02 e0d true`
	`2 entries were displayed.`

Task 5: Restrict Data LIFs

Step	Action
5-1	Display a list of the network services: **network interface service show**
5-2	Display a list of the storage VM and failover restrictions for each service type: **set advanced** **network interface service show -restrictions**
5-3	Show the service policy that is assigned to each LIF owned by c1_svm3: **network interface show -fields service-policy -vserver c1_svm3**
5-4	Show which network services are provided on each LIF owned by c1_svm3: **network interface show -fields service-policy,services -vserver c1_svm3**
5-5	Display a list of the service-policies that are known to c1_svm3 and the services that are included: **network interface service-policy show -vserver c1_svm3**
5-6	Clone the default-data-files service policy belonging to c1_svm3: **network interface service-policy clone -vserver c1_svm3 -policy default-data-files -target-vserver c1_svm3 -target-policy svm3-data-files**
5-7	Modify the service policy to allow management of c1_svm3 from only the company network: **network interface service-policy add-service -vserver c1_svm3 -policy svm3-data-files -service management-ssh -allowed-addresses 192.168.0.0/24** **network interface service-policy add-service -vserver c1_svm3 -policy svm3-data-files -service management-https -allowed-addresses 192.168.0.0/24**

Step	Action

5-8	Display the configuration of the new service policy:
	set admin
	
	network interface service-policy show -vserver c1_svm3 -policy svm3-data-files
	
	Sample output:
	`cluster1::> net int service-policy show -vserver c1_svm3 -policy svm3-data-files`
	`  (network interface service-policy show)`
	
	`                  Vserver: c1_svm3`
	`             Policy Name: svm3-data-files`
	`      Included Services: data-core, data-nfs, data-cifs, data-flexcache,`
	`                         management-ssh, management-https,`
	`                         data-fpolicy-client, management-dns-client,`
	`                         management-ad-client, management-ldap-client,`
	`                         management-nis-client, data-dns-server`
	`Service: Allowed Addresses: data-core: 0.0.0.0/0`
	`                         data-nfs: 0.0.0.0/0`
	`                         data-cifs: 0.0.0.0/0`
	`                         data-flexcache: 0.0.0.0/0`
	`                         management-ssh: 192.168.0.0/24`
	`                         management-https: 192.168.0.0/24`
	`                         data-fpolicy-client: 0.0.0.0/0`
	`                         management-dns-client: 0.0.0.0/0`
	`                         management-ad-client: 0.0.0.0/0`
	`                         management-ldap-client: 0.0.0.0/0`
	`                         management-nis-client: 0.0.0.0/0`
	`                         data-dns-server: 0.0.0.0/0`

5-9	Assign the new service policy to a data LIF:
	network interface modify -vserver c1_svm3 -lif c1_svm3_nas_lif1 -service-policy svm3-data-files
	
	Sample output:
	`cluster1::> net int modify -vserver c1_svm3 -lif c1_svm3_nas_lif1 -service-policy svm3-data-files`
	
	`Warning: Assigning service policy "svm3-data-files" to LIF "c1_svm3_nas_lif1"`
	`         on Vserver "c1_svm3" will impact the data services supported by this`
	`         LIF, which requires the LIF to be temporarily brought offline. Data`
	`         service on this LIF will be briefly interrupted while this change is`
	`         applied, and any existing network connections will be reset.`
	`Do you want to continue? {y|n}: y`

Step	Action

5-10	Show which service policies are assigned to LIFs owned by c1_svm3:
	`net int show -vserver c1_svm3 -fields service-policy`
	
	Sample output:
	`cluster1::> net int show -vserver c1_svm3 -fields service-policy`
	
	`vserver lif service-policy`
	`------- ---------- --------------`
	`c1_svm3 c1_svm3_nas_lif1 svm3-data-files`
	`c1_svm3 c1_svm3_nas_lif2 sm-custom-service-policy-nas-s3`
	`2 entries were displayed.`

End of exercise