



Set up NAS path failover (ONTAP 9.0-9.7 CLI)

ONTAP 9

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Set up NAS path failover (ONTAP 9.0 - 9.7 CLI)

This workflow guides you through the networking configuration steps to set up NAS path failover for ONTAP 9.0 - 9.7. This workflow assumes the following:

- You want to use NAS path failover best practices that simplify network configuration.
- You want to use the CLI, not ONTAP System Manager.
- You are configuring networking on a new system running ONTAP 9.0 to 9.7.

If you are running an ONTAP release later than 9.7, you should use the NAS path failover procedure for ONTAP 9.8 or later:

- [ONTAP 9.8 and later NAS Path Failover Workflow](#)

If you want network management details, you should use the following ONTAP 9 Network Management Reference:

- [ONTAP 9 Network Management Reference](#)

If you want to use ONTAP System Manager to configure the network for ONTAP 9.7 and later, you should choose the following documentation:

- [ONTAP System Manager docs](#)

If you want to use OnCommand System Manager to configure the network for ONTAP 9.7 and earlier, you should choose the following documentation:

- [Cluster management using System Manager](#)

If you require additional configuration or conceptual information, you should choose among the following documentation:

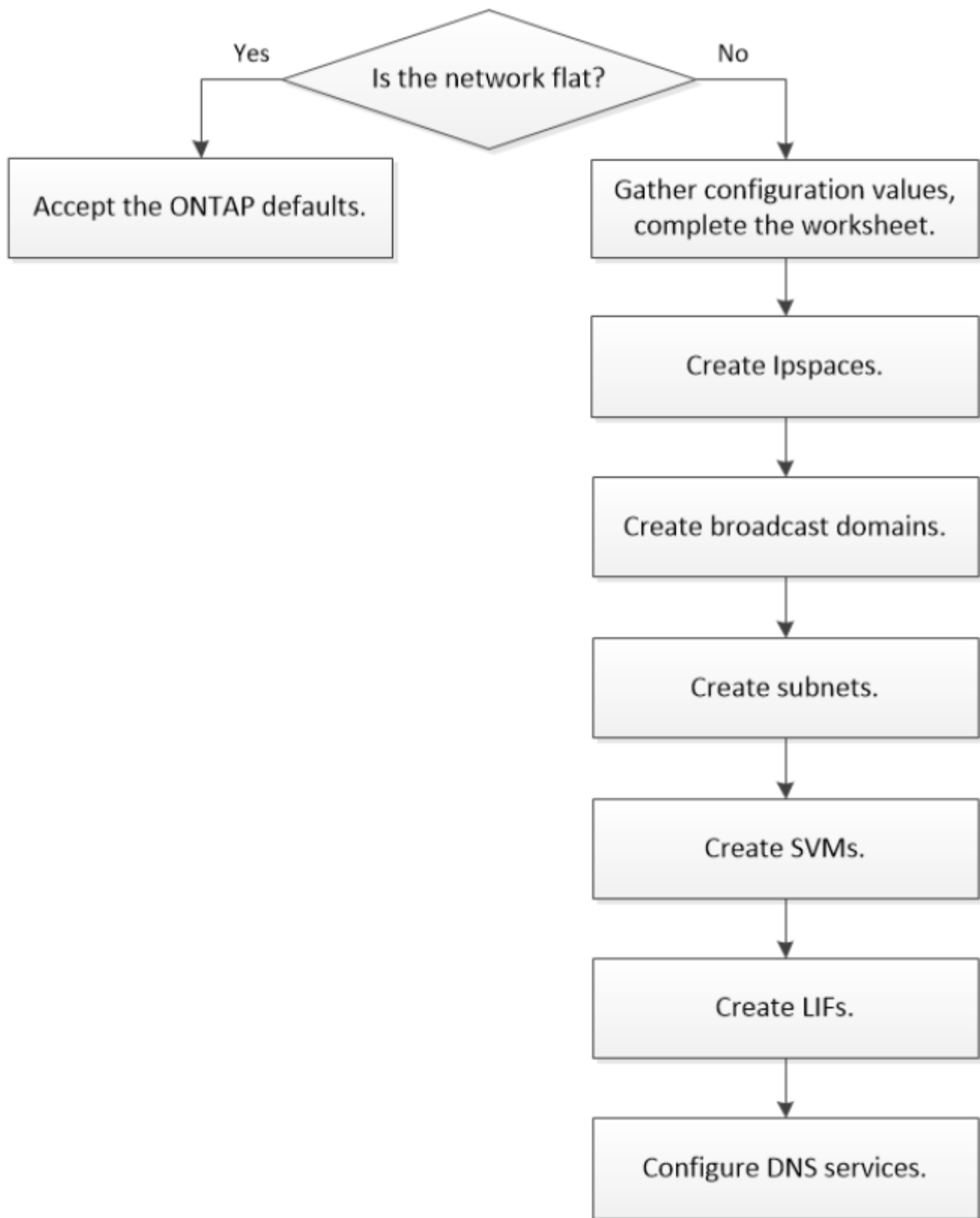
- Conceptual background for network configuration
 - [ONTAP concepts](#)
- NAS file access
 - [NFS management](#)
 - [SMB/CIFS management](#)
- SAN host provisioning
 - [SAN administration](#)
- Command reference
 - [ONTAP 9 commands](#)
- Technical Reports (TRs), which include additional information about ONTAP technology and interaction with external services
 - [NetApp Technical Report 4182: Ethernet Storage Design Considerations and Best Practices for Clustered Data ONTAP Configurations](#)

Workflow NAS path failover

Overview

If you are already familiar with basic networking concepts, you might be able to save time setting up your network by reviewing this "hands on" workflow for NAS path failover configuration.

A NAS LIF automatically migrates to a surviving network port after a link failure on its current port. If your network is flat, you can rely on the ONTAP defaults to manage path failover. Otherwise, you should configure path failover following the steps in this workflow.



A SAN LIF does not migrate (unless you move it manually after the link failure). Instead, multipathing technology on the host diverts traffic to a different LIF. For more information, see [SAN administration](#).

Worksheet for NAS path failover configuration for ONTAP 9.0 - 9.7

You should complete all sections of the worksheet before configuring NAS path failover.

IPspace configuration

You can use an IPspace to create a distinct IP address space for each SVM in a cluster. Doing so enables clients in administratively separate network domains to access cluster data while using overlapping IP addresses from the same IP address subnet range.

Information	Required?	Your values
IPspace name <ul style="list-style-type: none">• The name of the IPspace.• The name must be unique in the cluster.	Yes	

Broadcast domain configuration


A broadcast domain groups ports that belong in the same Layer 2 network and sets the MTU for the broadcast domain ports.

Broadcast domains are assigned to an IPspace. An IPspace can contain one or more broadcast domains.



The port to which a LIF fails over must be a member of the failover group for the LIF. When you create a broadcast domain, ONTAP automatically creates a failover group with the same name. The failover group contains all the ports assigned to the broadcast domain.

Information	Required?	Your values
IPspace name <ul style="list-style-type: none">• The IPspace to which the broadcast domain is assigned.• The IPspace must exist.	Yes	
Broadcast domain name <ul style="list-style-type: none">• The name of the broadcast domain.• This name must be unique in the IPspace.	Yes	

Information	Required?	Your values
<p>MTU</p> <ul style="list-style-type: none"> The MTU of the broadcast domain. You can specify either 1500 or 9000. The MTU value is applied to all ports in the broadcast domain and to any ports that are later added to the broadcast domain. <div>  <p>The MTU value must match all the devices connected to that network except for e0M port handling management traffic.</p> </div>	Yes	
<p>Ports</p> <ul style="list-style-type: none"> The network ports to add to the broadcast domain. The ports assigned to the broadcast domain can be physical ports, VLANs, or interface groups (ifgroups). If a port is in another broadcast domain, it must be removed before it can be added to the broadcast domain. Ports are assigned by specifying both the node name and port: for example, node1:e0d. 	Yes	

Subnet configuration

A subnet contains pools of IP addresses and a default gateway that can be assigned to LIFs used by SVMs residing in the IPspace.

- When creating a LIF on an SVM, you can specify the name of the subnet instead of supplying an IP address and a subnet.
- Since a subnet can be configured with a default gateway, you do not have to create the default gateway in a separate step when creating an SVM.

- A broadcast domain can contain one or more subnets.
You can configure SVM LIFs that are on different subnets by associating more than one subnet with the IPspace's broadcast domain.
- Each subnet must contain IP addresses that do not overlap with IP addresses assigned to other subnets in the same IPspace.
- You can assign specific IP addresses to SVM data LIFs and create a default gateway for the SVM instead of using a subnet.

Information	Required?	Your values
IPspace name <ul style="list-style-type: none"> • The IPspace to which the subnet will be assigned. • The IPspace must exist. 	Yes	
Subnet name <ul style="list-style-type: none"> • The name of the subnet. • The name must be unique in the IPspace. 	Yes	
Broadcast domain name <ul style="list-style-type: none"> • The broadcast domain to which the subnet will be assigned. • The broadcast domain must reside in the specified IPspace. 	Yes	
Subnet name and mask <ul style="list-style-type: none"> • The subnet and mask in which the IP addresses reside. 	Yes	
Gateway <ul style="list-style-type: none"> • You can specify a default gateway for the subnet. • If you do not assign a gateway when you create the subnet, you can assign one to the subnet at any time. 	No	

Information	Required?	Your values
<p>IP address ranges</p> <ul style="list-style-type: none"> You can specify a range of IP addresses or specific IP addresses. For example, you can specify a range such as: 192.168.1.1–192.168.1.100, 192.168.1.112, 192.168.1.145 If you do not specify an IP address range, the entire range of IP addresses in the specified subnet are available to assign to LIFs. 	No	
<p>Force update of LIF associations</p> <ul style="list-style-type: none"> Specifies whether to force the update of existing LIF associations. By default, subnet creation fails if any service processor interfaces or network interfaces are using the IP addresses in the ranges provided. Using this parameter associates any manually addressed interfaces with the subnet and allows the command to succeed. 	No	

SVM configuration

You use SVMs to serve data to clients and hosts.


The values you record are for creating a default data SVM. If you are creating a MetroCluster source SVM, see the [Fabric-attached MetroCluster Installation and Configuration Guide](#) or the [Stretch MetroCluster Installation and Configuration Guide](#).

Information	Required?	Your values
<p>SVM name</p> <ul style="list-style-type: none"> • The name of the SVM. • You should use a fully qualified domain name (FQDN) to ensure unique SVM names across cluster leagues. 	Yes	
<p>Root volume name</p> <ul style="list-style-type: none"> • The name of the SVM root volume. 	Yes	
<p>Aggregate name</p> <ul style="list-style-type: none"> • The name of the aggregate that holds the SVM root volume. • This aggregate must exist. 	Yes	
<p>Security style</p> <ul style="list-style-type: none"> • The security style for the SVM root volume. • Possible values are ntfs, unix, and mixed. 	Yes	
<p>IPspace name</p> <ul style="list-style-type: none"> • The IPspace to which the SVM is assigned. • This IPspace must exist. 	No	
<p>SVM language setting</p> <ul style="list-style-type: none"> • The default language to use for the SVM and its volumes. • If you do not specify a default language, the default SVM language is set to C.UTF-8. • The SVM language setting determines the character set used to display file names and data for all NAS volumes in the SVM. <p>You can modify The language after the SVM is created.</p>	No	

LIF configuration

An SVM serves data to clients and hosts through one or more network logical interfaces (LIFs).

Information	Required?	Your values
<p>SVM name</p> <ul style="list-style-type: none">• The name of the SVM for the LIF.	Yes	
<p>LIF name</p> <ul style="list-style-type: none">• The name of the LIF.• You can assign multiple data LIFs per node, and you can assign LIFs to any node in the cluster, provided that the node has available data ports.• To provide redundancy, you should create at least two data LIFs for each data subnet, and the LIFs assigned to a particular subnet should be assigned home ports on different nodes. <p>Important: If you are configuring a SMB server to host Hyper-V or SQL Server over SMB for nondisruptive operation solutions, the SVM must have at least one data LIF on every node in the cluster.</p>	Yes	
<p>LIF role</p> <ul style="list-style-type: none">• The role of the LIF.• Data LIFs are assigned the data role.	Yes Deprecated from ONTAP 9.6	data
<p>Service policy</p> <p>Service policy for the LIF.</p> <p>The service policy defines which network services can use the LIF. Built-in services and service policies are available for managing data and management traffic on both data and system SVMs.</p>	Yes Starting from ONTAP 9.6	

Information	Required?	Your values
<p>Allowed protocols</p> <ul style="list-style-type: none"> • The protocols that can use the LIF. • By default, CIFS, NFS, and FlexCache are allowed. The FlexCache protocol enables a volume to be used as an origin volume for a FlexCache volume on a system running Data ONTAP operating in 7-Mode. <div>  <p>The protocols that use the LIF cannot be modified after the LIF is created. You should specify all protocols when you configure the LIF.</p> </div>	No	
<p>Home node</p> <ul style="list-style-type: none"> • The node to which the LIF returns when the LIF is reverted to its home port. • You should record a home node for each data LIF. 	Yes	
<p>Home port or broadcast domain</p> <ul style="list-style-type: none"> • The port to which the logical interface returns when the LIF is reverted to its home port. • You should record a home port for each data LIF. 	Yes	

Information	Required?	Your values
Subnet name <ul style="list-style-type: none"> • The subnet to assign to the SVM. • All data LIFs used to create continuously available SMB connections to application servers must be on the same subnet. 	Yes (if using a subnet)	

DNS configuration

You must configure DNS on the SVM before creating an NFS or SMB server.

Information	Required?	Your values
SVM name <ul style="list-style-type: none"> • The name of the SVM on which you want to create an NFS or SMB server. 	Yes	
DNS domain name <ul style="list-style-type: none"> • A list of domain names to append to a host name when performing host- to-IP name resolution. • List the local domain first, followed by the domain names for which DNS queries are most often made. 	Yes	

Information	Required?	Your values
<p>IP addresses of the DNS servers</p> <p>* List of IP addresses for the DNS servers that will provide name resolution for the NFS or SMB server.</p> <p>* The listed DNS servers must contain the service location records (SRV) needed to locate the Active Directory LDAP servers and domain controllers for the domain that the SMB server will join. The SRV record is used to map the name of a service to the DNS computer name of a server that offers that service. SMB server creation fails if ONTAP cannot obtain the service location records through local DNS queries. The simplest way to ensure that ONTAP can locate the Active Directory SRV records is to configure Active Directory-integrated DNS servers as the SVM DNS servers. You can use non-Active Directory-integrated DNS servers provided that the DNS administrator has manually added the SRV records to the DNS zone that contains information about the Active Directory domain controllers.</p> <p>* For information about the Active Directory-integrated SRV records, see the topic How DNS Support for Active Directory Works on Microsoft TechNet.</p>	Yes	

Dynamic DNS configuration

Before you can use dynamic DNS to automatically add DNS entries to your Active Directory- integrated DNS servers, you must configure dynamic DNS (DDNS) on the SVM.

DNS records are created for every data LIF on the SVM. By creating multiple data LIFS on the SVM, you can load-balance client connections to the assigned data IP addresses. DNS load balances connections that are made using the host name to the assigned IP addresses in a round- robin fashion.

Information	Required?	Your values
SVM name <ul style="list-style-type: none"> • The SVM on which you want to create an NFS or SMB server. 	Yes	
Whether to use DDNS <ul style="list-style-type: none"> • Specifies whether to use DDNS. • The DNS servers configured on the SVM must support DDNS. By default, DDNS is disabled. 	Yes	
Whether to use secure DDNS <ul style="list-style-type: none"> • Secure DDNS is supported only with Active Directory-integrated DNS. • If your Active Directory-integrated DNS allows only secure DDNS updates, the value for this parameter must be true. • By default, secure DDNS is disabled. • Secure DDNS can be enabled only after a SMB server or an Active Directory account has been created for the SVM. 	No	
FQDN of the DNS domain <ul style="list-style-type: none"> • The FQDN of the DNS domain. • You must use the same domain name configured for DNS name services on the SVM. 	No	

Create IPspaces

You can use an IPspace to create a distinct IP address space for each SVM in a cluster. Doing so enables clients in administratively separate network domains to access cluster data while using overlapping IP addresses from the same IP address subnet range.

Before you begin

You must be a cluster administrator to perform this task.

Step

Create an IPspace.

```
network ipspace create -ipspace ipspace1
```

```
network ipspace show
```

IPspace	Vserver List	Broadcast Domains
Cluster	Cluster	Cluster
Default	Cluster1	Default
ipspace1	ipspace1	-

The IPspace is created, along with the system SVM for the IPspace. The system SVM carries management traffic.

Determining which ports can be used for a broadcast domain

Before you can configure a broadcast domain to add to the new IPspace, you must determine what ports are available for the broadcast domain.



This task is relevant for ONTAP 9.0 - 9.7, not ONTAP 9.8.

Before you begin

You must be a cluster administrator to perform this task.

About this task

- Ports can be physical ports, VLANs, or interface groups (ifgroups).
- The ports that you want to add to the new broadcast domain cannot be assigned to an existing broadcast domain.
- If the ports that you want to add to the broadcast domain are already in another broadcast domain (for example, the Default broadcast domain in the Default IPspace), you must remove the ports from that broadcast domain before assigning them to the new broadcast domain.
- Ports that have LIFs assigned to them cannot be removed from a broadcast domain.
- Because the cluster management and node management LIFs are assigned to the Default broadcast domain in the Default IPspace, the ports assigned to these LIFs cannot be removed from the Default broadcast domain.

Steps

1. Determine the current port assignments.

```
network port show
```


Node	Port	IPspace	Broadcast	Domain	Link	MTU	Admin/Oper
-----	----	-----	-----	-----	-----	----	-----
node1							
	e0a	Cluster	Cluster		up	9000	auto/1000
	e0b	Cluster	Cluster		up	9000	auto/1000
	e0c	Default	Default		up	1500	auto/1000
	e0d	Default	Default		up	1500	auto/1000
	e0e	Default	Default		up	1500	auto/1000
	e0f	Default	Default		up	1500	auto/1000
	e0g	Default	Default		up	1500	auto/1000
node2							
	e0a	Cluster	Cluster		up	9000	auto/1000
	e0b	Cluster	Cluster		up	9000	auto/1000
	e0c	Default	Default		up	1500	auto/1000
	e0d	Default	Default		up	1500	auto/1000
	e0e	Default	Default		up	1500	auto/1000
	e0f	Default	Default		up	1500	auto/1000
	e0g	Default	Default		up	1500	auto/1000

In this example, the output from the command provides the following information:

- Ports **e0c**, **e0d**, **e0e**, **e0f**, and **e0g** on each node are assigned to the Default broadcast domain.
- These ports are potentially available to use in the broadcast domain of the IPspace that you want to create.

- Determine which ports in the Default broadcast domain are assigned to LIF interfaces, and therefore cannot be moved to a new broadcast domain.

network interface show

Vserver	Logical Interface	Status Admin/Oper	Network Address/Mask	Current Node	Current Port	Is Home
-----	-----	-----	-----	-----	-----	-----
Cluster						
	node1_clus1	up/up	10.0.2.40/24	node1	e0a	true
	node1_clus2	up/up	10.0.2.41/24	node1	e0b	true
	node2_clus1	up/up	10.0.2.42/24	node2	e0a	true
	node2_clus2	up/up	10.0.2.43/24	node2	e0b	true
cluster1						
	cluster_mgmt	up/up	10.0.1.41/24	node1	e0c	true
	node1_mgmt	up/up	10.0.1.42/24	node1	e0c	true
	node2_mgmt	up/up	10.0.1.43/24	node2	e0c	true

In the following example, the output from the command provides the following information:

- The node ports are assigned to port `e0c` on each node and the cluster administrative LIF's home node is on `e0c` on `node1`.
- Ports `e0d`, `e0e`, `e0f`, and `e0g` on each node are not hosting LIFs and can be removed from the Default broadcast domain and then added to a new broadcast domain for the new IPspace.

Remove ports from a broadcast domain

If the ports that you want to add to the new broadcast domain are already in another broadcast domain, you must remove the ports from that broadcast domain before assigning them to the new broadcast domain.



This task is relevant for ONTAP 9.0 - 9.7, not ONTAP 9.8.

Before you begin

You must be a cluster administrator to perform this task.

Steps

1. Remove ports from the broadcast domain specifying the following:
 - IPspace, `Default` in the following sample.
 - Broadcast domain, `Default` in the following sample.
 - Ports, using the node and port syntax, `node1:e0d,node1:e0e,node2:e0d,node2:e0e` in the following sample.

```
network port broadcast-domain remove-ports -ipspace Default
-broadcast-domain Default -ports
node1:e0d,node1:e0e,node2:e0d,node2:e0e
```

2. Verify that the ports were removed from the broadcast domain:

```
network port show
```

Create a broadcast domain

You must create a broadcast domain for a custom IPspace. The SVMs created in the IPspace use the ports in the broadcast domain.



This task is relevant for ONTAP 9.0 - 9.7, not ONTAP 9.8.

Before you begin

You must be a cluster administrator to perform this task.

About this task

The port to which a LIF fails over must be a member of the failover group for the LIF. When you create a broadcast domain, ONTAP automatically creates a failover group with the same name. The failover group contains all the ports assigned to the broadcast domain.

Steps

1. Create a broadcast domain.

```
network port broadcast-domain create -ipspace ipspace1 -broadcast-domain  
-ipspacel -mtu 1500 -ports node1:e0d,node1:e0e,node2:e0d,node2:e0e
```

2. Verify that the broadcast domain configuration is correct.

- a. Verify the broadcast domain is correct:

```
network port broadcast-domain show
```

- b. Verify the network port is correct:

```
network port show
```

- c. Verify the failover group names and failover targets are correct:

```
network interface failover-groups show
```

Create a subnet

After you create the broadcast domain, you can create a subnet to allocate specific blocks of IPv4 or IPv6 addresses to be used later when you create LIFs for the SVM.

This enables you to create LIFs more easily by specifying a subnet name instead of having to specify IP address and network mask values for each LIF.

Before you begin

You must be a cluster administrator to perform this task.

Steps

1. Create a subnet.

```
network subnet create -broadcast-domain ipspacel -ipspace ipspacel  
-subnet-name ipspacel -subnet 10.0.0.0/24 -gateway 10.0.0.1 -ip-ranges  
"10.0.0.128-10.0.0.130,10.0.0.132"
```

The subnet name can be either a subnet IP value such as `192.0.2.0/24` or a string such as `ipspacel` like the one used in this example.

2. Verify that the subnet configuration is correct.

The output from this example shows information about the subnet named `ipspacel` in the `ipspacel` IPspace. The subnet belongs to the broadcast domain name `ipspacel`. You can assign the IP addresses in this subnet to data LIFs for SVMs created in the `ipspacel` IPspace.

```
network subnet show -ipspace ipspacel
```

Create SVMs

You must create an SVM to serve data to clients.

Before you begin

- You must be a cluster administrator to perform this task.
- You must know which security style the SVM root volume will have.

If you plan to implement a Hyper-V or SQL Server over SMB solution on this SVM, you should use NTFS security style for the root volume. Volumes that contain Hyper-V files or SQL database files must be set to NTFS security at the time they are created. By setting the root volume security style to NTFS, you ensure that you do not inadvertently create UNIX or mixed security-style data volumes.

Steps

1. Determine which aggregates are candidates for containing the SVM root volume.

```
storage aggregate show -has-mroot false
```

You must choose an aggregate that has at least 1 GB of free space to contain the root volume. If you intend to configure NAS auditing on the SVM, you must have a minimum of 3 GB of extra free space on the root aggregate, with the extra space being used to create the auditing staging volume when auditing is enabled.



If NAS auditing is already enabled on an existing SVM, the aggregate's staging volume is created immediately after aggregate creation is successfully completed.

2. Record the name of the aggregate on which you want to create the SVM root volume.
3. If you plan on specifying a language when you create the SVM and do not know the value to use, identify and record the value of the language you want to specify:

```
vserver create -language ?
```

4. If you plan on specifying a Snapshot policy when you create the SVM and do not know the name of the policy, list the available policies and identify and record the name of the Snapshot policy you want to use:

```
volume snapshot policy show -vserver <vserver_name>
```

5. If you plan on specifying a quota policy when you create the SVM and do not know the name of the policy, list the available policies and identify and record the name of the quota policy you want to use:

```
volume quota policy show -vserver <vserver_name>
```

6. Create an SVM:

```
vserver create -vserver <vserver_name> -aggregate <aggregate_name> -rootvolume  
<root_volume_name> -rootvolume-security-style {unix|ntfs|mixed} [-ipspace  
<IPspace_name>] [-language <language>] [-snapshot-policy  
<snapshot_policy_name>] [-quota-policy <quota_policy_name>] [-comment  
<comment>]
```

```
vserver create -vserver vs1 -aggregate aggr3 -rootvolume vs1_root -rootvolume-  
security-style ntfs -ipspace ipspace1 -language en_US.UTF-8
```

```
[Job 72] Job succeeded: Vserver creation completed
```

7. Verify that the SVM configuration is correct.

```
vserver show -vserver vs1
```

```
Vserver: vs1  
Vserver Type: data  
Vserver Subtype: default  
Vserver UUID: 11111111-1111-1111-1111-111111111111  
Root Volume: vs1_root  
Aggregate: aggr3  
NIS Domain: -  
Root Volume Security Style: ntfs  
LDAP Client: -  
Default Volume Language Code: en_US.UTF-8  
Snapshot Policy: default  
Comment:  
Quota Policy: default  
List of Aggregates Assigned: -  
Limit on Maximum Number of Volumes allowed: unlimited  
Vserver Admin State: running  
Vserver Operational State: running  
Vserver Operational State Stopped Reason: -  
Allowed Protocols: nfs, cifs, ndmp  
Disallowed Protocols: fcp, iscsi  
QoS Policy Group: -  
Config Lock: false  
IPspace Name: ipspace1  
Is Vserver Protected: false
```

In this example, the command creates the SVM named "vs1" in IPspace "ipspace1". The root volume is named "vs1_root" and is created on aggr3 with NTFS security style.

Create LIFs

An SVM serves data to clients through one or more network logical interfaces (LIFs). You must create LIFs on the ports you want to use to access data.

Before you begin

You must be a cluster administrator to perform this task.

About this task

Starting with ONTAP 9.7, ONTAP automatically chooses the home port of a LIF, as long as at least one LIF

already exists in the same subnet in that IPspace. ONTAP chooses a home-port in the same broadcast domain as other LIFs in that subnet. You can still specify a home port, but it is no longer required (unless no LIFs yet exist in that subnet in the specified IPspace).

You should not configure LIFs that carry CIFS traffic to automatically revert to their home nodes. This recommendation is mandatory if the CIFS server is to host a solution for nondisruptive operations with Hyper-V or SQL Server over SMB.

Steps

- 1. Determine which broadcast domain ports you want to use for the LIF.

```
network port broadcast-domain show -ipspace ipspace1
```

IPspace	Broadcast			Update
Name	Domain name	MTU	Port List	Status Details
ipspace1	default	1500		
			node1:e0d	complete
			node1:e0e	complete
			node2:e0d	complete
			node2:e0e	complete

- 2. Verify that the subnet you want to use for the LIFs contains sufficient unused IP addresses.

```
network subnet show -ipspace ipspace1
```

- 3. Create one or more LIFs on the ports you want to use to access data.

```
network interface create -vserver vs1 -lif lif1 -home-node node1 -home-port e0d -service-policy default-data-files -subnet-name ipspace1
```

- 4. Verify that the LIF interface configuration is correct.

```
network interface show -vserver vs1
```

Vserver	Logical Interface	Status Admin/Oper	Network Address/Mask	Current Node	Current Port	Is Home
vs1	lif1	up/up	10.0.0.128/24	node1	e0d	true

- 5. Verify that the failover group configuration is as desired.

```
network interface show -failover -vserver vs1
```

Vserver	Logical interface	Home Node:Port	Failover Policy	Failover Group
-----	-----	-----	-----	-----
vs1	lif1	node1:e0d	system-defined	ipspace1
Failover Targets: node1:e0d, node1:e0e, node2:e0d, node2:e0e				

Get more information

You can get help and find more information through various resources, documentation, and forums.

- [Documentation](#) – Release Notes and Guides for this release and previous releases.
- [NetApp TechCommTV](#) – NetApp videos.
- [NetApp resources](#) – Technical Reports and Knowledgebase Articles.
- [NetApp Community](#) – NetApp product and solutions forums.

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