NFS configuration

System Manager Classic

NetApp
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NFS configuration

NFS configuration overview

You can quickly set up NFS access to a new volume on either a new or existing storage virtual machine (SVM) using the ONTAP System Manager classic interface (ONTAP 9.7 and earlier).

Use this procedure if you want to configure access to a volume in the following way:

- NFS access will be through NFSv3, not NFSv4 or NFSv4.1.
- You want to use best practices, not explore every available option.
- Your data network uses the default IPspace, the default broadcast domain, and the default failover group.

  If your data network is flat, using these default objects ensures that LIFs will fail over correctly in the event of a link failure. If you are not using the default objects, you should refer to Network Management Documentation for information on how to configure LIF path failover.

- UNIX file permissions will be used to secure the new volume.
- LDAP, if used, is provided by Active Directory.

If you want details about the range of ONTAP NFS protocol capabilities, consult the NFS reference overview.

Other ways to do this in ONTAP

To perform these tasks with…	Refer to…
The redesigned System Manager (available with ONTAP 9.7 and later)	Provision NAS storage for Linux servers using NFS
The ONTAP command line interface	NFS configuration overview with the CLI

NFS configuration workflow

Configuring NFS involves optionally creating an aggregate and then choosing a workflow that is specific to your goal—creating a new NFS-enabled SVM, configuring NFS access to an existing SVM, or simply adding an NFS volume to an existing SVM that is already fully configured for NFS access.

Create an aggregate

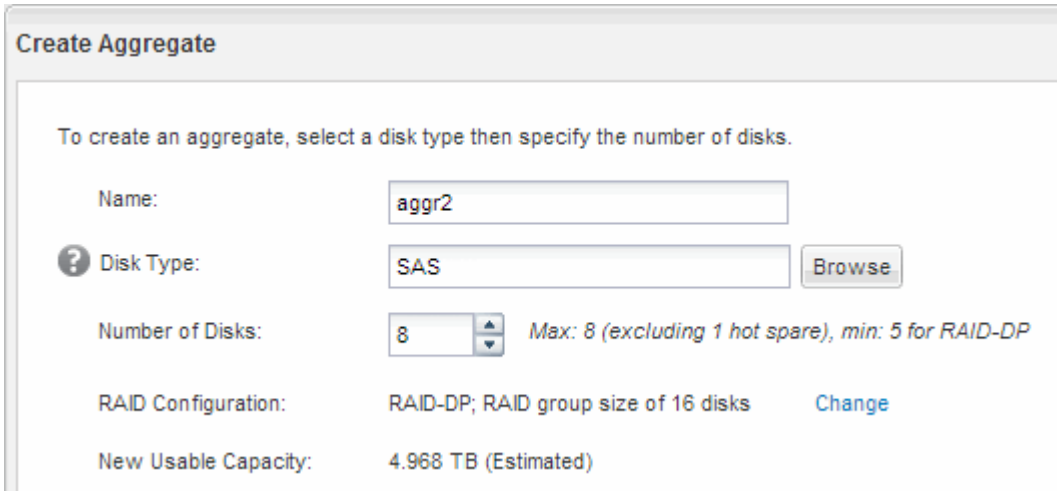
If you do not want to use an existing aggregate, you can create a new aggregate to provide physical storage to the volume which you are provisioning.

About this task

If you have an existing aggregate that you want to use for the new volume, you can skip this procedure.

Steps

1. Enter the URL `https://IP-address-of-cluster-management-LIF` in a web browser and log in to System Manager using your cluster administrator credential.
2. Navigate to the **Aggregates** window.
3. Click **Create.**
4. Follow the instructions on the screen to create the aggregate using the default RAID-DP configuration, and then click **Create**.



Results

The aggregate is created with the specified configuration and added to the list of aggregates in the Aggregates window.

Decide where to provision the new volume

Before you create a new NFS volume, you must decide whether to place it in an existing storage virtual machine (SVM), and, if so, how much configuration the SVM requires. This decision determines your workflow.

Procedure

- If you want to provision a volume on a new SVM, create a new NFS-enabled SVM.

  Creating a new NFS-enabled SVM

  You must choose this option if NFS is not enabled on an existing SVM.

- If you want to provision a volume on an existing SVM on which NFS is enabled but not configured, configure NFS access on the existing SVM.

  Configuring NFS access on an existing SVM

  This is the case if you did not follow this procedure to create the SVM while configuring a different protocol.

- If you want to provision a volume on an existing SVM that is fully configured for NFS access, add an NFS volume to the NFS-enabled SVM.

  Adding an NFS volume to an NFS-enabled SVM

Create a new NFS-enabled SVM

Setting up an NFS-enabled SVM involves creating the new SVM with an NFS volume and export, opening the default export policy of the SVM root volume and then verifying NFS access from a UNIX administration host. You can then configure NFS client access.

Create a new SVM with an NFS volume and export

You can use a wizard that guides you through the process of creating the storage virtual machine (SVM), configuring Domain Name System (DNS), creating a data logical interface (LIF), enabling NFS, optionally configuring NIS, and then creating and exporting a volume.

Before you begin

- Your network must be configured and the relevant physical ports must be connected to the network.
- You must know which of the following networking components the SVM will use:
  - The node and the specific port on that node where the data logical interface (LIF) will be created
  - The subnet from which the data LIF's IP address will be provisioned, or optionally the specific IP address you want to assign to the data LIF
  - NIS information, if your site uses NIS for name services or name mapping
- The subnet must be routable to all external servers required for services such as Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Active Directory (AD), and DNS.
- Any external firewalls must be appropriately configured to allow access to network services.
- The time on the AD domain controllers, clients, and SVM must be synchronized to within five minutes of each other.

Steps

1. Navigate to the **SVMs** window.
2. Click **Create.**
3. In the **Storage Virtual Machine (SVM) Setup** dialog box, create the SVM:

   a. Specify a unique name for the SVM.

      The name must either be a fully qualified domain name (FQDN) or follow another convention that ensures unique names across a cluster.

   b. Select all the protocols that you have licenses for and that you will eventually use on the SVM, even if you do not want to configure all the protocols immediately.

      If CIFS access is required eventually, you must select **CIFS** now so that CIFS and NFS clients can share the same data LIF.

   c. Keep the default language setting, C.UTF-8.

      If you support international character display in both NFS and SMB/CIFS clients, consider using the **UTF8MB4** language code, which is available beginning with ONTAP 9.5.

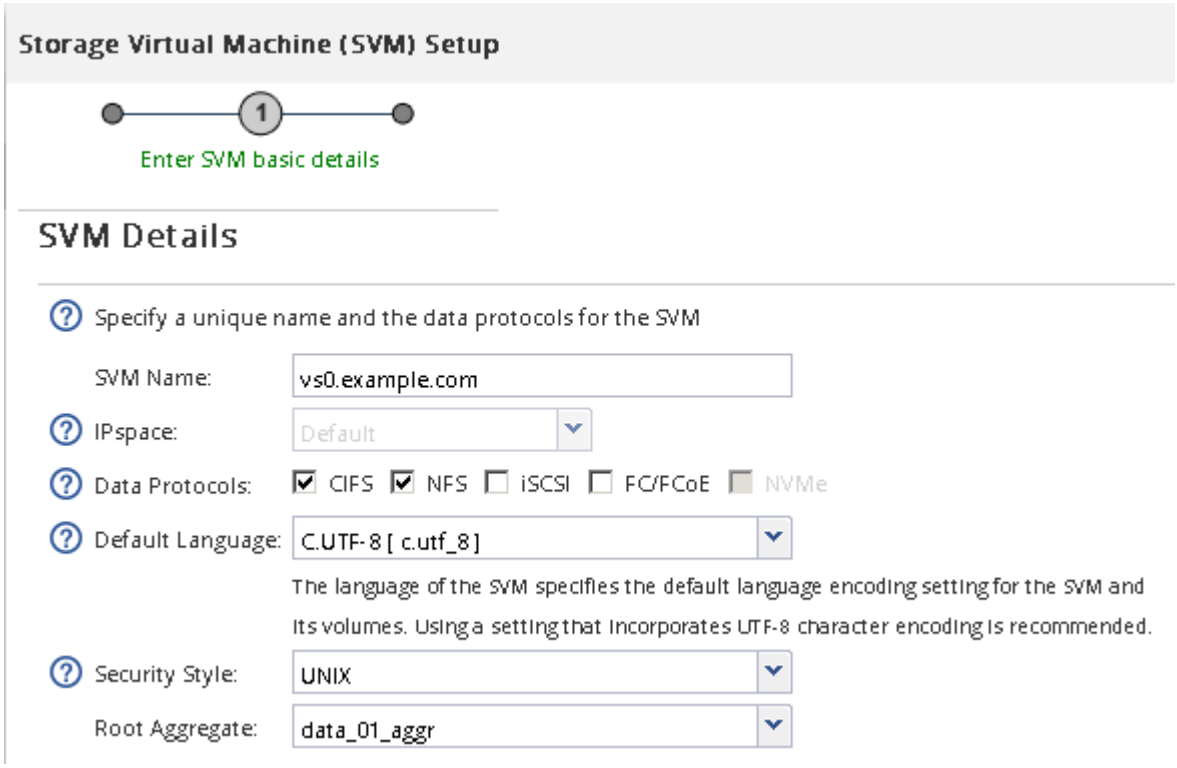
This language is inherited by the volume that you create later, and a volume's language cannot be changed.

d. **Optional**: If you enabled the CIFS protocol, change the security style to **UNIX**.

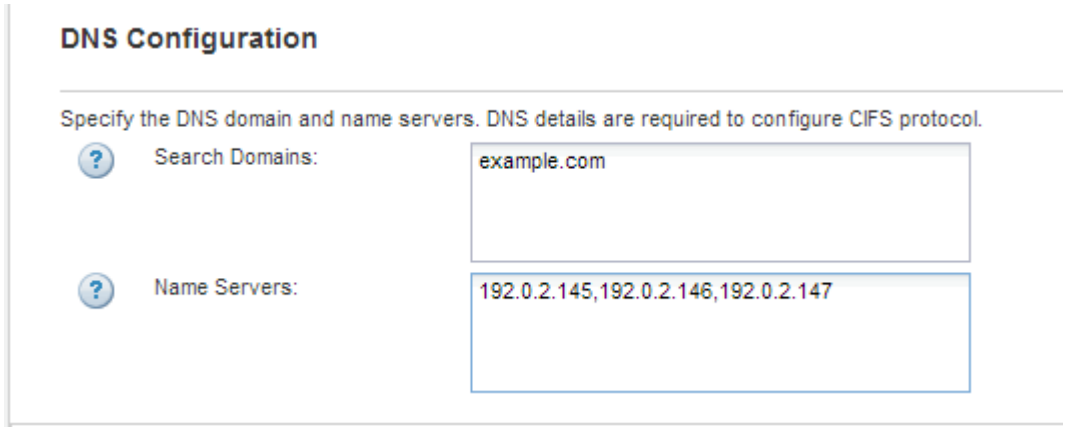
Selecting the CIFS protocol sets the security style to NTFS by default.

e. **Optional**: Select the root aggregate to contain the SVM root volume.

The aggregate that you select for the root volume does not determine the location of the data volume. The aggregate for the data volume is selected automatically when you provision storage in a later step.



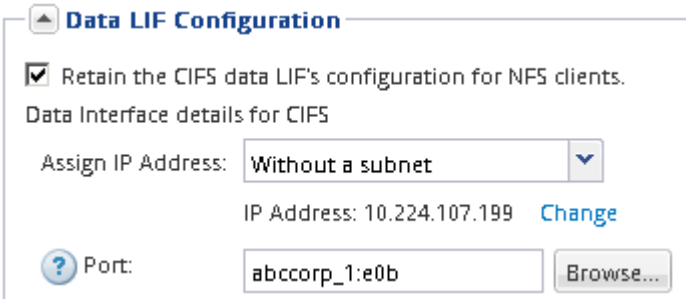
f. In the **DNS Configuration** area, ensure that the default DNS search domain and name servers are the ones that you want to use for this SVM.



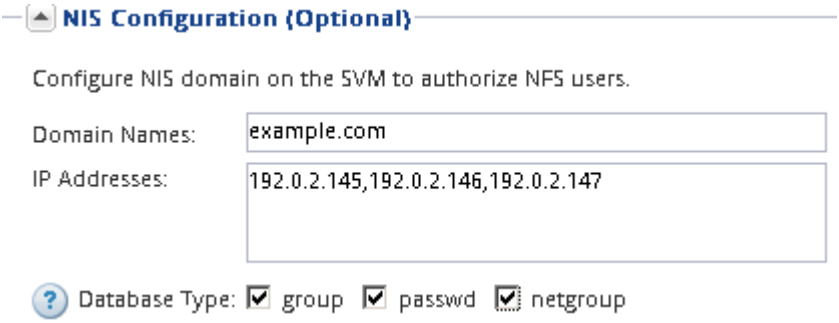
g. Click **Submit & Continue**.

The SVM is created, but protocols are not yet configured.

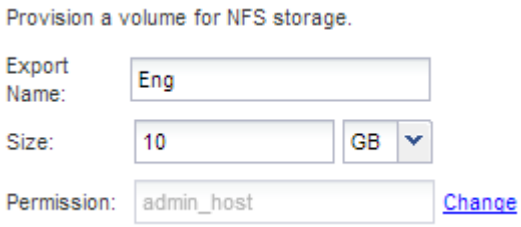
4. In the **Data LIF Configuration** section of the **Configure CIFS/NFS protocol** page, specify the details of the LIF that clients will use to access data:
   a. Assign an IP address to the LIF automatically from a subnet you specify or manually enter the address.
   b. Click **Browse** and select a node and port that will be associated with the LIF.



5. If the **NIS Configuration** area is collapsed, expand it.
6. If your site uses NIS for name services or name mapping, specify the domain and IP addresses of the NIS servers.

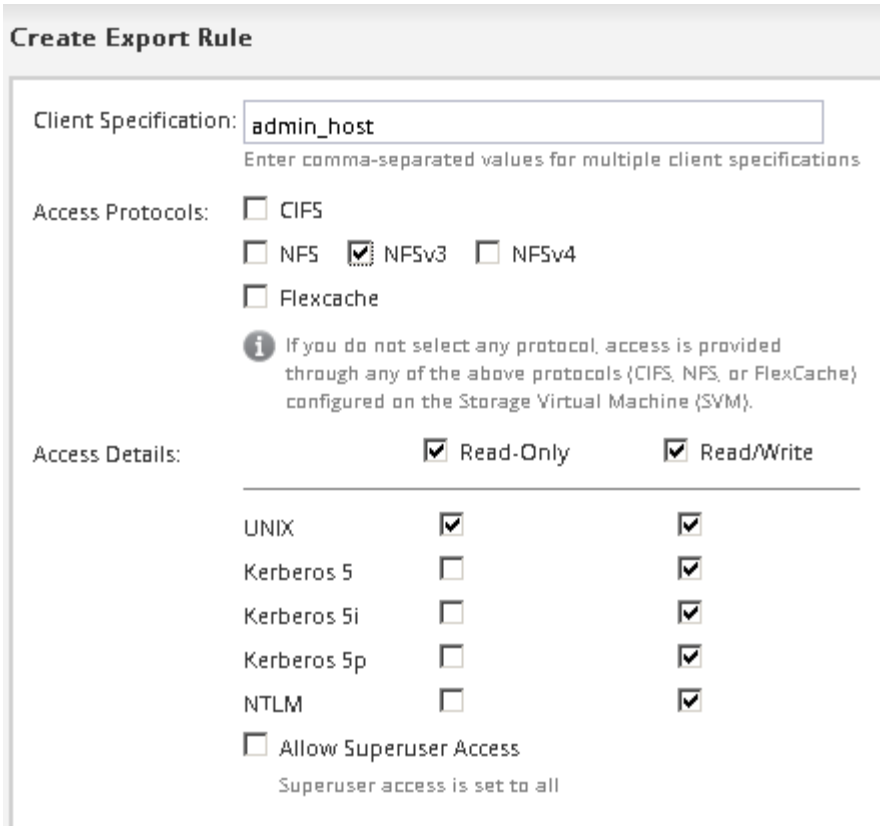


7. Create and export a volume for NFS access:
   a. For **Export Name**, type a name that will be both the export name and the beginning of the volume name.
   b. Specify a size for the volume that will contain the files.



   You do not have to specify the aggregate for the volume because it is automatically located on the aggregate with the most available space.

   c. In the **Permission** field, click **Change**, and specify an export rule that gives NFSv3 access to a UNIX administration host, including Superuser access.



You can create a 10 GB volume named Eng, export it as Eng, and add a rule that gives the “admin_host” client full access to the export, including Superuser access.

8. Click **Submit & Continue**.

   The following objects are created:

   - A data LIF named after the SVM with the suffix “_nfs_lif1”
   - An NFS server
   - A volume that is located on the aggregate with the most available space and has a name that matches the name of the export and ends in the suffix “_NFS_volume”
   - An export for the volume
   - An export policy with the same name as the export

9. For all other protocol configuration pages that are displayed, click **Skip** and configure the protocol later.
10. When the **SVM Administration** page is displayed, configure or defer configuring a separate administrator for this SVM:
    - Click **Skip** and configure an administrator later if required.
    - Enter the requested information and then click **Submit & Continue**.
11. Review the **Summary** page, record any information you might require later and then click **OK**.

    NFS clients need to know the IP address of the data LIF.

Results

A new SVM is created with an NFS server containing a new volume that is exported for an administrator.

Open the export policy of the SVM root volume (Create a new NFS-enabled SVM)

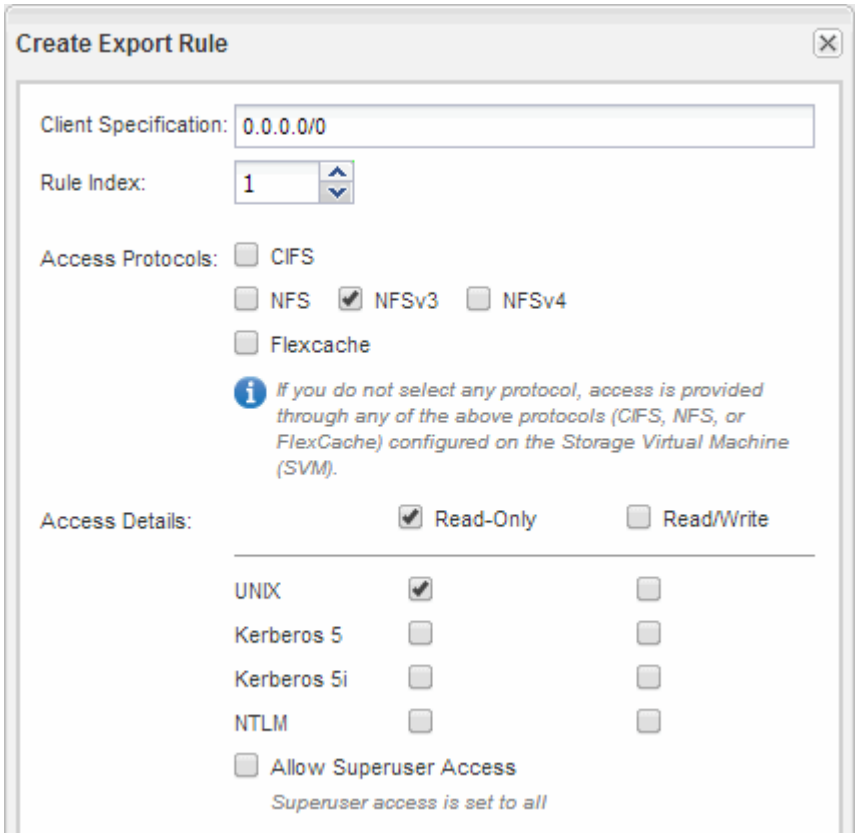
You must add a rule to the default export policy to allow all clients access through NFSv3. Without such a rule, all NFS clients are denied access to the storage virtual machine (SVM) and its volumes.

About this task

You should specify all NFS access as the default export policy, and later restrict access to individual volumes by creating custom export policies for individual volumes.

Steps

1. Navigate to the **SVMs** window.
2. Click the **SVM Settings** tab.
3. In the **Policies** pane, click **Export Policies**.
4. Select the export policy named **default**, which is applied to the SVM root volume.
5. In the lower pane, click **Add**.
6. In the **Create Export Rule** dialog box, create a rule that opens access to all clients for NFS clients:
   a. In the **Client Specification** field, enter `0.0.0.0/0` so that the rule applies to all clients.
   b. Retain the default value as **1** for the rule index.
   c. Select **NFSv3**.
   d. Clear all the check boxes except the **UNIX** check box under **Read-Only**.
   e. Click **OK**.



Results

NFSv3 clients can now access any volumes created on the SVM.

Configure LDAP (Create a new NFS-enabled SVM)

If you want the storage virtual machine (SVM) to get user information from Active Directory-based Lightweight Directory Access Protocol (LDAP), you must create an LDAP client, enable it for the SVM, and give LDAP priority over other sources of user information.

Before you begin

- The LDAP configuration must be using Active Directory (AD).

  If you use another type of LDAP, you must use the command-line interface (CLI) and other documentation to configure LDAP. For more information, see Overview of using LDAP.

- You must know the AD domain and servers, as well as the following binding information: the authentication level, the Bind user and password, the base DN, and the LDAP port.

Steps

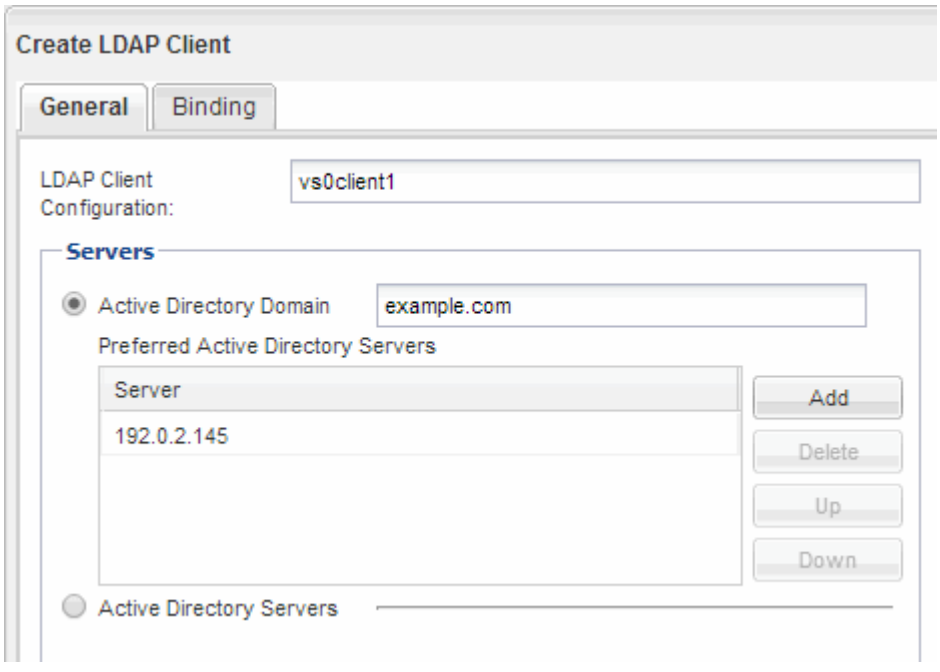
1. Navigate to the **SVMs** window.
2. Select the required SVM
3. Click the **SVM Settings** tab.
4. Set up an LDAP client for the SVM to use:

   a. In the **Services** pane, click **LDAP Client**.

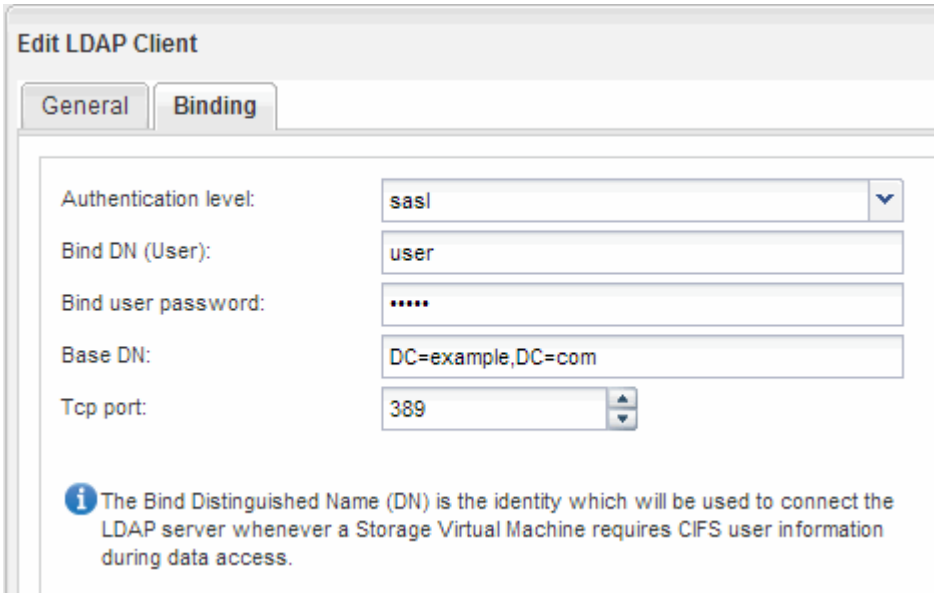
   b. In the **LDAP Client Configuration** window, click **Add**.

   c. In the **General** tab of the **Create LDAP Client** window, type the name of the LDAP client configuration, such as `vs0client1`.

   d. Add either the AD domain or the AD servers.



e. Click **Binding**, and specify the authentication level, the Bind user and password, the base DN, and the port.



f. Click **Save and Close**.

A new client is created and available for the SVM to use.

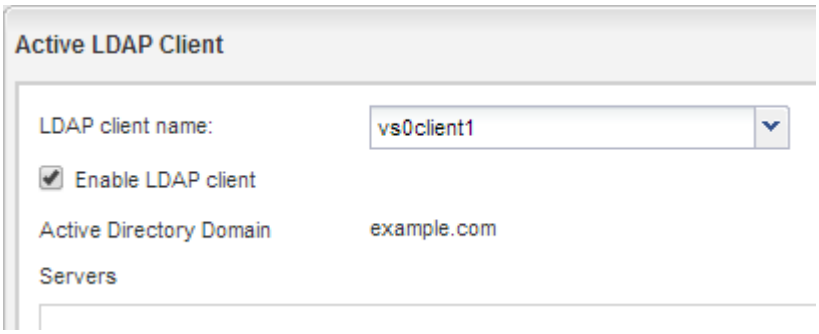
5. Enable the new LDAP client for the SVM:

   a. In the navigation pane, click **LDAP Configuration**.

   b. Click **Edit**.

   c. Ensure that the client you just created is selected in **LDAP client name**.

   d. Select **Enable LDAP client**, and click **OK**.



The SVM uses the new LDAP client.

6. Give LDAP priority over other sources of user information, such as Network Information Service (NIS) and local users and groups:

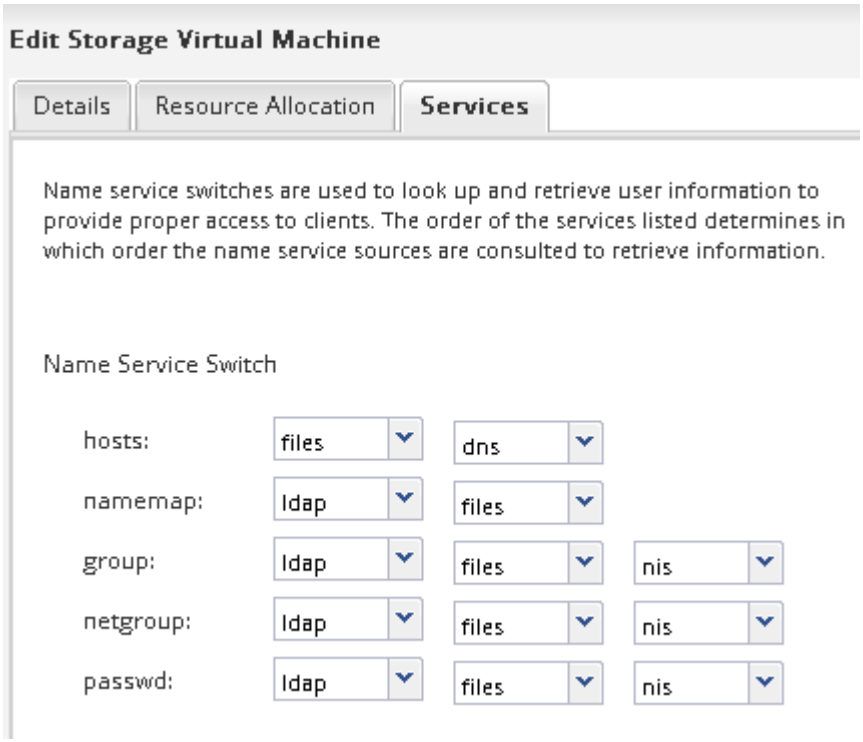
   a. Navigate to the **SVMs** window.

   b. Select the SVM and click **Edit**.

   c. Click the **Services** tab.

   d. Under **Name Service Switch**, specify **LDAP** as the preferred name service switch source for the database types.

e. Click **Save and Close**.



LDAP is the primary source of user information for name services and name mapping on this SVM.

Verify NFS access from a UNIX administration host

After you configure NFS access to storage virtual machine (SVM), you should verify the configuration by logging in to an NFS administration host and reading data from and writing data to the SVM.

Before you begin

- The client system must have an IP address that is allowed by the export rule you specified earlier.
- You must have the login information for the root user.

Steps

1. Log in as the root user to the client system.
2. Enter `cd /mnt/` to change the directory to the mount folder.
3. Create and mount a new folder using the IP address of the SVM:
   a. Enter `mkdir /mnt/folder` to create a new folder.
   b. Enter `mount -t nfs -o nfsvers=3,hard IPAddress:/volume_name /mnt/folder` to mount the volume at this new directory.
   c. Enter `cd folder` to change the directory to the new folder.

   The following commands create a folder named test1, mount the vol1 volume at the 192.0.2.130 IP address on the test1 mount folder, and change to the new test1 directory:

```
host# mkdir /mnt/test1
host# mount -t nfs -o nfsvers=3,hard 192.0.2.130:/vol1 /mnt/test1
host# cd /mnt/test1
```

4. Create a new file, verify that it exists, and write text to it:
   a. Enter `touch filename` to create a test file.
   b. Enter `ls -l filename` to verify that the file exists.
   c. Enter `cat >filename`, type some text, and then press Ctrl+D to write text to the test file.
   d. Enter `cat filename` to display the content of the test file.
   e. Enter `rm filename` to remove the test file.
   f. Enter `cd ..` to return to the parent directory.

```
host# touch myfile1
host# ls -l myfile1
-rw-r--r-- 1 root root 0 Sep 18 15:58 myfile1
host# cat >myfile1
This text inside the first file
host# cat myfile1
This text inside the first file
host# rm -r myfile1
host# cd ..
```

Results

You have confirmed that you have enabled NFS access to the SVM.

Configure and verify NFS client access (Create a new NFS-enabled SVM)

When you are ready, you can give select clients access to the share by setting UNIX file permissions on a UNIX administration host and adding an export rule in System Manager. Then you should test that the affected users or groups can access the volume.

Steps

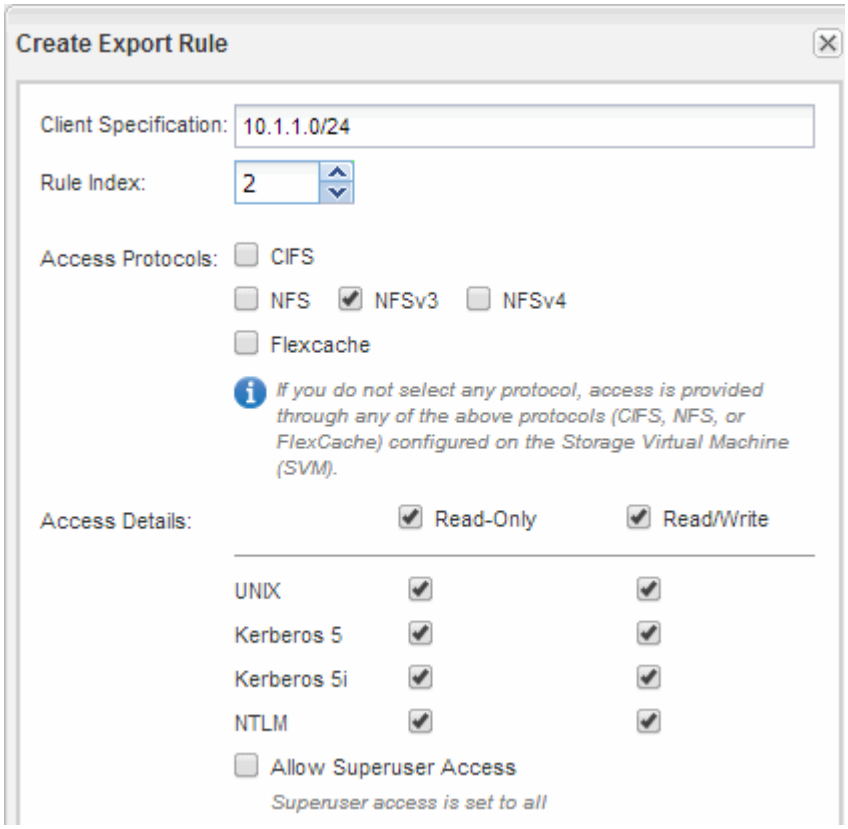
1. Decide which clients and users or groups will be given access to the share.
2. On a UNIX administration host, use the root user to set UNIX ownership and permissions on the volume.
3. In System Manager, add rules to the export policy to permit NFS clients to access the share.
   a. Select the storage virtual machine (SVM), and click **SVM Settings**.
   b. In the **Policies** pane, click **Export Policies**.
   c. Select the export policy with the same name as the volume.
   d. In the **Export Rules** tab, click **Add**, and specify a set of clients.
   e. Select **2** for the **Rule Index** so that this rule executes after the rule that allows access to the

administration host.

f. Select **NFSv3**.

g. Specify the access details that you want, and click **OK.**

You can give full read/write access to clients by typing the subnet `10.1.1.0/24` as the **Client Specification**, and selecting all the access check boxes except **Allow Superuser Access**.



4. On a UNIX client, log in as one of the users who now has access to the volume, and verify that you can mount the volume and create a file.

Configure NFS access to an existing SVM

Adding access for NFS clients to an existing SVM involves adding NFS configurations to the SVM, opening the export policy of the SVM root volume, optionally configuring LDAP, and verifying NFS access from a UNIX administration host. You can then configure NFS client access.

Add NFS access to an existing SVM

Adding NFS access to an existing SVM involves creating a data LIF, optionally configuring NIS, provisioning a volume, exporting the volume, and configuring the export policy.

Before you begin

- You must know which of the following networking components the SVM will use:

- The node and the specific port on that node where the data logical interface (LIF) will be created
- The subnet from which the data LIF's IP address will be provisioned, or optionally the specific IP address you want to assign to the data LIF

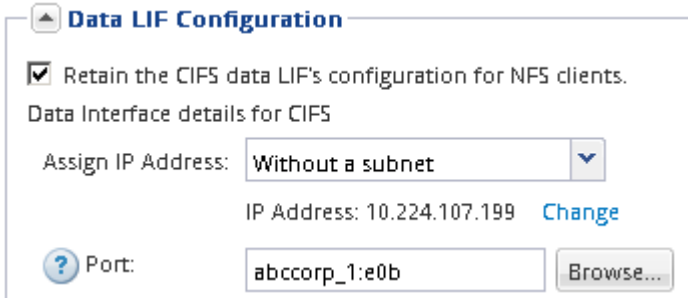
- Any external firewalls must be appropriately configured to allow access to network services.
- The NFS protocol must be allowed on the SVM.

For more information, see the Network management documentation.

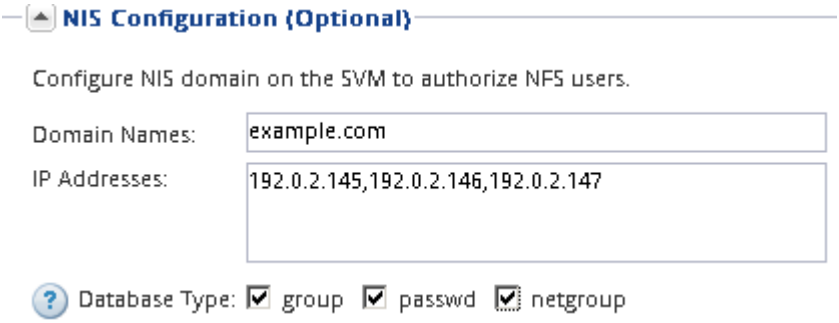
Steps

1. Navigate to the area where you can configure the protocols of the SVM:
   a. Select the SVM that you want to configure.
   b. In the **Details** pane, next to **Protocols**, click **NFS**.

2. In the **Configure NFS protocol** dialog box, create a data LIF.
   a. Assign an IP address to the LIF automatically from a subnet you specify or manually enter the address.
   b. Click **Browse** and select a node and port that will be associated with the LIF.

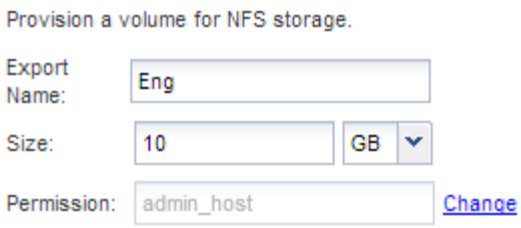


3. If your site uses NIS for name services or name mapping, specify the domain and IP addresses of the NIS servers and select the database types for which you want to add the NIS name service source.



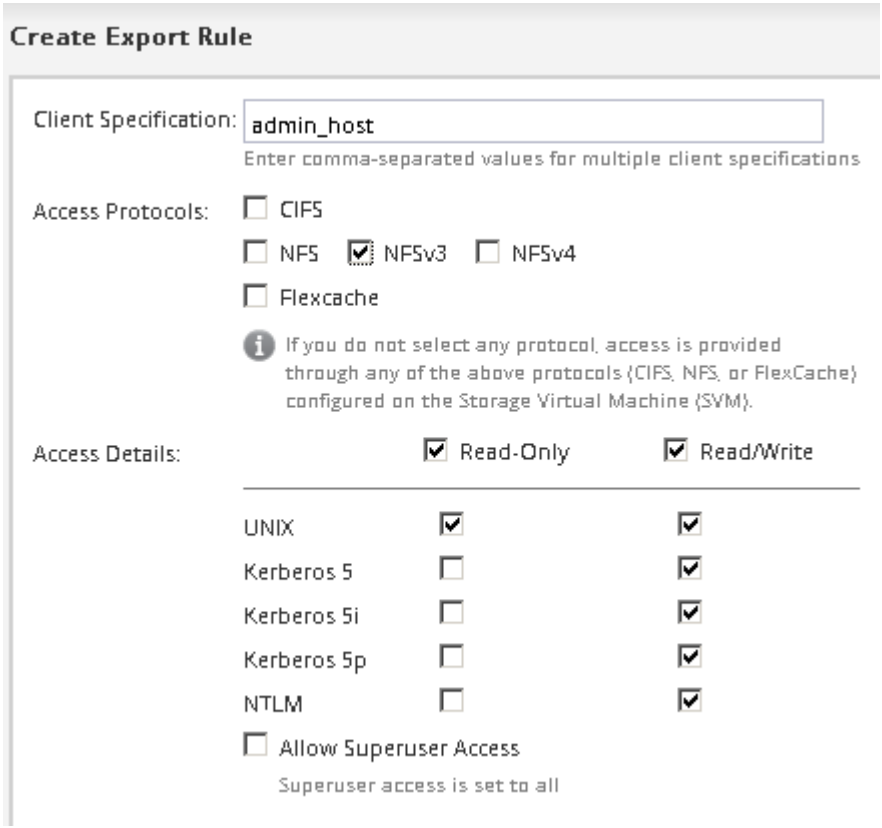
   If NIS services are not available, do not attempt to configure it. Improperly configured NIS services can cause datastore access issues.

4. Create and export a volume for NFS access:
   a. For **Export Name**, type a name that will be both the export name and the beginning of the volume name.
   b. Specify a size for the volume that will contain the files.



You do not have to specify the aggregate for the volume because it is automatically located on the aggregate with the most available space.

c. In the **Permission** field, click **Change**, and specify an export rule that gives NFSv3 access to a UNIX administration host, including Superuser access.



You can create a 10 GB volume named Eng, export it as Eng, and add a rule that gives the “admin_host” client full access to the export, including Superuser access.

5. Click **Submit & Close**, and then click **OK**.

Open the export policy of the SVM root volume (Configure NFS access to an existing SVM)

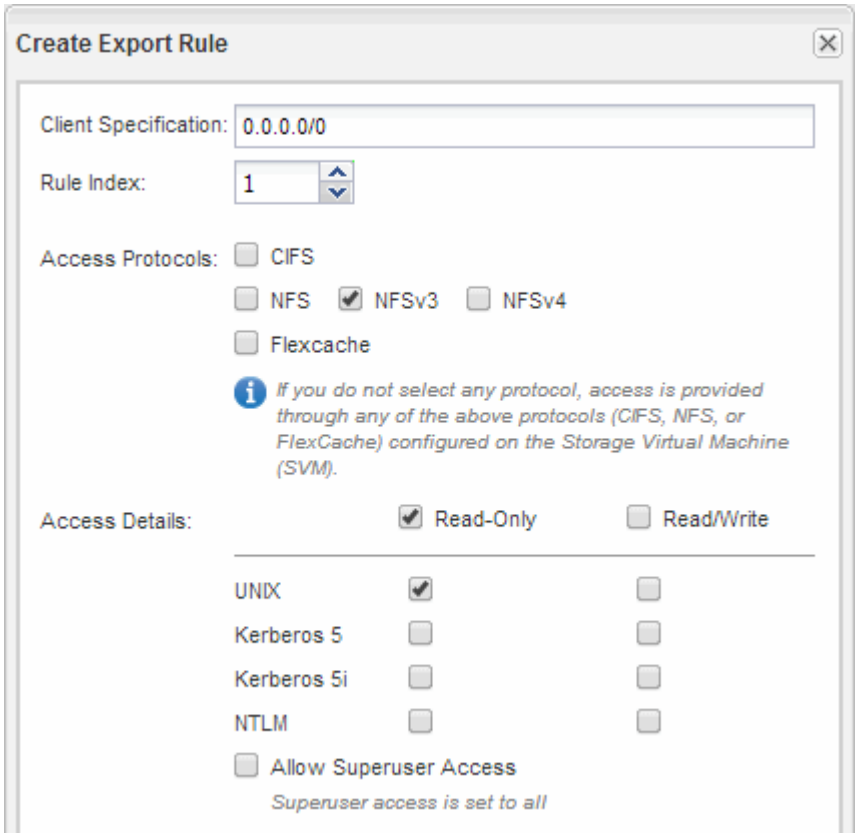
You must add a rule to the default export policy to allow all clients access through NFSv3. Without such a rule, all NFS clients are denied access to the storage virtual machine (SVM) and its volumes.

About this task

You should specify all NFS access as the default export policy, and later restrict access to individual volumes by creating custom export policies for individual volumes.

Steps

1. Navigate to the **SVMs** window.
2. Click the **SVM Settings** tab.
3. In the **Policies** pane, click **Export Policies**.
4. Select the export policy named **default**, which is applied to the SVM root volume.
5. In the lower pane, click **Add**.
6. In the **Create Export Rule** dialog box, create a rule that opens access to all clients for NFS clients:
   a. In the **Client Specification** field, enter `0.0.0.0/0` so that the rule applies to all clients.
   b. Retain the default value as **1** for the rule index.
   c. Select **NFSv3**.
   d. Clear all the check boxes except the **UNIX** check box under **Read-Only**.
   e. Click **OK**.



Results

NFSv3 clients can now access any volumes created on the SVM.

Configure LDAP (Configure NFS access to an existing SVM)

If you want the storage virtual machine (SVM) to get user information from Active Directory-based Lightweight Directory Access Protocol (LDAP), you must create an LDAP client, enable it for the SVM, and give LDAP priority over other sources of user information.

Before you begin

- The LDAP configuration must be using Active Directory (AD).

  If you use another type of LDAP, you must use the command-line interface (CLI) and other documentation to configure LDAP. For more information, see Overview of using LDAP.

- You must know the AD domain and servers, as well as the following binding information: the authentication level, the Bind user and password, the base DN, and the LDAP port.

Steps

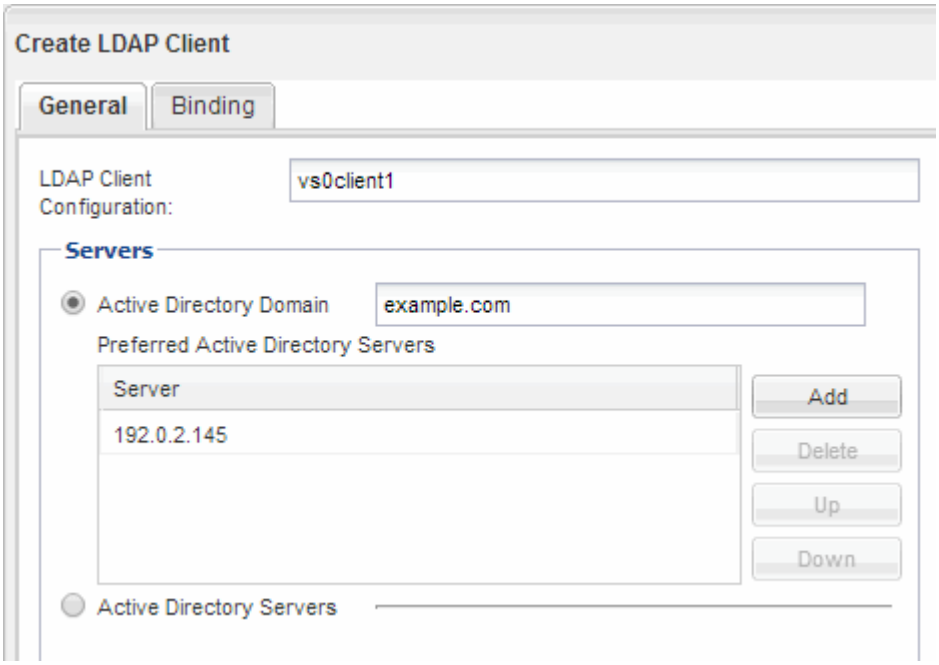
1. Navigate to the **SVMs** window.
2. Select the required SVM
3. Click the **SVM Settings** tab.
4. Set up an LDAP client for the SVM to use:

   a. In the **Services** pane, click **LDAP Client**.

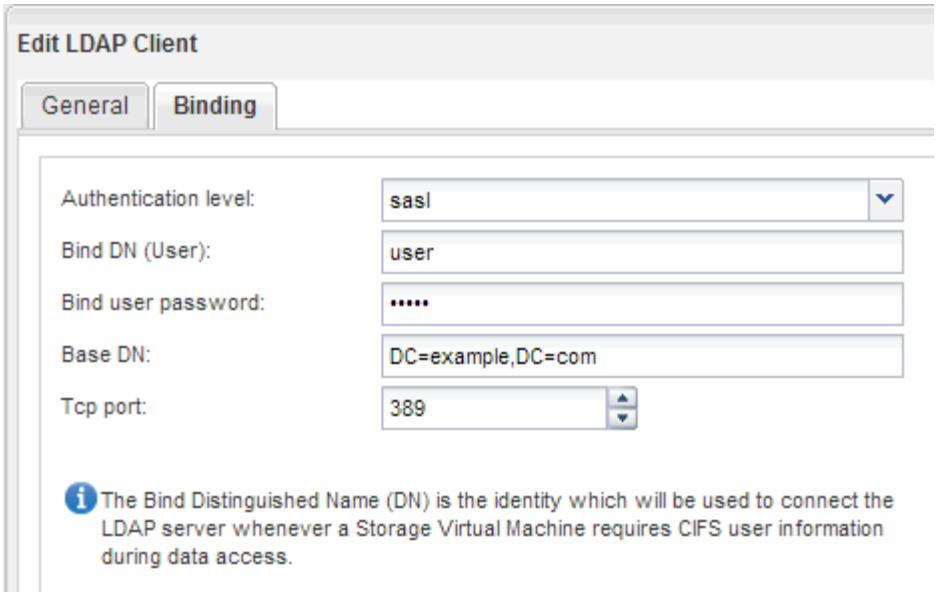
   b. In the **LDAP Client Configuration** window, click **Add**.

   c. In the **General** tab of the **Create LDAP Client** window, type the name of the LDAP client configuration, such as `vs0client1`.

   d. Add either the AD domain or the AD servers.



   e. Click **Binding**, and specify the authentication level, the Bind user and password, the base DN, and the port.



f. Click **Save and Close**.

A new client is created and available for the SVM to use.

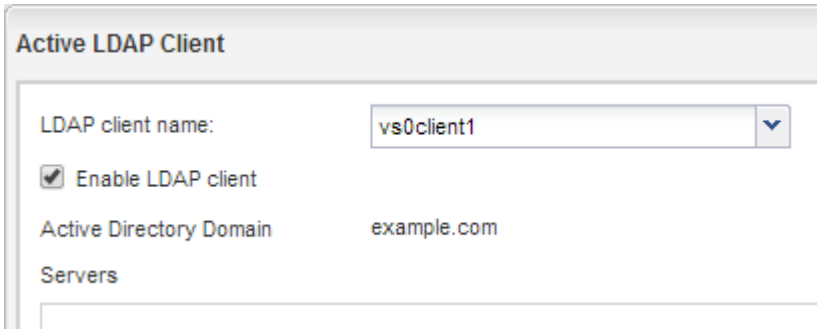
5. Enable the new LDAP client for the SVM:

   a. In the navigation pane, click **LDAP Configuration**.

   b. Click **Edit**.

   c. Ensure that the client you just created is selected in **LDAP client name**.

   d. Select **Enable LDAP client**, and click **OK**.



The SVM uses the new LDAP client.

6. Give LDAP priority over other sources of user information, such as Network Information Service (NIS) and local users and groups:

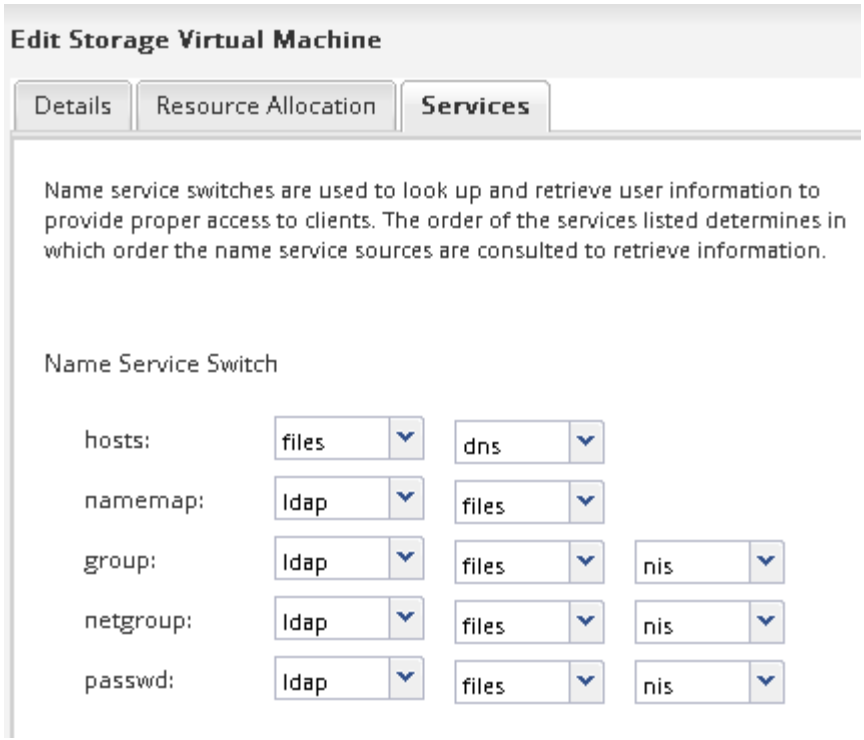
   a. Navigate to the **SVMs** window.

   b. Select the SVM and click **Edit**.

   c. Click the **Services** tab.

   d. Under **Name Service Switch**, specify **LDAP** as the preferred name service switch source for the database types.

   e. Click **Save and Close**.



+ LDAP is the primary source of user information for name services and name mapping on this SVM.

Verify NFS access from a UNIX administration host

After you configure NFS access to storage virtual machine (SVM), you should verify the configuration by logging in to an NFS administration host and reading data from and writing data to the SVM.

Before you begin

- The client system must have an IP address that is allowed by the export rule you specified earlier.
- You must have the login information for the root user.

Steps

1. Log in as the root user to the client system.
2. Enter `cd /mnt/` to change the directory to the mount folder.
3. Create and mount a new folder using the IP address of the SVM:
   a. Enter `mkdir /mnt/folder` to create a new folder.
   b. Enter `mount -t nfs -o nfsvers=3,hard IPAddress:/volume_name /mnt/folder` to mount the volume at this new directory.
   c. Enter `cd folder` to change the directory to the new folder.

   The following commands create a folder named test1, mount the vol1 volume at the 192.0.2.130 IP address on the test1 mount folder, and change to the new test1 directory:

```
host# mkdir /mnt/test1
host# mount -t nfs -o nfsvers=3,hard 192.0.2.130:/vol1 /mnt/test1
host# cd /mnt/test1
```

4. Create a new file, verify that it exists, and write text to it:
   a. Enter `touch filename` to create a test file.
   b. Enter `ls -l filename` to verify that the file exists.
   c. Enter `cat >filename`, type some text, and then press Ctrl+D to write text to the test file.
   d. Enter `cat filename` to display the content of the test file.
   e. Enter `rm filename` to remove the test file.
   f. Enter `cd ..` to return to the parent directory.

```
host# touch myfile1
host# ls -l myfile1
-rw-r--r-- 1 root root 0 Sep 18 15:58 myfile1
host# cat >myfile1
This text inside the first file
host# cat myfile1
This text inside the first file
host# rm -r myfile1
host# cd ..
```

Results

You have confirmed that you have enabled NFS access to the SVM.

Configure and verify NFS client access (Configure NFS access to an existing SVM)

When you are ready, you can give select clients access to the share by setting UNIX file permissions on a UNIX administration host and adding an export rule in System Manager. Then you should test that the affected users or groups can access the volume.

Steps

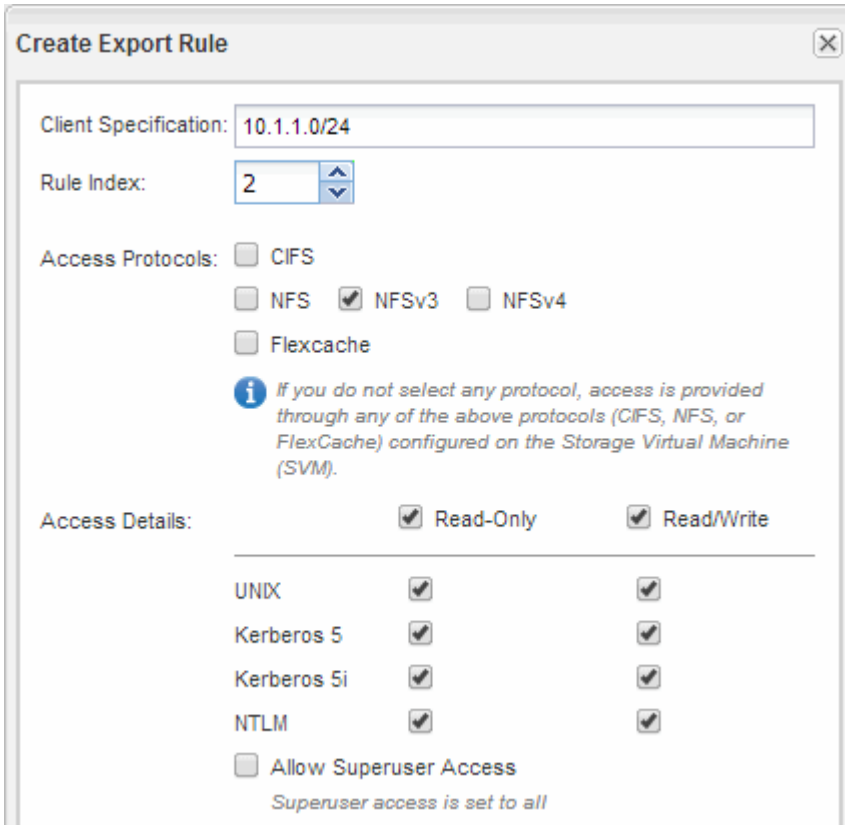
1. Decide which clients and users or groups will be given access to the share.
2. On a UNIX administration host, use the root user to set UNIX ownership and permissions on the volume.
3. In System Manager, add rules to the export policy to permit NFS clients to access the share.
   a. Select the storage virtual machine (SVM), and click **SVM Settings**.
   b. In the **Policies** pane, click **Export Policies**.
   c. Select the export policy with the same name as the volume.
   d. In the **Export Rules** tab, click **Add**, and specify a set of clients.
   e. Select **2** for the **Rule Index** so that this rule executes after the rule that allows access to the

administration host.

f. Select **NFSv3**.

g. Specify the access details that you want, and click **OK.**

You can give full read/write access to clients by typing the subnet `10.1.1.0/24` as the **Client Specification**, and selecting all the access check boxes except **Allow Superuser Access**.



4. On a UNIX client, log in as one of the users who now has access to the volume, and verify that you can mount the volume and create a file.

Add an NFS volume to an NFS-enabled SVM

Adding an NFS volume to an NFS-enabled SVM involves creating and configuring a volume, creating an export policy, and verifying access from a UNIX administration host. You can then configure NFS client access.

Before you begin

NFS must be completely set up on the SVM.

Create and configure a volume

You must create a FlexVol volume to contain your data. You can optionally change the volume's default security style, which is inherited from the security style of the root volume. You can also optionally change the volume's default location in the namespace, which is at the root volume of the storage virtual machine (SVM).

Steps

1. Navigate to the **Volumes** window.
2. Click **Create** > **Create FlexVol**.

   The Create Volume dialog box is displayed.

3. If you want to change the default name, which ends in a date and time stamp, specify a new name, such as `vol1`.
4. Select an aggregate for the volume.
5. Specify the size of the volume.
6. Click **Create**.

   Any new volume created in System Manager is mounted by default at the root volume using the volume name as the junction name. NFS clients use the junction path and the junction name when mounting the volume.

7. If you do not want the volume to be located at the root of the SVM, modify the place of the new volume in the existing namespace:

   a. Navigate to the **Namespace** window.

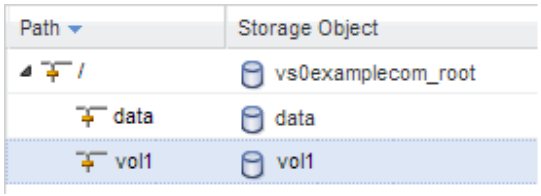
   b. Select the **SVM** from the drop-down menu.

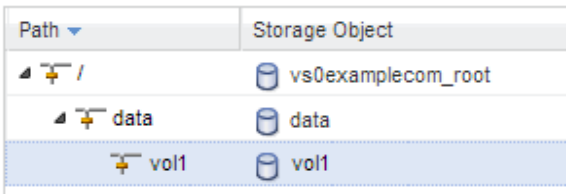
   c. Click **Mount**.

   d. In the **Mount Volume** dialog box, specify the volume, the name of its junction path, and the junction path on which you want the volume mounted.

   e. Verify the new junction path in the **Namespace** window.

      If you want to organize certain volumes under a main volume named “data”, you can move the new volume “vol1” from the root volume to the “data” volume.



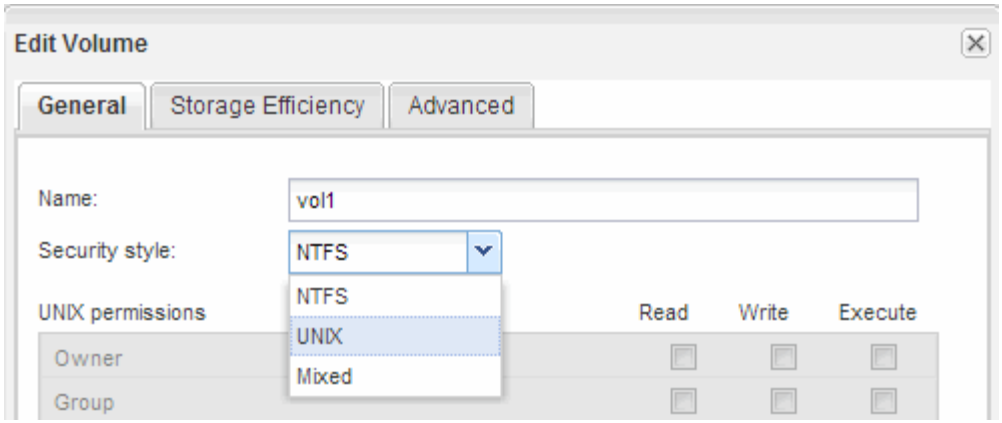


8. Review the volume’s security style and change it, if necessary:

   a. In the **Volume** window, select the volume you just created, and click **Edit**.

      The Edit Volume dialog box is displayed, showing the volume’s current security style, which is inherited from the security style of the SVM root volume.

   b. Make sure the security style is UNIX.

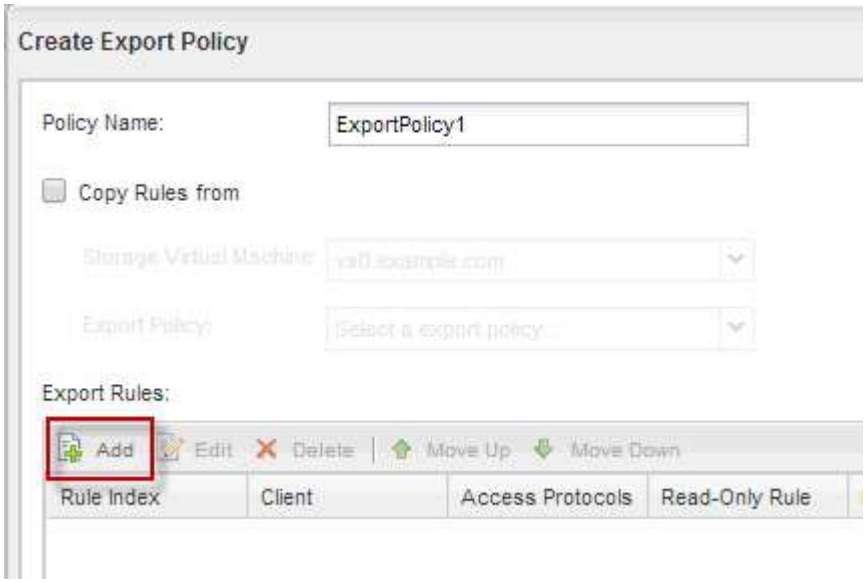


Create an export policy for the volume

Before any NFS clients can access a volume, you must create an export policy for the volume, add a rule that permits access by an administration host, and apply the new export policy to the volume.

Steps

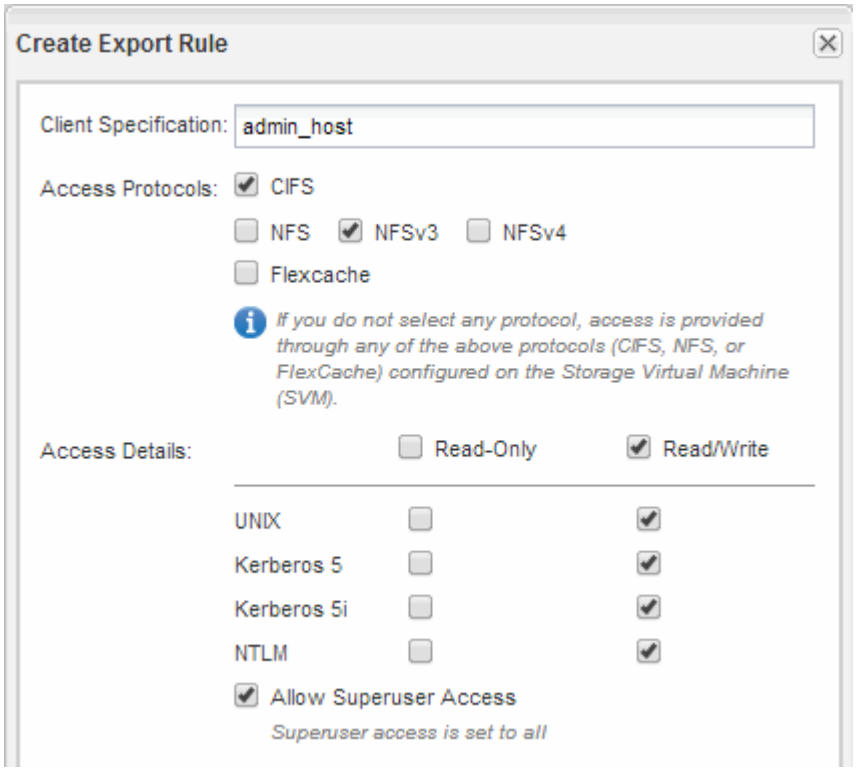
1. Navigate to the **SVMs** window.
2. Click the **SVM Settings** tab.
3. Create a new export policy:
   a. In the **Policies** pane, click **Export Policies** and then click **Create**.
   b. In the **Create Export Policy** window, specify a policy name.
   c. Under **Export Rules**, click **Add** to add a rule to the new policy.



4. In the **Create Export Rule** dialog box, create a rule that allows an administrator full access to the export through all protocols:
   a. Specify the IP address or client name, such as admin_host, from which the exported volume will be administered.

b. Select **NFSv3**.

c. Ensure that all **Read/Write** access details are selected, as well as **Allow Superuser Access**.



d. Click **OK** and then click **Create**.

The new export policy is created, along with its new rule.

5. Apply the new export policy to the new volume so that the administrator host can access the volume:

   a. Navigate to the **Namespace** window.

   b. Select the volume and click **Change Export Policy**.

   c. Select the new policy and click **Change**.

Related information

Verifying NFS access from a UNIX administration host

Verify NFS access from a UNIX administration host

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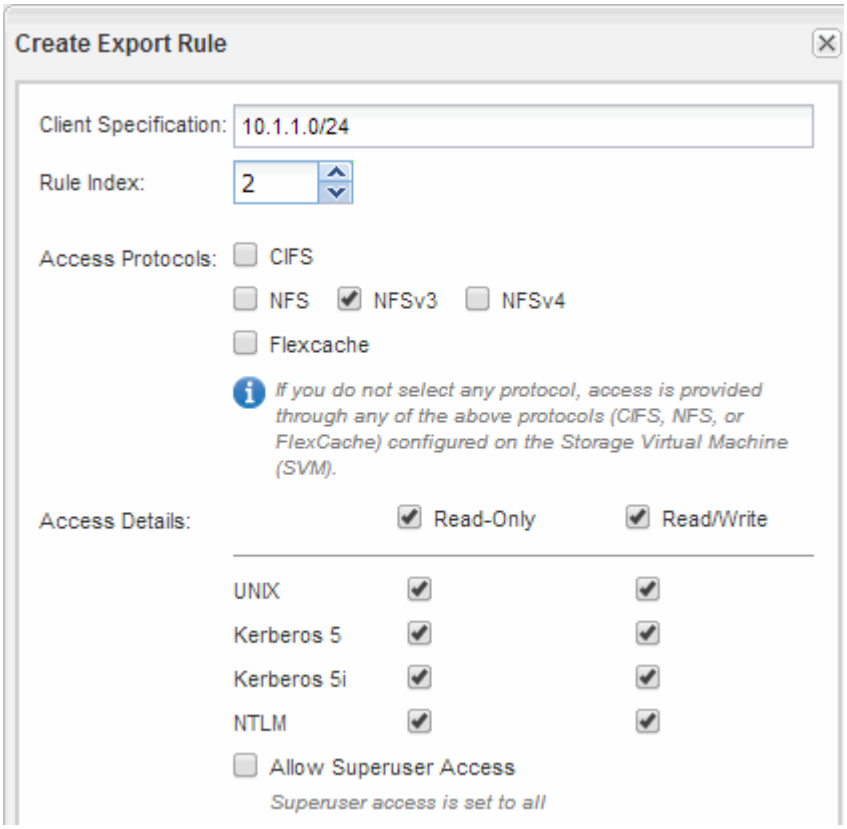

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