# Manage NAS protocols with System Manager

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# Table of Contents


Manage NAS protocols with System Manager . . . 1
- NAS management overview with System Manager . . . 1
- Provision NFS storage for VMware datastores . . . 1
- Provision NAS storage for home directories . . . 2
- Provision NAS storage for Linux servers using NFS . . . 3
- Manage access using export policies . . . 5
- Provision NAS storage for Windows servers using SMB . . . 5
- Provision NAS storage for both Windows and Linux using both NFS and SMB . . . 8
- Secure client access with Kerberos . . . 10
- Provide client access with name services . . . 11
- Manage directories and files . . . 12
- Manage host-specific users and groups with System Manager . . . 12
- Monitor NFS active clients . . . 15
- Enable NAS storage . . . 16

# Manage NAS protocols with System Manager

## NAS management overview with System Manager

The topics in this section show you how to configure and manage NAS environments with System Manager in ONTAP 9.7 and later releases.

If you are using the classic System Manager (available only in ONTAP 9.7 and earlier), see these topics:

- NFS configuration overview
- SMB configuration overview

System Manager supports workflows for:

- Initial configuration of clusters that you intend to use for NAS file services.
- Additional volume provisioning for changing storage needs.
- Configuration and maintenance for industry-standard authentication and security facilities.

Using System Manager, you can manage NAS services at the component level:

- Protocols – NFS, SMB, or both (NAS multiprotocol)
- Name services – DNS, LDAP, and NIS
- Name service switch
- Kerberos security
- Exports and shares
- Qtrees
- Name mapping of users and groups

## Provision NFS storage for VMware datastores

Before using Virtual Storage Console for VMware vSphere (VSC) to provision NFS volumes on an ONTAP based storage system for ESXi hosts, enable NFS using System Manager for ONTAP 9.7 or later.

After creating an NFS-enabled storage VM in System Manager, you then provision NFS volumes and manage datastores using VSC.

Beginning with VSC 7.0, VSC is part of the ONTAP Tools for VMware vSphere virtual appliance, which includes VSC, vStorage APIs for Storage Awareness (VASA) Provider, and Storage Replication Adapter (SRA) for VMware vSphere capabilities.

Be sure to check the NetApp Interoperability Matrix to confirm compatibility between your current ONTAP and VSC releases.

To set up NFS access for ESXi hosts to datastores using System Manager Classic (for ONTAP 9.7 and earlier releases), see NFS configuration for ESXi using VSC overview

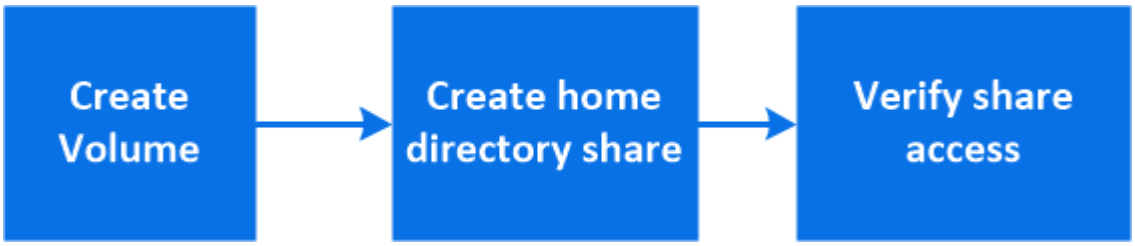
For more information, see TR-4597: VMware vSphere for ONTAP and the documentation for your VSC

release.

# Provision NAS storage for home directories

Create volumes to provide storage for home directories using the SMB protocol.

This procedure creates new volumes for home directories on an existing SMB-enabled storage VM. You can accept systems defaults when configuring volumes or specify custom configurations.




You can create FlexVol volumes, or for large file systems with high performance requirements, you can create FlexGroup volumes. See also Provision NAS storage for large file systems using FlexGroup volumes.

You can also save the specifications of this volume to an Ansible Playbook. For more details, go to Use Ansible Playbooks to add or edit volumes or LUNs.

**Steps**

1. Add a new volume in an SMB-enabled storage VM.
   a. Click **Storage > Volumes** and then click **Add**.
   b. Enter a name, select the storage VM, and enter a size.

      Only storage VMs configured with the SMB protocol are listed. If only one storage VM configured with the SMB protocol is available, the **Storage VM** field is not shown.

      - If you click **Save** at this point, System Manager uses system defaults to create and add a FlexVol volume.
      - You can click **More options** to customize the configuration of the volume to enable services such as authorization, quality of service, and data protection. Refer to Customize the volume configuration, then return here to complete the following steps.
2. Click **Storage > Shares**, click **Add**, and select **Home Directory**.
3. On a Windows client, do the following to verify that the share is accessible.
   a. In Windows Explorer, map a drive to the share in the following format:
      `\\_SMB_Server_Name__Share_Name_`

      If the share name was created with variables (%w, %d, or %u), be sure to test access with a resolved name.

   b. On the newly created drive, create a test file, and then delete the file.

## Customize the volume configuration

You can customize the volume configuration when you add volumes instead of accepting the system defaults.

**Procedure**

After clicking **More options**, select the functionality you need and enter the required values.

- Cache for remote volume.
- Performance service level (quality of service, QoS).

  Beginning with ONTAP 9.8, you can specify a Custom QoS policy or disable QoS, in addition to the default Value selection.

  - To disable QoS, select **Custom**, **Existing**, then **none**.
  - If you select **Custom** and specify an existing service level, a local tier is automatically chosen.
  - Beginning with ONTAP 9.9.1, if you choose to create a custom performance service level, you can use System Manager to manually select the local tier (**Manual placement**) on which you want to place the volume you are creating.

    This option is not available if you select the remote cache or FlexGroup volume options.

- FlexGroup volumes (select **Distribute volume data across the cluster**).

  This option is not available if you previously selected **Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.

- Access permissions for the protocols for which the volume is configured.
- Data protection with SnapMirror (local or remote), then specify the protection policy and settings for the destination cluster from the pull-down lists.
- Click **Save** to create the volume and add it to the cluster and storage VM.

After you save the volume, return to Step 2 in the workflow to complete provisioning for home directories.

# Provision NAS storage for Linux servers using NFS

## Create volumes to provide storage for Linux servers using the NFS protocol with ONTAP System Manager (9.7 and later).

This procedure creates new volumes on an existing NFS-enabled storage VM. You can accept system defaults when configuring volumes or specify custom configurations.

You can create FlexVol volumes, or for large file systems with high performance requirements, you can create FlexGroup volumes. See also Provision NAS storage for large file systems using FlexGroup volumes.

You can also save the specifications of this volume to an Ansible Playbook. For more details, go to Use Ansible Playbooks to add or edit volumes or LUNs.

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

**Steps**

1. Add a new volume in an NFS-enabled storage VM.
   a. Click **Storage > Volumes** and then click **Add**.
   b. Enter a name, select the storage VM, and enter a size.

Only storage VMs configured with the NFS protocol are listed. If only one storage VM configured with the SMB protocol is available, the **Storage VM** field is not shown.

- If you click **Save** at this point, System Manager uses system defaults to create and add a FlexVol volume.

  The default export policy grants full access to all users.

- You can click **More options** to customize the configuration of the volume to enable services such as authorization, quality of service, and data protection. Refer to Customize the volume configuration, then return here to complete the following steps.

2. On a Linux client, do the following to verify access.

   a. Create and mount the volume using the network interface of the storage VM.

   b. On the newly mounted volume, create a test file, write text to it, and then delete the file.

After verifying access, you can restrict client access with the volume's export policy and set any desired UNIX ownership and permissions on the mounted volume.

## Customize the volume configuration

You can customize the volume configuration when you add volumes instead of accepting the system defaults.

**Procedure**

After clicking **More options**, select the functionality you need and enter the required values.

- Cache for remote volume.
- Performance service level (quality of service, QoS).

  Beginning with ONTAP 9.8, you can specify a Custom QoS policy or disable QoS, in addition to the default Value selection.

  - To disable QoS, select **Custom**, **Existing**, then **none**.
  - If you select **Custom** and specify an existing service level, a local tier is automatically chosen.
  - Beginning with ONTAP 9.9.1, if you choose to create a custom performance service level, you can use System Manager to manually select the local tier (**Manual placement**) on which you want to place the volume you are creating.

    This option is not available if you select the remote cache or FlexGroup volume options.

- FlexGroup volumes (select **Distribute volume data across the cluster**).

  This option is not available if you previously selected **Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.

- Access permissions for the protocols for which the volume is configured.
- Data protection with SnapMirror (local or remote), then specify the protection policy and settings for the destination cluster from the pull-down lists.
- Click **Save** to create the volume and add it to the cluster and storage VM.

After you save the volume, return to Step 2 in the workflow to complete provisioning for Linux servers using NFS.

### Other ways to do this in ONTAP

| To perform this task with… | Refer to… |
|---|---|
| System Manager Classic (ONTAP 9.7 and earlier) | NFS configuration overview |
| The ONTAP command line interface (CLI) | NFS configuration overview with the CLI |

# Manage access using export policies

Enable Linux client access to NFS servers by using export policies.

This procedure creates or modifies export policies for an existing NFS-enabled storage VM.

**Steps**

1. In System Manager, Click **Storage** > **Volumes**.
2. Click an NFS-enabled volume and click **More**.
3. Click **Edit Export Policy** and then click **Select an existing policy** or **Add a new policy**.

# Provision NAS storage for Windows servers using SMB

Create volumes to provide storage for Windows servers using the SMB protocol using System Manager, which is available with ONTAP 9.7 and later.

This procedure creates new volumes on an existing SMB-enabled storage VM and creates a share for the volume root (/) directory. You can accept systems defaults when configuring volumes or specify custom configurations. After initial SMB configuration, you can also create additional shares and modify their properties.

You can create FlexVol volumes, or for large file systems with high performance requirements, you can create FlexGroup volumes. See also Provision NAS storage for large file systems using FlexGroup volumes.

You can also save the specifications of this volume to an Ansible Playbook. For more details, go to Use Ansible Playbooks to add or edit volumes or LUNs.

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

**Steps**

1. Add a new volume in an SMB-enabled storage VM.
   a. Click **Storage > Volumes** and then click **Add**.
   b. Enter a name, select the storage VM, and enter a size.

      Only storage VMs configured with the SMB protocol are listed. If only one storage VM configured with the SMB protocol is available, the **Storage VM** field is not shown.

      - If you click **Save** at this point, System Manager uses system defaults to create and add a FlexVol volume.

        - You can click **More options** to customize the configuration of the volume to enable services such as authorization, quality of service, and data protection. Refer to Customize the volume configuration, then return here to complete the following steps.

2. Switch to a Windows client to verify that the share is accessible.
   a. In Windows Explorer, map a drive to the share in the following format: `\\_SMB_Server_Name__Share_Name_`
   b. On the newly created drive, create a test file, write text to it, and then delete the file.

After verifying access, you can restrict client access with the share ACL and set any desired security properties on the mapped drive. See Create an SMB share for more information.

## Add or modify shares

You can add additional shares after initial SMB configuration. Shares are created with default values and properties you select. These can be modified later.

You can set the following share properties when configuring a share:

- Access permissions
- Share properties
  - Enable continuous availability to shares that contain Hyper-V and SQL Server over SMB data (beginning with ONTAP 9.10.1). See also:
    - Continuously available share requirements for Hyper-V over SMB
    - Continuously available share requirements for SQL Server over SMB
  - Encrypt data with SMB 3.0 while accessing this share.

After initial configuration, you can also modify these properties:

- Symbolic links
  - Enable or disable symlinks and widelinks
- Share properties
  - Allow clients to access Snapshot copies directory.
  - Enable oplocks, allowing clients to lock files and cache content locally (default).
  - Enable access-based enumeration (ABE) to display shared resources based on the access permissions of the user.

**Procedures**

To add a new share in an SMB-enabled volume, click **Storage > Shares**, click **Add**, and select **Share**.

To modify an exisitng share, click **Storage > Shares**, then click the ⋮ and select **Edit**.

## Customize the volume configuration

You can customize the volume configuration when you add volumes instead of accepting the system defaults.

**Procedure**

After clicking **More options**, select the functionality you need and enter the required values.

- Cache for remote volume.
- Performance service level (quality of service, QoS).

  Beginning with ONTAP 9.8 you can specify a Custom QoS policy or disable QoS, in addition to the default value selection.

  - To disable QoS, select **Custom**, **Existing**, then **none**.
  - If you select **Custom** and specify an existing service level, a local tier is automatically chosen.
  - Beginning with ONTAP 9.9.1, if you choose to create a custom performance service level, you can use System Manager to manually select the local tier (**Manual placement**) on which you want to place the volume you are creating.

    This option is not available if you select the remote cache or FlexGroup volume options.

- FlexGroup volumes (select **Distribute volume data across the cluster**).

  This option is not available if you previously selected **Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.

  **This option is not available if you previously selected *Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.
  **Access permission for the protocols for which the volume is configured.**
  ***Data protection with SnapMirror (local or remote), then specify the protection policy and settings for the destination cluster from the pull-down lists.**
  ***Click *Save** to create the volume and add it to the cluster and storage VM.

You can customize the volume configuration when you add volumes instead of accepting the system defaults.

**Procedure**

After clicking **More options**, select the functionality you need and enter the required values.

- Cache for remote volume.
- Performance service level (quality of service, QoS).

  Beginning with ONTAP 9.8, you can specify a Custom QoS policy or disable QoS, in addition to the default Value selection.

  - To disable QoS, select **Custom**, **Existing**, then **none**.
  - If you select **Custom** and specify an existing service level, a local tier is automatically chosen.
  - Beginning with ONTAP 9.9.1, if you choose to create a custom performance service level, you can use System Manager to manually select the local tier (**Manual placement**) on which you want to place the volume you are creating.

    This option is not available if you select the remote cache or FlexGroup volume options.

- FlexGroup volumes (select **Distribute volume data across the cluster**).

  This option is not available if you previously selected **Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.

- Access permissions for the protocols for which the volume is configured.

- Data protection with SnapMirror (local or remote), then specify the protection policy and settings for the destination cluster from the pull-down lists.
- Click **Save** to create the volume and add it to the cluster and storage VM.

After you save the volume, return to Step 2 in the workflow to complete provisioning for Windows servers using SMB.

### Other ways to do this in ONTAP

| To perform this task with… | Refer to… |
|---|---|
| System Manager Classic (ONTAP 9.7 and earlier) | SMB configuration overview |
| The ONTAP command line interface | SMB configuration overview with the CLI |

# Provision NAS storage for both Windows and Linux using both NFS and SMB

Create volumes to provide storage for clients using either the NFS or SMB protocol.

This procedure creates new volumes on an existing storage VM enabled for both NFS and SMB protocols.

You can create FlexVol volumes, or for large file systems with high performance requirements, you can create FlexGroup volumes. See also Provision NAS storage for large file systems using FlexGroup volumes.

You can also save the specifications of this volume to an Ansible Playbook. For more details, go to Use Ansible Playbooks to add or edit volumes or LUNs.

**Steps**

1. Add a new volume in a storage VM enabled for both NFS and SMB.

   a. Click **Storage > Volumes** and then click **Add**.

   b. Enter a name, select the storage VM, and enter a size. Only storage VMs configured with both the NFS and SMB protocols are listed. If only one storage VM configured with the NFS and SMB protocols is available, the **Storage VM** field is not shown.

   c. Click **More Options** and select **Share via NFS**.

      The default setting grants full access to all users. You can add more restrictive rules to the export policy later.

   d. Select **Share via SMB**.

      The share is created with a default Access Control List (ACL) set to "Full Control" for the **Everyone** group. You can add restrictions to the ACL later.

   e. If you click **Save** at this point, System Manager uses system defaults to create and add a FlexVol

volume.

Alternatively, you can continue to enable any additional required services such as authorization, quality of service, and data protection. Refer to Customize the volume configuration, then return here to complete the following steps.

2. On a Linux client, verify that the export is accessible.
   a. Create and mount the volume using the network interface of the storage VM.
   b. On the newly mounted volume, create a test file, write text to it, and then delete the file.
3. On a Windows client, do the following to verify that the share is accessible.
   a. In Windows Explorer, map a drive to the share in the following format: `\\_SMB_Server_Name__Share_Name_`
   b. On the newly created drive, create a test file, write text to it, and then delete the file.

After verifying access, you can restrict client access with the volume's export policy, restrict client access with the share ACL, and set any desired ownership and permissions on the exported and shared volume.

## Customize the volume configuration

You can customize the volume configuration when you add volumes instead of accepting the system defaults.

**Procedure**

After clicking **More options**, select the functionality you need and enter the required values.

- Cache for remote volume.
- Performance service level (quality of service, QoS).

  Beginning with ONTAP 9.8, you can specify a Custom QoS policy or disable QoS, in addition to the default Value selection.

  - To disable QoS, select **Custom**, **Existing**, then **none**.
  - If you select **Custom** and specify an existing service level, a local tier is automatically chosen.
  - Beginning with ONTAP 9.9.1, if you choose to create a custom performance service level, you can use System Manager to manually select the local tier (**Manual placement**) on which you want to place the volume you are creating.

    This option is not available if you select the remote cache or FlexGroup volume options.

- FlexGroup volumes (select **Distribute volume data across the cluster**).

  This option is not available if you previously selected **Manual placement** under **Performance Service Level**. Otherwise, the volume you are adding becomes a FlexVol volume by default.

- Access permissions for the protocols for which the volume is configured.
- Data protection with SnapMirror (local or remote), then specify the protection policy and settings for the destination cluster from the pull-down lists.
- Click **Save** to create the volume and add it to the cluster and storage VM.

After you save the volume, return to Step 2 in the workflow to complete multiprotocol provisioning for Windows and Linux servers.

### Other ways to do this in ONTAP

| To perform these tasks with… | See this content… |
|---|---|
| System Manager Classic (ONTAP 9.7 and earlier) | SMB and NFS multiprotocol configuration overview |
| The ONTAP command line interface | SMB configuration overview with the CLI<br>NFS configuration overview with the CLI<br>What the security styles and their effects are<br>Case-sensitivity of file and directory names in a multiprotocol environment |

# Secure client access with Kerberos

Enable Kerberos to secure storage access for NAS clients.

This procedure configures Kerberos on an existing storage VM enabled for NFS or SMB.

Before beginning you should have configured DNS, NTP, and LDAP on the storage system.

**Steps**

1. At the ONTAP command line, set UNIX permissions for the storage VM root volume.
   a. Display the relevant permissions on the storage VM root volume: `volume show -volume` *`root_vol_name`*`-fields user,group,unix-permissions`

      The root volume of the storage VM must have the following configuration:

      | Name… | Setting… |
      |---|---|
      | UID | root or ID 0 |
      | GID | root or ID 0 |
      | UNIX permissions | 755 |

   b. If these values are not shown, use the `volume modify` command to update them.
2. Set user permissions for the storage VM root volume.
   a. Display the local UNIX users: `vserver services name-service unix-user show -vserver` *`vserver_name`*

      The storage VM should have the following UNIX users configured:

      | User name | User ID | Primary group ID |
      |---|---|---|
      | nfs | 500 | 0 |
      | root | 0 | 0 |

      **Note:** The NFS user is not required if a Kerberos-UNIX name mapping exists for the SPN of the NFS

client user; see step 5.

b. If these values are not shown, use the `vserver services name-service unix-user modify` command to update them.

3. Set group permissions for the storage VM root volume.

a. Display the local UNIX groups: `vserver services name-service unix-group show -vserver vserver_name`

The storage VM should have the following UNIX groups configured:

| Group name | Group ID |
|---|---|
| daemon | 1 |
| root | 0 |

b. If these values are not shown, use the `vserver services name-service unix-group modify` command to update them.

4. Switch to System Manager to configure Kerberos
5. In System Manager, click **Storage > Storage VMs** and select the storage VM.
6. Click **Settings**.
7. Click → under Kerberos.
8. Click **Add** under Kerberos Realm, and complete the following sections:
   - Add Kerberos Realm

     Enter configuration details depending on KDC vendor.

   - Add Network Interface to Realm

     Click **Add** and select a network interface.

9. If desired, add mappings from Kerberos principal names to local user names.

a. Click **Storage > Storage VMs** and select the storage VM.

b. Click **Settings**, and then click → under **Name Mapping**.

c. Under **Kerberos to UNIX**, add patterns and replacements using regular expressions.

# Provide client access with name services

## Enable ONTAP to look up host, user, group, or netgroup information using LDAP or NIS to authenticate NAS clients.

This procedure creates or modifies LDAP or NIS configurations on an existing storage VM enabled for NFS or SMB.

For LDAP configurations, you should have the LDAP configuration details required in your environment and you should be using a default ONTAP LDAP schema.

**Steps**

1. Configure the required service: click **Storage > Storage VMs**.
2. Select the storage VM, click **Settings**, and then click for LDAP or NIS.
3. Include any changes in the name services switch: click under Name Services Switch.

# Manage directories and files

Expand the System Manager volume display to view and delete directories and files.

Beginning with ONTAP 9.9.1, directories are deleted with low-latency fast directory delete functionality.

For more information about viewing file systems in ONTAP 9.9.1 and later, see File System Analytics overview.

**Step**

1. 1. Click **Storage > Volumes**. Then expand a volume to view its contents.

# Manage host-specific users and groups with System Manager

Beginning with ONTAP 9.10.1, you can use System Manager to manage users and groups that are specific to a UNIX or Windows host.

You can perform the following procedures:

| Windows | UNIX |
| --- | --- |
| • View Windows users and groups<br>• Add, edit, or delete a Windows group<br>• Manage Windows Users | • View UNIX users and groups<br>• Add, edit, or delete a UNIX group<br>• Manage UNIX Users |

## View Windows users and groups

In System Manager, you can view a list of Windows users and groups.

**Steps**

1. In System Manager, click **Storage > Storage VMs**.
2. Select the storage VM, then select the **Settings** tab.
3. Scroll to the **Host Users and Groups** area.

   The **Windows** section displays a summary of the number of users in each group associated with the selected storage VM.

4. Click in the **Windows** section.
5. Click the **Groups** tab, then click next to a group name to view details about that group.
6. To view the users in a group, select the group, then click the **Users** tab.

## Add, edit, or delete a Windows group

In System Manager, you can manage Windows groups by adding, editing, or deleting them.

**Steps**

1. In System Manager, view the list of Windows groups. Refer to View Windows users and groups.
2. On the **Groups** tab, you can manage groups with the following tasks:

| To perform this action… | Perform these steps… |
| --- | --- |
| Add a group | 1. Click + Add .<br>2. Enter the group information.<br>3. Specify privileges.<br>4. Specify group members (add local users, domain users, or domain groups). |
| Edit a group | 1. Next to the group name, click ⋮, then click **Edit**.<br>2. Modify the group information. |
| Delete a group | 1. Check the box next to the group or groups you want to delete.<br>2. Click Delete .<br>**Note:** You can also delete a single group by clicking ⋮ next to the group name, then clicking **Delete**. |

## Manage Windows Users

In System Manager, you can manage Windows users by adding, editing, deleting, enabling, or disabling them. You can also change the password of a Windows user.

**Steps**

1. In System Manager, view the list of users for the group. Refer to View Windows users and groups.
2. On the **Users** tab, you can manage users with the following tasks:

| To perform this action… | Perform these steps… |
| --- | --- |
| Add a user | 1. Click + Add .<br>2. Enter the user information. |
| Edit a user | 1. Next to the user name, click ⋮, then click **Edit**.<br>2. Modify the user information. |

| | |
|---|---|
| Delete a user | 1. Check the box next to the user or users you want to delete.<br>2. Click Delete .<br><br>**Note:** You can also delete a single user by clicking ⋮ next to the user name, then clicking **Delete**. |
| Change user password | 1. Next to the user name, click ⋮, then click **Change Password**.<br>2. Enter the new password and confirm it. |
| Enable a user | 1. Check the box next to each disabled user you want to enable.<br>2. Click Enable . |
| Disable a users | 1. Check the box next to each enabled user you want to disable.<br>2. Click Disable . |

## View UNIX users and groups

In System Manager, you can view a list of UNIX users and groups.

**Steps**

1. In System Manager, click **Storage > Storage VMs**.
2. Select the storage VM, then select the **Settings** tab.
3. Scroll to the **Host Users and Groups** area.

   The **UNIX** section displays a summary of the number of users in each group associated with the selected storage VM.

4. Click → in the **UNIX** section.
5. Click the **Groups** tab to view details about that group.
6. To view the users in a group, select the group, then click the **Users** tab.

## Add, edit, or delete a UNIX group

In System Manager, you can manage UNIX groups by adding, editing, or deleting them.

**Steps**

1. In System Manager, view the list of UNIX groups. Refer to View UNIX users and groups.
2. On the **Groups** tab, you can manage groups with the following tasks:

| To perform this action… | Perform these steps… |
|---|---|

| | |
|---|---|
| Add a group | 1. Click + Add .<br>2. Enter the group information.<br>3. (Optional) Specify associated users. |
| Edit a group | 1. Select the group.<br>2. Click Edit .<br>3. Modify the group information.<br>4. (Optional) Add or remove users. |
| Delete a group | 1. Select the group or groups you want to delete.<br>2. Click Delete . |

### Manage UNIX Users

In System Manager, you can manage Windows users by adding, editing, or deleting them.

**Steps**

1. In System Manager, view the list of users for the group. Refer to View UNIX users and groups.
2. On the **Users** tab, you can manage users with the following tasks:

| To perform this action… | Perform these steps… |
|---|---|
| Add a user | 1. Click + Add .<br>2. Enter the user information. |
| Edit a user | 1. Select the user you want to edit.<br>2. Click Edit .<br>3. Modify the user information. |
| Delete a user | 1. Select the user or users you want to delete.<br>2. Click Delete . |

# Monitor NFS active clients

Beginning with ONTAP 9.8, System Manager shows which NFS client connections are active when NFS is licensed on a cluster.

This allows you to quickly verify which NFS clients are actively connect to a storage VM, which are connected but idle, and which are disconnected.

For each NFS client IP address, the **NFS Clients** display shows:
* Time of last access
* Network interface IP address
* NFS connection version

* Storage VM name

In addition, a list of NFS clients active in the last 48 hours is also shown in the **Storage>Volumes** display and a count of NFS clients is includes in the **Dashboard** display.

**Step**

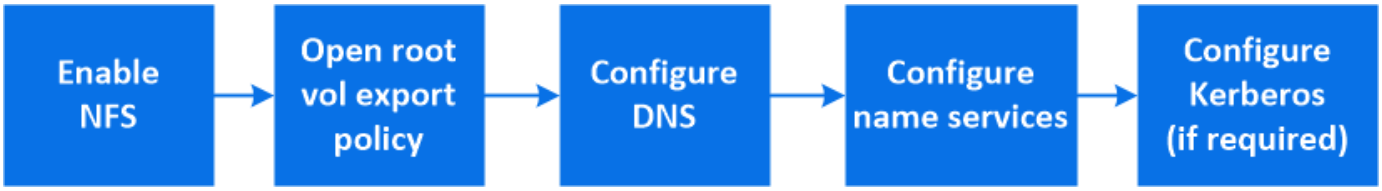
1. Display NFS client activity: Click **Hosts > NFS Clients**.

# Enable NAS storage

## Enable NAS storage for Linux servers using NFS

Modify storage VMs to enable NFS servers for serving data to Linux clients.

This procedure enables an existing storage VM. It is assumed that configuration details are available for any authentication or security services required in your environment.



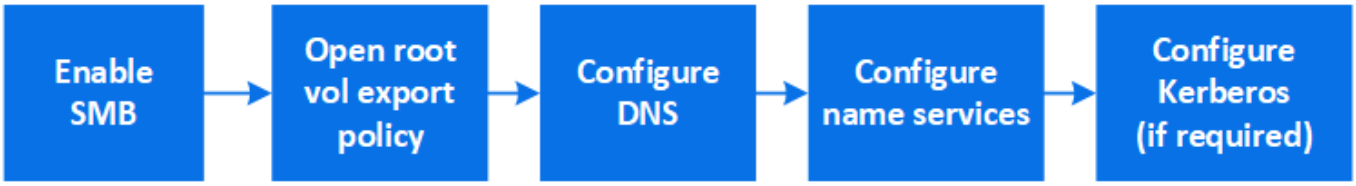

**Steps**

1. Enable NFS on an existing VM: click **Storage > Storage VMs**, select a storage VM, click **Settings**, and then click ⚙ under **NFS**.
2. Open the export policy of the storage VM root volume:
   a. Click **Storage > Volumes**, select the root volume of the storage VM (which by default is *volume-name* _root), and then click on the policy that is displayed under **Export Policy**.
   b. Click **Add** to add a rule.
      - Client specification = `0.0.0.0/0`
      - Access protocols = NFS
      - Access details = UNIX Read-Only
3. Configure DNS for host-name resolution: click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click ⚙ under **DNS**.
4. Configure name services as required.
   a. Click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click for ⚙ LDAP or NIS.
   b. Include any changes in the name services switch file: click ✎ in the Name Services Switch tile.
5. Configure Kerberos if required:
   a. Click **Storage > Storage VMs**, select the storage VM, and then click **Settings**.
   b. Click → in the Kerberos tile and then click **Add**.

## Enable NAS storage for Windows servers using SMB

Modify storage VMs to enable SMB servers for serving data to Windows clients.

This procedure enables an existing storage VM. It is assumed that configuration details are available for any authentication or security services required in your environment.



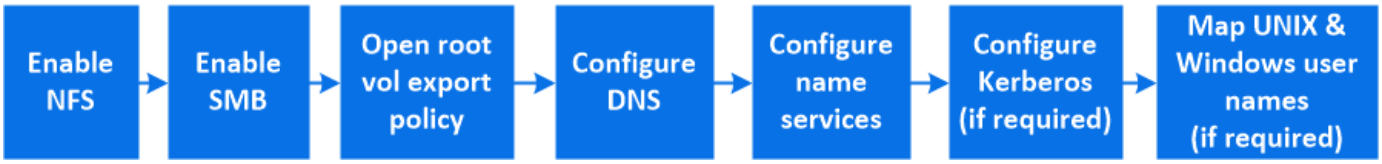

**Steps**

1. Enable SMB on an existing VM: click **Storage > Storage VMs**, select a storage VM, click **Settings**, and then click ⚙ under **SMB**.
2. Open the export policy of the storage VM root volume:
   a. Click **Storage > Volumes**, select the root volume of the storage VM (which by default is *volume-name_root*), and then click on the policy that is displayed under **Export Policy**.
   b. Click **Add** to add a rule.
      - Client specification = `0.0.0.0/0`
      - Access protocols = SMB
      - Access details = NTFS Read-Only
3. Configure DNS for host-name resolution:
   a. Click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click ⚙ under **DNS**.
   b. Switch to the DNS server and map the SMB server.
      - Create forward (A - Address record) and reverse (PTR - Pointer record) lookup entries to map the SMB server name to the IP address of the data network interface.
      - If you use NetBIOS aliases, create an alias canonical name (CNAME resource record) lookup entry to map each alias to the IP address of the SMB server's data network interface.
4. Configure name services as required
   a. Click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click ⚙ under **LDAP** or **NIS**.
   b. Include any changes in the name services switch file: click ✎ under **Name Services Switch**.
5. Configure Kerberos if required:
   a. Click **Storage > Storage VMs**, select the storage VM, and then click **Settings**.
   b. Click → under **Kerberos** and then click **Add**.

## Enable NAS storage for both Windows and Linux using both NFS and SMB

Modify storage VMs to enable NFS and SMB servers to serve data to Linux and Windows clients.

This procedure enables an existing storage VM. It is assumed that configuration details are available for any authentication or security services required in your environment.




**Steps**

1. Enable NFS on an existing VM: click **Storage > Storage VMs**, select a storage VM, click **Settings**, and then click ⚙ under **NFS**.
2. Enable SMB on an existing VM: click ⚙ under **SMB**.
3. Open the export policy of the storage VM root volume:
   a. Click **Storage > Volumes**, select the root volume of the storage VM (which by default is *volume-name_root*), and then click on the policy that is displayed under **Export Policy**.
   b. Click **Add** to add a rule.
      - Client specification = `0.0.0.0/0`
      - Access protocols = NFS
      - Access details = NFS Read-Only
4. Configure DNS for host-name resolution:
   a. Click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click ⚙ under **DNS**.
   b. When DNS configuration is complete, switch to the DNS server and map the SMB server.
      - Create forward (A - Address record) and reverse (PTR - Pointer record) lookup entries to map the SMB server name to the IP address of the data network interface.
      - If you use NetBIOS aliases, create an alias canonical name (CNAME resource record) lookup entry to map each alias to the IP address of the SMB server's data network interface.
5. Configure name services as required:
   a. Click **Storage > Storage VMs**, select the storage VM, click **Settings**, and then click ⚙ for LDAP or NIS.
   b. Include any changes in the name services switch file: click ✎ under **Name Services Switch**.
6. Configure Kerberos if required: click → in the Kerberos tile and then click **Add**.
7. Map UNIX and Windows user names if required: click → under **Name Mapping** and then click **Add**.

   You should use this procedure only if your site has Windows and UNIX user accounts that do not map implicitly, which is when the lowercase version of each Windows user name matches the UNIX user name. This procedure can be done using LDAP, NIS, or local users. If you have two sets of users that do not match, you should configure name mapping.

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