ONTAP® 9

SMB/CIFS Configuration Power Guide

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Deciding whether to use the SMB/CIFS Configuration Power Guide

This guide describes how to use ONTAP 9 CLI commands to configure SMB client access to files contained in a new volume or qtree in a new or existing SVM. It includes examples and advanced configuration options.

Note: SMB (Server Message Block) refers to modern dialects of the Common Internet File System (CIFS) protocol. You will still see CIFS in the ONTAP command-line interface (CLI) and in OnCommand management tools.

You should use this guide if you want to configure SMB access to a volume or qtree in the following way:

• You want to use SMB version 2 or later.
• You want to serve SMB clients only, not NFS clients (not a multiprotocol configuration).
• NTFS file permissions will be used to secure the new volume.
• You have cluster administrator privileges, not SVM administrator privileges. Cluster administrator privileges are required to create SVMs and LIFs. SVM administrator privileges are sufficient for other SMB configuration tasks.
• You want to use the CLI, not OnCommand System Manager or an automated scripting tool. You can use the SMB/CIFS Configuration Express Guide and other Express Guides to support configuration with System Manager, and OnCommand Workflow Automation for automated scripting support.
• You want to use best practices, not explore every available option. Details about command syntax are available from CLI help and ONTAP man pages.
• You do not want to read a lot of conceptual background. Additional information about ONTAP technology and interaction with external services is available in the ONTAP Reference Library and in Technical Reports (TRs).

If this guide is not suitable for your situation, you should see the following documentation instead:

• ONTAP 9 commands
• SMB/CIFS and NFS multiprotocol express configuration
• SMB/CIFS configuration express
• SMB/CIFS management
• Network and LIF management
• NetApp Documentation: OnCommand Workflow Automation (current releases)

OnCommand Workflow Automation enables you to run prepackaged workflows that automate management tasks such as the workflows described in Express Guides.
SMB/CIFS configuration workflow

Configuring SMB involves assessing physical storage and networking requirements, and then choosing a workflow that is specific to your goal: configuring SMB access to a new or existing SVM, or adding a volume or qtree to an existing SVM that is already fully configured for SMB/CIFS access.

1. Assess physical storage requirements.
2. Assess networking requirements.
3. Decide where to provision new storage capacity.
4. Gather configuration values, complete the worksheet.
5. Is an SVM available with SMB configured?
   - No
     - Configure SMB access to an SVM:
       1. Create a new SVM.
       2. Create LIFs.
       3. Configure DNS.
       4. AD domain or workgroup?
          - Configure time services.
          - Create the SMB server in an AD domain.
          - Verify the enabled SMB versions.
          - Map the SMB server in the DNS server.
          - Create the SMB server in a workgroup.
          - Configure local users and groups.
6. Yes
   - Configure SMB client access to shared storage:
     1. Create a volume or a qtree.
     2. Create an SMB share.
     3. Verify SMB client access.
     4. Create SMB share ACLs.
     5. Configure file permissions.
     6. Verify user access.
Assessing physical storage requirements

Before provisioning SMB storage for clients, you must ensure that there is sufficient space in an existing aggregate for the new volume. If there is not, you can add disks to an existing aggregate or create a new aggregate of the desired type.

Steps

1. Display available space in existing aggregates:
   
   **storage aggregate show**
   
   If there is an aggregate with sufficient space, record its name in the worksheet.

   **Example**

   ```plaintext
   cluster::> storage aggregate show
   Aggregate     Size       Available  Used% State   #Vols Nodes  RAID Status
   --------- -------- --------- ----- ------- ------ ------  -----------
   aggr_0     239.0GB   11.13GB   95% online       1 node1  raid_dp, normal
   aggr_1     239.0GB   11.13GB   95% online       1 node1  raid_dp, normal
   aggr_2     239.0GB   11.13GB   95% online       1 node2  raid_dp, normal
   aggr_3     239.0GB   11.13GB   95% online       1 node2  raid_dp, normal
   aggr_4     239.0GB   238.9GB   95% online       5 node3  raid_dp, normal
   aggr_5     239.0GB   239.0GB   95% online       4 node4  raid_dp, normal
   6 entries were displayed.
   ```

2. If there are no aggregates with sufficient space, add disks to an existing aggregate by using the **storage aggregate add-disks** command, or create a new aggregate by using the **storage aggregate create** command.

Assessing networking requirements

Before providing SMB storage to clients, you must verify that networking is correctly configured to meet the SMB provisioning requirements.

Before you begin

The following cluster networking objects must be configured:

- Physical and logical ports
- Broadcast domains
- Subnets (if required)
- IPspaces (as required, in addition to the default IPspace)
- Failover groups (as required, in addition to the default failover group for each broadcast domain)
- External firewalls
Steps

1. Display the available physical and virtual ports:
   
   network port show
   
   • When possible, you should use the port with the highest speed for the data network.
   • All components in the data network must have the same MTU setting for best performance.

2. If you are planning to use a subnet name to allocate the IP address and network mask value for a LIF, verify that the subnet exists and has sufficient addresses available:
   
   network subnet show
   
   Subnets contain a pool of IP addresses that belong to the same layer 3 subnet. Subnets are created by using the network subnet create command.

3. Display available IPspaces:
   
   network ipspace show
   
   You can use the default IPspace or a custom IPspace.

4. If you want to use IPv6 addresses, verify that IPv6 is enabled on the cluster:
   
   network options ipv6 show
   
   If required, you can enable IPv6 by using the network options ipv6 modify command.

Deciding where to provision new SMB/CIFS storage capacity

Before you create a new SMB volume or qtree, you must decide whether to place it in a new or existing SVM, and how much configuration the SVM requires. This decision determines your workflow.

Choices

• If you want to provision a volume or qtree on a new SVM, or on an existing SVM that has SMB enabled but not configured, complete the steps in both “Configuring SMB/CIFS access to an SVM” and “Adding storage capacity to an SMB/CIFS-enabled SVM”.

  Configuring SMB/CIFS access to an SVM on page 14
  Configuring SMB client access to shared storage on page 31

  You might choose to create a new SVM if one of the following is true:

  ◦ You are enabling SMB on a cluster for the first time.
  ◦ You have existing SVMs in a cluster in which you do not want to enable SMB support.
  ◦ You have one or more SMB-enabled SVMs in a cluster, and you want one of the following connections:
    • To a different Active Directory forest or workgroup.
    • To an SMB server in an isolated namespace (multi-tenancy scenario).

  You should also choose this option to provision storage on an existing SVM that has SMB enabled but not configured. This might be the case if you created the SVM for SAN access or if no protocols were enabled when the SVM was created.

  After enabling SMB on the SVM, proceed to provision a volume or qtree.

• If you want to provision a volume or qtree on an existing SVM that is fully configured for SMB access, complete the steps in “Adding storage capacity to an SMB/CIFS-enabled SVM”.

SMB/CIFS configuration workflow | 7
Worksheet for gathering SMB/CIFS configuration information

The SMB configuration worksheet enables you to collect the required information to set up SMB access for clients.

You should complete one or both sections of the worksheet, depending on the decision you made about where to provision storage:

• If you are configuring SMB access to an SVM, you should complete both sections.

  Configuring SMB/CIFS access to an SVM on page 14

  Configuring SMB client access to shared storage on page 31

• If you are adding storage capacity to an SMB-enabled SVM, you should complete only the second section.

  Configuring SMB client access to shared storage on page 31

The command man pages contain details about the parameters.

Configuring SMB access to an SVM

Parameters for creating an SVM

You supply these values with the `vserver create` command if you are creating a new SVM.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>A name you supply for the new SVM that is either a fully qualified domain name (FQDN) or follows another convention that enforces unique SVM names across a cluster.</td>
<td></td>
</tr>
<tr>
<td>-aggregate</td>
<td>The name of an aggregate in the cluster with sufficient space for new SMB storage capacity.</td>
<td></td>
</tr>
<tr>
<td>-rootvolume</td>
<td>A unique name you supply for the SVM root volume.</td>
<td></td>
</tr>
<tr>
<td>-rootvolume-security-style</td>
<td>Use the NTFS security style for the SVM.</td>
<td>ntfs</td>
</tr>
<tr>
<td>-language</td>
<td>Use the default language setting in this workflow.</td>
<td>C.UTF-8</td>
</tr>
<tr>
<td>ipspace</td>
<td>Optional: IPspaces are distinct IP address spaces in which SVMs reside.</td>
<td></td>
</tr>
</tbody>
</table>

Parameters for creating a LIF

You supply these values with the `network interface create` command when you are creating LIFs.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-lif</td>
<td>A name you supply for the new LIF.</td>
<td></td>
</tr>
<tr>
<td>-role</td>
<td>Use the data LIF role in this workflow.</td>
<td>data</td>
</tr>
<tr>
<td>-data-protocol</td>
<td>Use only the SMB protocol in this workflow.</td>
<td>cifs</td>
</tr>
<tr>
<td>-home-node</td>
<td>The node to which the LIF returns when the network interface revert command is run on the LIF.</td>
<td></td>
</tr>
<tr>
<td>-home-port</td>
<td>The port or interface group to which the LIF returns when the network interface revert command is run on the LIF.</td>
<td></td>
</tr>
<tr>
<td>-address</td>
<td>The IPv4 or IPv6 address on the cluster that will be used for data access by the new LIF.</td>
<td></td>
</tr>
<tr>
<td>-netmask</td>
<td>The network mask and gateway for the LIF.</td>
<td></td>
</tr>
<tr>
<td>-subnet</td>
<td>A pool of IP addresses. Used instead of -address and -netmask to assign addresses and netmasks automatically.</td>
<td></td>
</tr>
<tr>
<td>-firewall-policy</td>
<td>Use the default data firewall policy in this workflow.</td>
<td>data</td>
</tr>
<tr>
<td>-auto-revert</td>
<td>Optional: Specifies whether a data LIF is automatically reverted to its home node on startup or under other circumstances. The default setting is false.</td>
<td></td>
</tr>
</tbody>
</table>

**Parameters for DNS host name resolution**

You supply these values with the `vserver services name-service dns create` command when you are configuring DNS.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-domains</td>
<td>Up to five DNS domain names.</td>
<td></td>
</tr>
<tr>
<td>-name-servers</td>
<td>Up to three IP addresses for each DNS name server.</td>
<td></td>
</tr>
</tbody>
</table>

**Setting up an SMB server in an Active Directory domain**

**Parameters for time service configuration**

You supply these values with the `cluster time-service ntp server create` command when you are configuring time services.
Parameters for creating an SMB server in an Active Directory domain

You supply these values with the `vserver cifs create` command when you create a new SMB server and specify domain information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vserver</code></td>
<td>The name of the SVM on which to create the SMB server.</td>
<td></td>
</tr>
<tr>
<td><code>cifs-server</code></td>
<td>The name of the SMB server (up to 15 characters).</td>
<td></td>
</tr>
<tr>
<td><code>domain</code></td>
<td>The fully qualified domain name (FQDN) of the Active Directory domain to associate with the SMB server.</td>
<td></td>
</tr>
<tr>
<td><code>-ou</code></td>
<td>Optional: The organizational unit within the Active Directory domain to associate with the SMB server. By default, this parameter is set to CN=Computers.</td>
<td></td>
</tr>
<tr>
<td><code>-netbios-aliases</code></td>
<td>Optional: A list of NetBIOS aliases, which are alternate names to the SMB server name.</td>
<td></td>
</tr>
<tr>
<td><code>-comment</code></td>
<td>Optional: A text comment for the server. Windows clients can see this SMB server description when browsing servers on the network.</td>
<td></td>
</tr>
</tbody>
</table>

Setting up an SMB server in a workgroup

Parameters for creating an SMB server in a workgroup

You supply these values with the `vserver cifs create` command when you create a new SMB server and specify supported SMB versions.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vserver</code></td>
<td>The name of the SVM on which to create the SMB server.</td>
<td></td>
</tr>
<tr>
<td><code>cifs-server</code></td>
<td>The name of the SMB server (up to 15 characters).</td>
<td></td>
</tr>
<tr>
<td><code>workgroup</code></td>
<td>The name of the workgroup (up to 15 characters).</td>
<td></td>
</tr>
<tr>
<td><code>-comment</code></td>
<td>Optional: A text comment for the server. Windows clients can see this SMB server description when browsing servers on the network.</td>
<td></td>
</tr>
</tbody>
</table>
Parameters for creating local users

You supply these values when you create local users by using the `vserver cifs users-and-groups local-user create` command. They are required for SMB servers in workgroups and optional in AD domains.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of the SVM on which to create the local user.</td>
<td></td>
</tr>
<tr>
<td>-user-name</td>
<td>The name of the local user (up to 20 characters).</td>
<td></td>
</tr>
<tr>
<td>-full-name</td>
<td>Optional: The user's full name. If the full name contains a space, enclose the full name within double quotation marks.</td>
<td></td>
</tr>
<tr>
<td>-description</td>
<td>Optional: A description for the local user. If the description contains a space, enclose the parameter in quotation marks.</td>
<td></td>
</tr>
<tr>
<td>-is-account-disabled</td>
<td>Optional: Specifies whether the user account is enabled or disabled. If this parameter is not specified, the default is to enable the user account.</td>
<td></td>
</tr>
</tbody>
</table>

Parameters for creating local groups

You supply these values when you create local groups by using the `vserver cifs users-and-groups local-group create` command. They are optional for SMB servers in AD domains and workgroups.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of the SVM on which to create the local group.</td>
<td></td>
</tr>
<tr>
<td>-group-name</td>
<td>The name of the local group (up to 256 characters).</td>
<td></td>
</tr>
<tr>
<td>-description</td>
<td>Optional: A description for the local group. If the description contains a space, enclose the parameter in quotation marks.</td>
<td></td>
</tr>
</tbody>
</table>

Adding storage capacity to an SMB-enabled SVM

Parameters for creating a volume

You supply these values with the `volume create` command if you are creating a volume instead of a qtree.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of a new or existing SVM that will host the new volume.</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
<td>Your value</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>-volume</td>
<td>A unique descriptive name you supply for the new volume.</td>
<td></td>
</tr>
<tr>
<td>-aggregate</td>
<td>The name of an aggregate in the cluster with sufficient space for the new SMB volume.</td>
<td></td>
</tr>
<tr>
<td>-size</td>
<td>An integer you supply for the size of the new volume.</td>
<td></td>
</tr>
<tr>
<td>-security-style</td>
<td>Use the NTFS security style for this workflow.</td>
<td>ntfs</td>
</tr>
<tr>
<td>-junction-path</td>
<td>Location under root (/) where the new volume is to be mounted.</td>
<td></td>
</tr>
</tbody>
</table>

**Parameters for creating a qtree**

You supply these values with the `volume qtree create` command if you are creating a qtree instead of a volume.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of the SVM on which the volume containing the qtree resides.</td>
<td></td>
</tr>
<tr>
<td>-volume</td>
<td>The name of the volume that will contain the new qtree.</td>
<td></td>
</tr>
<tr>
<td>-qtree</td>
<td>A unique descriptive name you supply for the new qtree, 64 characters or less.</td>
<td></td>
</tr>
<tr>
<td>-qtree-path</td>
<td>The qtree path argument in the format <code>/vol/volume_name/ qtree_name</code> can be specified instead of specifying volume and qtree as separate arguments.</td>
<td></td>
</tr>
</tbody>
</table>

**Parameters for creating SMB shares**

You supply these values with the `vserver cifs share create` command.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of the SVM on which to create the SMB share.</td>
<td></td>
</tr>
<tr>
<td>-share-name</td>
<td>The name of the SMB share that you want to create (up to 256 characters).</td>
<td></td>
</tr>
<tr>
<td>-path</td>
<td>The name of the path to the SMB share (up to 256 characters). This path must exist in a volume before creating the share.</td>
<td></td>
</tr>
</tbody>
</table>
### Parameters for creating SMB share access control lists (ACLs)

You supply these values with the `vserver cifs share access-control create` command.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Your value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-vserver</td>
<td>The name of the SVM on which to create the SMB ACL.</td>
<td></td>
</tr>
<tr>
<td>-share</td>
<td>The name of the SMB share on which to create.</td>
<td></td>
</tr>
<tr>
<td>-user-group-type</td>
<td>The type of the user or group to add to the share's ACL. The default type is <code>windows</code></td>
<td><code>windows</code></td>
</tr>
<tr>
<td>-user-or-group</td>
<td>The user or group to add to the share's ACL. If you specify the user name, you must include the user's domain using the “domain \username” format.</td>
<td></td>
</tr>
<tr>
<td>-permission</td>
<td>Specifies the permissions for the user or group.</td>
<td>[ No_access</td>
</tr>
</tbody>
</table>
Configuring SMB/CIFS access to an SVM

If you do not already have an SVM configured for SMB client access, you must either create and configure a new SVM or configure an existing SVM. Configuring SMB involves opening SVM root volume access, creating an SMB server, creating a LIF, enabling host-name resolution, configuring name services, and if desired, enabling Kerberos security.

Steps
1. Creating an SVM on page 14
2. Verifying that the SMB protocol is enabled on the SVM on page 15
3. Opening the export policy of the SVM root volume on page 16
4. Creating a LIF on page 17
5. Enabling DNS for host-name resolution on page 19
6. Setting up an SMB server in an Active Directory domain on page 21
7. Setting up an SMB server in a workgroup on page 24
8. Verifying enabled SMB versions on page 29
9. Mapping the SMB server on the DNS server on page 30

Creating an SVM

If you do not already have at least one SVM in a cluster to provide data access to SMB clients, you must create one.

Steps
1. Create an SVM:

   vserver create -vserver vserver_name -rootvolume root_volume_name -aggregate aggregate_name -rootvolume-security-style ntfs -language C.UTF-8 -ipspace ipspace_name

   • Use the NTFS setting for the -rootvolume-security-style option.
   • Use the default C.UTF-8 -language option.
   • The ipspace setting is optional.

2. Verify the configuration and status of the newly created SVM:

   vserver show -vserver vserver_name

   The Allowed Protocols field must include CIFS. You can edit this list later.
   The Vserver Operational State field must display the running state. If it displays the initializing state, it means that some intermediate operation such as root volume creation failed, and you must delete the SVM and re-create it.

Examples

The following command creates an SVM for data access in the IPspace ipspaceA:
The following command shows that an SVM was created with a root volume of 1 GB, and it was started automatically and is in running state. The root volume has a default export policy that does not include any rules, so the root volume is not exported upon creation.

```
cluster1::> vserver show -vserver vs1.example.com
Vserver: vs1.example.com
  Vserver Type: data
  Vserver Subtype: default
  Vserver UUID: b8375669-19b0-11e5-b9d1-00a0983d9736
  Root Volume: root_vs1
  Aggregate: aggr1
  NIS Domain: -
  Root Volume Security Style: ntfs
  LDAP Client: -
  Default Volume Language Code: C.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, fcp, iscsi, ndmp
  Disallowed Protocols: -
  Is Vserver with Infinite Volume: false
  QoS Policy Group: -
  Config Lock: false
  IPspace Name: ipspaceA
```

**Verifying that the SMB protocol is enabled on the SVM**

Before you can configure and use SMB on SVMs, you must verify that the protocol is enabled.

**About this task**

This is typically done during SVM setup, but if you did not enable the protocol during setup, you can enable it later by using the `vserver add-protocols` command.

**Note:** You cannot add or remove a protocol from a LIF once it is created.

You can also disable protocols on SVMs using the `vserver remove-protocols` command.

**Steps**

1. Check which protocols are currently enabled and disabled for the SVM:

   `vserver show -vserver vserver_name -protocols`

   You can also use the `vserver show-protocols` command to view the currently enabled protocols on all SVMs in the cluster.

2. If necessary, enable or disable a protocol:
• To enable the SMB protocol:

```
vserver add-protocols -vserver vserver_name -protocols cifs
```

• To disable a protocol:

```
vserver remove-protocols -vserver vserver_name -protocols protocol_name[,protocol_name,...]
```

3. Confirm that the enabled and disabled protocols were updated correctly:

```
vserver show -vserver vserver_name -protocols
```

### Example

The following command displays which protocols are currently enabled and disabled (allowed and disallowed) on the SVM named vs1:

```
vs1::> vserver show -vserver vs1.example.com -protocols
Vserver           Allowed Protocols         Disallowed Protocols
-----------       ----------------------    -----------------------
vs1.example.com   cifs                       nfs, fcp, iscsi, ndmp
```

The following command allows access over SMB by adding `cifs` to the list of enabled protocols on the SVM named vs1:

```
vs1::> vserver add-protocols -vserver vs1.example.com -protocols cifs
```

---

**Opening the export policy of the SVM root volume**

The default export policy of the SVM root volume must include a rule to allow all clients open access through SMB. Without such a rule, all SMB clients are denied access to the SVM and its volumes.

### About this task

When a new SVM is created, a default export policy (called default) is created automatically for the root volume of the SVM. You must create one or more rules for the default export policy before clients can access data on the SVM.

You should verify that all SMB access is open in the default export policy, and later restrict access to individual volumes by creating custom export policies for individual volumes or qtrees.

### Steps

1. If you are using an existing SVM, check the default root volume export policy:

```
vserver export-policy rule show
```

### Example

The command output should be similar to the following:

```
cluster::> vserver export-policy rule show -vserver vs1.example.com -policyname default -instance

Vserver: vs1.example.com
Policy Name: default
Rule Index: 1
Access Protocol: cifs
```
Client Match Hostname, IP Address, Netgroup, or Domain: 0.0.0.0/0
RO Access Rule: any
RW Access Rule: any
User ID To Which Anonymous Users Are Mapped: 65534
Superuser Security Types: any
Honor SetUID Bits in SETATTR: true
Allow Creation of Devices: true

If such a rule exists that allows open access, this task is complete. If not, proceed to the next step.

2. Create an export rule for the SVM root volume:

   vserver export-policy rule create -vserver vserver_name -policyname default -ruleindex 1 -protocol cifs -clientmatch 0.0.0.0/0 -rorule any -rwrule any -superuser any

3. Verify rule creation by using the vserver export-policy rule show command.

   Result

   Any SMB client can now access any volume or qtree created on the SVM.

Creating a LIF

A LIF is an IP address associated with a physical or logical port. If there is a component failure, a LIF can fail over to or be migrated to a different physical port, thereby continuing to communicate with the network.

Before you begin

- The underlying physical or logical network port must have been configured to the administrative up status.

- If you are planning to use a subnet name to allocate the IP address and network mask value for a LIF, the subnet must already exist.
  Subnets contain a pool of IP addresses that belong to the same layer 3 subnet. They are created using the network subnet create command.

About this task

- You can create both IPv4 and IPv6 LIFs on the same network port.

- If you have a large number of LIFs in your cluster, you can verify the LIF capacity supported on the cluster by using the network interface capacity show command and the LIF capacity supported on each node by using the network interface capacity details show command (at the advanced privilege level).

Beginning in ONTAP 9.4, FC-NVMe is supported. If you are creating an FC-NVMe LIF you should be aware of the following:

- The NVMe protocol must be supported by the FC adapter on which the LIF is created.

- FC-NVMe can be the only data protocol on data LIFs.

- One management LIF must be configured for every storage virtual machine (SVM) supporting SAN.

- NVMe LIFs and namespaces must be hosted on the same node.

- Only one NVMe data LIF can be configured per SVM
Steps

1. Create a LIF:

   network interface create -vserver vserver_name -lif lif_name -role data
   -data-protocol cifs -home-node node_name -home-port port_name { -address
   IP_address -netmask IP_address | -subnet-name subnet_name } -firewall-
   policy data -auto-revert {true|false}

   - The -data-protocol parameter must be specified when the LIF is created, and cannot be
     modified later without destroying and re-creating the data LIF.
   - -home-node is the node to which the LIF returns when the network interface revert
     command is run on the LIF.
     You can also specify whether the LIF should automatically revert to the home-node and home-
     port with the -auto-revert option.
   - -home-port is the physical or logical port to which the LIF returns when the network
     interface revert command is run on the LIF.
   - You can specify an IP address with the -address and -netmask options, or you enable
     allocation from a subnet with the -subnet_name option.
   - When using a subnet to supply the IP address and network mask, if the subnet was defined
     with a gateway, a default route to that gateway is added automatically to the SVM when a LIF
     is created using that subnet.
   - If you assign IP addresses manually (without using a subnet), you might need to configure a
     default route to a gateway if there are clients or domain controllers on a different IP subnet.
     The network route create man page contains information about creating a static route
     within a SVM.
   - For the -firewall-policy option, use the same default data as the LIF role.
     You can create and add a custom firewall policy later if desired.
   - -auto-revert allows you to specify whether a data LIF is automatically reverted to its home
     node under circumstances such as startup, changes to the status of the management database,
     or when the network connection is made. The default setting is false, but you can set it to
     true depending on network management policies in your environment.

2. Verify that the LIF was created successfully by using the network interface show command.

3. Verify that the configured IP address is reachable:

<table>
<thead>
<tr>
<th>To verify an...</th>
<th>Use...</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4 address</td>
<td>network ping</td>
</tr>
<tr>
<td>IPv6 address</td>
<td>network ping6</td>
</tr>
</tbody>
</table>

Examples

The following command creates a LIF and specifies the IP address and network mask values
using the -address and -netmask parameters:

   cluster-1:/> network interface create -vserver vsl.example.com -lif
data1if1 -role data -data-protocol cifs -home-node node-4 -home-
port e1c -address 192.0.2.145 -netmask 255.255.255.0 -firewall-
policy data -auto-revert true

The following command creates a LIF and assigns IP address and network mask values from
the specified subnet (named client1_sub):
cluster-1::> network interface create -vserver vs3.example.com -lif datalif3 -role data -data-protocol cifs -home-node node-3 -home-port e1c -subnet-name client1_sub -firewall-policy data -auto-revert true

The following command shows all the LIFs in cluster-1. Data LIFs datalif1 and datalif3 are configured with IPv4 addresses, and datalif4 is configured with an IPv6 address:

cluster-1::> network interface show

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Logical Interface</th>
<th>Status</th>
<th>Network</th>
<th>Current Node</th>
<th>Current Port</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>cluster-1</td>
<td>cluster_mgmt</td>
<td>up/up</td>
<td>192.0.2.3/24</td>
<td>node-1</td>
<td>e1a</td>
<td>true</td>
</tr>
<tr>
<td>node-1</td>
<td>clus1</td>
<td>up/up</td>
<td>192.0.2.12/24</td>
<td>node-1</td>
<td>e0a</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>clus2</td>
<td>up/up</td>
<td>192.0.2.13/24</td>
<td>node-1</td>
<td>e0b</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>mgmt1</td>
<td>up/up</td>
<td>192.0.2.68/24</td>
<td>node-1</td>
<td>e1a</td>
<td>true</td>
</tr>
<tr>
<td>node-2</td>
<td>clus1</td>
<td>up/up</td>
<td>192.0.2.14/24</td>
<td>node-2</td>
<td>e0a</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>clus2</td>
<td>up/up</td>
<td>192.0.2.15/24</td>
<td>node-2</td>
<td>e0b</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>mgmt1</td>
<td>up/up</td>
<td>192.0.2.69/24</td>
<td>node-2</td>
<td>e1a</td>
<td>true</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>datalif1</td>
<td>up/down</td>
<td>192.0.2.145/30</td>
<td>node-1</td>
<td>e1c</td>
<td>true</td>
</tr>
<tr>
<td>vs3.example.com</td>
<td>datalif3</td>
<td>up/up</td>
<td>192.0.2.146/30</td>
<td>node-2</td>
<td>e0c</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>datalif4</td>
<td>up/up</td>
<td>2001::2/64</td>
<td>node-2</td>
<td>e0c</td>
<td>true</td>
</tr>
</tbody>
</table>

5 entries were displayed.

The following command shows how to create an intercluster LIF and assign a service policy, policy1, to it:

cluster1::> network interface create -vserver siteA -lif node1_inter1 -service-policy policy1

---

**Enabling DNS for host-name resolution**

You can use the `vserver services name-service dns` command to enable DNS on an SVM, and configure it to use DNS for host-name resolution. Host names are resolved using external DNS servers.

**Before you begin**

A site-wide DNS server must be available for host name lookups.

You should configure more than one DNS server to avoid a single-point-of-failure. The `vserver services name-service dns create` command issues a warning if you enter only one DNS server name.

**About this task**

The *Network Management Guide* contains information about configuring dynamic DNS on the SVM.

**Steps**

1. Enable DNS on the SVM:

   ```
   vserver services name-service dns create -vserver vserver_name -domains domain_name -name-servers ip_addresses -state enabled
   ```
The following command enables external DNS server servers on the SVM vs1:

```
cluster-1::> vserver services name-service dns create -vserver vs1.example.com -domains example.com -name-servers 192.0.2.201,192.0.2.202 -state enabled
```

**Note:** Starting in ONTAP 9.2, the `vserver services name-service dns create` command performs an automatic configuration validation and reports an error message if ONTAP cannot contact the name server.

2. Display the DNS domain configurations by using the `vserver services name-service dns show` command.

**Example**

The following command displays the DNS configurations for all SVMs in the cluster:

```
cluster-1::> vserver services name-service dns show
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>State</th>
<th>Domains</th>
<th>Name Servers</th>
</tr>
</thead>
<tbody>
<tr>
<td>cluster1</td>
<td>enabled</td>
<td>example.com</td>
<td>192.0.2.201, 192.0.2.202</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>enabled</td>
<td>example.com</td>
<td>192.0.2.201, 192.0.2.202</td>
</tr>
</tbody>
</table>

The following command displays detailed DNS configuration information for SVM vs1:

```
cluster-1::> vserver services name-service dns show -vserver vs1.example.com
```

<table>
<thead>
<tr>
<th>Vserver: vs1.example.com</th>
<th>Name Server</th>
<th>Status</th>
<th>Status Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domains: example.com</td>
<td>192.0.2.201, 192.0.2.202</td>
<td>enabled</td>
<td></td>
</tr>
<tr>
<td>Enable/Disable DNS: enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeout (secs): 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Attempts: 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Validate the status of the name servers by using the `vserver services name-service dns check` command.

**Example**

```
cluster-1::> vserver services name-service dns check -vserver vs1.example.com
```

<table>
<thead>
<tr>
<th>Vserver: vs1.example.com</th>
<th>Name Server</th>
<th>Status</th>
<th>Status Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0.0.50</td>
<td>up</td>
<td></td>
<td>Response time (msec): 2</td>
</tr>
<tr>
<td>10.0.0.51</td>
<td>up</td>
<td></td>
<td>Response time (msec): 2</td>
</tr>
</tbody>
</table>
Setting up an SMB server in an Active Directory domain

Setting up an SMB server as a member in an Active Directory (AD) domain consists of preparing the cluster by configuring time services, and then creating the SMB server in the SVM.

Configuring time services

Before creating an SMB server in an Active Domain controller, you must ensure that the cluster time and the time on the domain controllers of the domain to which the SMB server will belong matches to within five minutes.

About this task

You should configure cluster NTP services to use the same NTP servers for time synchronization that the Active Directory domain uses.

Beginning in ONTAP 9.5, you can set up your NTP server with symmetric authentication.

Steps

1. Configure time services by using the `cluster time-service ntp server create` command.
   - To configure time services without symmetric authentication enter the following command:
     `cluster time-service ntp server create -server server_ip_address`
   - To configure time services with symmetric authentication, enter the following command:
     `cluster time-service ntp server create -server server_ip_address -key-id key_id`

   Example
   
   `cluster time-service ntp server create -server 10.10.10.1`
   `cluster time-service ntp server create -server 10.10.10.2`

2. Verify that time services are set up correctly by using the `cluster time-service ntp server show` command.

   Example
   
   `cluster time-service ntp server show`

<table>
<thead>
<tr>
<th>Server</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.10.10.1</td>
<td>auto</td>
</tr>
<tr>
<td>10.10.10.2</td>
<td>auto</td>
</tr>
</tbody>
</table>

Commands for managing symmetric authentication on NTP servers

Beginning in ONTAP 9.5, Network Time Protocol (NTP) version 3 is supported. NTPv3 includes symmetric authentication using SHA-1 keys which increases network security.

<table>
<thead>
<tr>
<th>To do this...</th>
<th>Use this command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure an NTP server without symmetric authentication</td>
<td><code>cluster time-service ntp server create -server server_name</code></td>
</tr>
</tbody>
</table>
To do this... | Use this command...
--- | ---
Configure an NTP server with symmetric authentication | `cluster time-service ntp server create -server server_ip_address -key-id key_id`
Enable symmetric authentication for an existing NTP server
An existing NTP server can be modified to enable authentication by adding the required key-id. | `cluster time-service ntp server modify -server server_name -key-id key_id`
Configure a shared NTP key | `cluster time-service ntp key create -id shared_key_id -type shared_key_type -value shared_key_value`
**Note:** Shared keys are referred to by an ID. The ID, its type, and value must be identical on both the node and the NTP server.
Configure an NTP server with an unknown key ID | `cluster time-service ntp server create -server server_name -key-id key_id`
Configure a server with a key ID not configured on the NTP server. | `cluster time-service ntp server create -server server_name -key-id key_id`
**Note:** The key ID, type, and value must be identical to the key ID, type, and value configured on the NTP server.
Disable symmetric authentication | `cluster time-service ntp server modify -server server_name -authentication disabled`

**Creating an SMB server in an Active Directory domain**

You can use the `vserver cifs create` command to create an SMB server on the SVM and specify the Active Directory (AD) domain to which it belongs.

**Before you begin**

The SVM and LIFs that you are using to serve data must have been configured to allow the SMB protocol. The LIFs must be able to connect to the DNS servers that are configured on the SVM and to an AD domain controller of the domain to which you want to join the SMB server.

Any user who is authorized to create machine accounts in the AD domain to which you are joining the SMB server can create the SMB server on the SVM. This can include users from other domains.

**About this task**

When creating an SMB server in an Activity Directory domain:

- You must use the fully qualified domain name (FQDN) when specifying the domain.
- The default setting is to add the SMB server machine account to the Active Directory CN=Computer object.
• You can choose to add the SMB server to a different organizational unit (OU) by using the -ou option.

• You can optionally choose to add a comma-delimited list of one or more NetBIOS aliases (up to 200) for the SMB server. Configuring NetBIOS aliases for an SMB server can be useful when you are consolidating data from other file servers to the SMB server and want the SMB server to respond to the original servers' names.

The `vserver cifs` man pages contain additional optional parameters and naming requirements.

**Note:** Beginning in ONTAP 9.1, you can enable SMB version 2.0 to connect to a domain controller. Doing so is necessary if you have disabled SMB 1.0 on domain controllers. Beginning in ONTAP 9.2, SMB 2.0 is enabled by default.

The *SMB/CIFS Reference* contains more information about SMB server configuration options.

**Steps**

1. Verify that SMB/CIFS is licensed on your cluster:
   ```bash
   system license show -package cifs
   ```
   If it is not, contact your sales representative.

   A CIFS license is not required if the SMB server will be used for authentication only.

2. Create the SMB server in an AD domain:
   ```bash
   vserver cifs create -vserver vserver_name -cifs-server smb_server_name -domain FQDN [-ou organizational_unit][-netbios-aliases NetBIOS_name, ...] [-comment text]
   ```
   When joining a domain, this command might take several minutes to finish.

   **Example**

   The following command creates the SMB server “smb_server01” in the domain “example.com”:
   ```bash
   cluster1::> vserver cifs create -vserver vs1.example.com -cifs-server smb_server01 -domain example.com
   ```

3. Verify the SMB server configuration by using the `vserver cifs show` command.

   **Example**

   In this example, the command output shows that an SMB server named “SMB_SERVER01” was created on SVM vs1.example.com, and was joined to the “example.com” domain.
   ```bash
   cluster1::> vserver cifs show -vserver vs1
   Vserver: vs1.example.com
   CIFS Server NetBIOS Name: SMB_SERVER01
   NetBIOS Domain/Workgroup Name: EXAMPLE
   Fully Qualified Domain Name: EXAMPLE.COM
   Default Site Used by LIFs Without Site Membership:
   Authentication Style: domain
   CIFS Server Administrative Status: up
   CIFS Server Description: -
   List of NetBIOS Aliases: -
   ```

**Examples**

The following command creates a SMB server named “smb_server02” on SVM vs2.example.com in the “example.com” domain. The machine account is created in the
“OU=eng,OU=corp,DC=example,DC=com” container. The SMB server is assigned a NetBIOS alias.

```
cluster1::> vserver cifs create -vserver vs2.example.com -cifs-server smb_server02 -domain example.com -ou OU=eng,OU=corp -netbios-aliases old_cifs_server01
```

```
cluster1::> vserver cifs show -vserver vs1
  Vserver: vs2.example.com
  CIFS Server NetBIOS Name: SMB_SERVER02
  NetBIOS Domain/Workgroup Name: EXAMPLE
  Fully Qualified Domain Name: EXAMPLE.COM
  Default Site Used by LIFs Without Site Membership: 
  Authentication Style: domain
  CIFS Server Administrative Status: up
  CIFS Server Description: -
  List of NetBIOS Aliases: OLD_CIFS_SERVER01
```

The following command enables a user from a different domain, in this case an administrator of a trusted domain, to create a SMB server named “smb_server03” on SVM vs3.example.com. The `domain` option specifies the name of the home domain (specified in the DNS configuration) in which you want to create the SMB server. The `username` option specifies the administrator of the trusted domain.

```
  Home domain: example.com
  Trusted domain: trust.lab.com
  Username for the trusted domain: Administrator1
```

```
cluster1::> vserver cifs create -vserver vs3.example.com -cifs-server smb_server03 -domain example.com
  Username: Administrator1@trust.lab.com
  Password: ...
```

### Related information

**SMB/CIFS management**

### Setting up an SMB server in a workgroup

Setting up an SMB server as a member in a workgroup consists of creating the SMB server, and then creating local users and groups.

### Creating an SMB server in a workgroup

You can use the `vserver cifs create` command to create an SMB server on the SVM and specify the workgroup to which it belongs.

### Before you begin

The SVM and LIFs that you are using to serve data must have been configured to allow the SMB protocol. The LIFs must be able to connect to the DNS servers that are configured on the SVM.

### About this task

SMB servers in workgroup mode do not support the following SMB features:

- SMB3 Witness protocol
- SMB3 CA shares
• SQL over SMB
• Folder Redirection
• Roaming Profiles
• Group Policy Object (GPO)
• Volume Snapshot Service (VSS)

The `vserver cifs` man pages contain additional optional configuration parameters and naming requirements.

Steps

1. Verify that SMB/CIFS is licensed on your cluster:
   ```
   system license show -package cifs
   ```
   If it is not, contact your sales representative.
   A CIFS license is not required if the SMB server will be used for authentication only.

2. Create the SMB server in a workgroup:
   ```
   vserver cifs create -vserver vserver_name -cifs-server cifs_server_name -workgroup workgroup_name [-comment text]
   ```
   Example
   The following command creates the SMB server “smb_server01” in the workgroup “workgroup01”:
   ```
   cluster1::> vserver cifs create -vserver vs1.example.com -cifs-server SMB_SERVER01 -workgroup workgroup01
   ```

3. Verify the SMB server configuration by using the `vserver cifs show` command.
   Example
   In the following example, the command output shows that a SMB server named “smb_server01” was created on SVM vs1.example.com in the workgroup “workgroup01”:
   ```
   cluster1::> vserver cifs show -vserver vs0
   ```

After you finish

For a CIFS server in a workgroup, you must create local users, and optionally local groups, on the SVM.
Creating local user accounts

You can create a local user account that can be used to authorize access to data contained in the SVM over an SMB connection. You can also use local user accounts for authentication when creating an SMB session.

About this task

Local user functionality is enabled by default when the SVM is created.

When you create a local user account, you must specify a user name and you must specify the SVM with which to associate the account.

The `vserver cifs users-and-groups local-user` man pages contain details about optional parameters and naming requirements.

Steps

1. Create the local user:
   ```bash
   vserver cifs users-and-groups local-user create -vserver vserver_name user-name user_name optional_parameters
   ```
   The following optional parameters might be useful:
   - `-full-name`
     The user's full name.
   - `-description`
     A description for the local user.
   - `-is-account-disabled {true|false}`
     Specifies whether the user account is enabled or disabled. If this parameter is not specified, the default is to enable the user account.

   The command prompts for the local user's password.

2. Enter a password for the local user, and then confirm the password.

3. Verify that the user was successfully created:
   ```bash
   vserver cifs users-and-groups local-user show -vserver vserver_name
   ```

Example

The following example creates a local user “SMB_SERVER01\sue”, with a full name “Sue Chang”, associated with SVM vs1.example.com:

```
cluster1::> vserver cifs users-and-groups local-user create -vserver vs1.example.com
-username SMB_SERVER01\sue -full-name "Sue Chang"
Enter the password:
Confirm the password:
cluster1::> vserver cifs users-and-groups local-user show -vserver vs1.example.com
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>User Name</th>
<th>Full Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1</td>
<td>SMB_SERVER01\Administrator</td>
<td></td>
<td>Built-in administrator account</td>
</tr>
<tr>
<td>vs1</td>
<td>SMB_SERVER01\sue</td>
<td>Sue Chang</td>
<td></td>
</tr>
</tbody>
</table>
Creating local groups

You can create local groups that can be used for authorizing access to data associated with the SVM over an SMB connection. You can also assign privileges that define what user rights or capabilities a member of the group has.

About this task

Local group functionality is enabled by default when the SVM is created.

When you create a local group, you must specify a name for the group and you must specify the SVM with which to associate the group. You can specify a group name with or without the local domain name, and you can optionally specify a description for the local group. You cannot add a local group to another local group.

The `vserver cifs users-and-groups local-group` man pages contain details about optional parameters and naming requirements.

Steps

1. Create the local group:

   ```
   vserver cifs users-and-groups local-group create -vserver vserver_name -
   group-name group_name
   ```

   The following optional parameter might be useful:

   • `-description`

   A description for the local group.

2. Verify that the group was successfully created:

   ```
   vserver cifs users-and-groups local-group show -vserver vserver_name
   ```

Example

The following example creates a local group “SMB_SERVER01\engineering” associated with SVM vs1:

```
cluster1::> vserver cifs users-and-groups local-group create -vserver vs1.example.com -
group-name SMB_SERVER01\engineering
cluster1::> vserver cifs users-and-groups local-group show -vserver vs1.example.com
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Group Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1.example.com</td>
<td>BUILTIN\Administrators</td>
<td>Built-in Administrators group</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>BUILTIN\Backup Operators</td>
<td>Backup Operators group</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>BUILTIN\Power Users</td>
<td>Restricted administrative privileges</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>BUILTIN\Users</td>
<td>All users</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>SMB_SERVER01\engineering</td>
<td></td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>SMB_SERVER01\sales</td>
<td></td>
</tr>
</tbody>
</table>

After you finish

You must add members to the new group.
Managing local group membership

You can manage local group membership by adding and removing local or domain users, or adding and removing domain groups. This is useful if you want to control access to data based on access controls placed on the group, or if you want users to have privileges associated with that group.

About this task

If you no longer want a local user, domain user, or domain group to have access rights or privileges based on membership in a group, you can remove the member from the group.

You must keep the following in mind when adding members to a local group:

- You cannot add users to the special Everyone group.
- You cannot add a local group to another local group.
- To add a domain user or group to a local group, ONTAP must be able to resolve the name to a SID.

You must keep the following in mind when removing members from a local group:

- You cannot remove members from the special Everyone group.
- To remove a member from a local group, ONTAP must be able to resolve their name to a SID.

Step

1. Add a member to or remove a member from a group.

   - Add a member:
     ```
     vserver cifs users-and-groups local-group add-members -vserver
     vserver_name -group-name group_name -member-names name[,,...]
     ```
   
   You can specify a comma-delimited list of local users, domain users, or domain groups to add to the specified local group.

   - Remove a member:
     ```
     vserver cifs users-and-groups local-group remove-members -vserver
     vserver_name -group-name group_name -member-names name[,,...]
     ```
   
   You can specify a comma-delimited list of local users, domain users, or domain groups to remove from the specified local group.

Examples

The following example adds a local user “SMB_SERVER01\sue” to the local group “SMB_SERVER01\engineering” on SVM vs1.example.com:

```
cluster1::> vserver cifs users-and-groups local-group add-members -vserver
vs1.example.com -group-name SMB_SERVER01\engineering -member-names
SMB_SERVER01\sue
```

The following example removes the local users “SMB_SERVER01\sue” and “SMB_SERVER01\james” from the local group “SMB_SERVER01\engineering” on SVM vs1.example.com:

```
cluster1::> vserver cifs users-and-groups local-group remove-members -vserver
vs1.example.com -group-name SMB_SERVER\engineering -member-names
SMB_SERVER\sue,SMB_SERVER\james
```
Verifying enabled SMB versions

Your ONTAP 9 release determines which SMB versions are enabled by default for connections with clients and domain controllers. You should verify that the SMB server supports the clients and functionality required in your environment.

About this task

For connections with both clients and domain controllers, you should enable SMB 2.0 and later whenever possible. For security reasons, you should avoid using SMB 1.0, and you should disable it if you have verified that it is not required in your environment.

In ONTAP 9, SMB versions 2.0 and later are enabled by default for client connections, but the version of SMB 1.0 enabled by default depends on your ONTAP release.

• Beginning with ONTAP 9.2, SMB 1.0 can be disabled on SVMs.
  The -smb1-enabled option to the vserver cifs options modify command enables or disables SMB 1.0.

• Beginning with ONTAP 9.3, it is disabled by default on new SVMs.

If your SMB server is in an Active Directory (AD) domain, you can enable SMB 2.0 to connect to a domain controller (DC) beginning with ONTAP 9.1. Doing so is necessary if you have disabled SMB 1.0 on DCs. Beginning with ONTAP 9.2, SMB 2.0 is enabled by default for DC connections.

Note: If -smb1-enabled-for-dc-connections is set to false while -smb1-enabled is set to true, ONTAP denies SMB 1.0 connections as the client, but continues to accept inbound SMB 1.0 connections as the server.

The SMB/CIFS Reference contains details about supported SMB versions and functionality.

Steps

1. Set the privilege level to advanced:
   set -privilege advanced

2. Verify which SMB versions are enabled:
   vserver cifs options show
   You can scroll down the list to view the SMB versions enabled for client connections, and if you are configuring an SMB server in an AD domain, for AD domain connections.

3. Enable or disable the SMB protocol for client connections as required:

   • To enable an SMB version:
     vserver cifs options modify -vserver vserver_name smb_version true

   • To disable an SMB version:
     vserver cifs options modify -vserver vserver_name smb_version false

Possible values for smb_version:

• -smb1-enabled
• -smb2-enabled
• -smb3-enabled
• -smb31-enabled
Example
The following command enables SMB 3.1 on SVM vs1.example.com:

`cluster1::*> vserver cifs options modify -vserver vs1.example.com -smb31-enabled true`

4. If your SMB server is in an Advanced Directory domain, enable or disable the SMB protocol for DC connections as required:
   • To enable an SMB version:
     `vserver cifs security modify -vserver vserver_name -smb2-enabled-for-dc-connections true`
   • To disable an SMB version:
     `vserver cifs security modify -vserver vserver_name -smb2-enabled-for-dc-connections false`

5. Return to the admin privilege level:
   `set -privilege admin`

Related information

*SMB/CIFS management*

### Mapping the SMB server on the DNS server

Your site's DNS server must have an entry pointing the SMB server name, and any NetBIOS aliases, to the IP address of the data LIF so that Windows users can map a drive to the SMB server name.

**Before you begin**

You must have administrative access to your site's DNS server. If you do not have administrative access, you must ask the DNS administrator to perform this task.

**About this task**

If you use NetBIOS aliases for the SMB server name, it is a best practice to create DNS server entry points for each alias.

**Steps**

1. Log in to the DNS server.
2. 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 LIF.
3. 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 LIF.

**Result**

After the mapping is propagated across the network, Windows users can map a drive to the SMB server name or its NetBIOS aliases.
Configuring SMB client access to shared storage

To provide SMB client access to shared storage on an SVM, you must create a volume or qtree to provide a storage container, and then create or modify a share for that container. You can then configure share and file permissions, and test access from client systems.

**Before you begin**

- SMB must be completely set up on the SVM.
- Any updates to your name services configuration must be complete.
- Any additions or modifications to an Active Directory domain or workgroup configuration must be complete.

**Steps**

1. Creating a volume or qtree storage container on page 31
2. Requirements and considerations for creating an SMB share on page 33
3. Creating an SMB share on page 34
4. Verifying SMB client access on page 35
5. Creating SMB share access control lists on page 36
6. Configuring NTFS file permissions in a share on page 37
7. Verifying user access on page 38

Creating a volume or qtree storage container

You can provision storage on a volume or a qtree. If you are creating a qtree, the volume that contains it must already exist.

Creating a volume

You can create a volume and specify its junction point and other properties by using the `volume create` command.

**Before you begin**

The SVM security style must be NTFS, and SMB/CIFS should be set up and running.

**About this task**

A volume must include a *junction path* for its data to be made available to clients. You can specify the junction path when you create a new volume. If you create a volume without specifying a junction path, you must `mount` the volume in the SVM namespace using the `volume mount` command.

**Steps**

1. Create the volume with a junction point:

   ```
   volume create -vserver vserver_name -volume volume_name -aggregate aggregate_name -size {integer[KB|MB|GB|TB|PB]} -security-style ntfs -junction-path junction_path
   ```

   The choices for `-junction-path` are the following:
• Directly under root, for example, /new_vol
  You can create a new volume and specify that it be mounted directly to the SVM root volume.

• Under an existing directory, for example, /existing_dir/new_vol
  You can create a new volume and specify that it be mounted to an existing volume (in an existing hierarchy), expressed as a directory.

If you want to create a volume in a new directory (in a new hierarchy under a new volume), for example, /new_dir/new_vol, then you must first create a new parent volume that is junctioned to the SVM root volume. You would then create the new child volume in the junction path of the new parent volume (new directory).

2. Verify that the volume was created with the desired junction point:

   volume show -vserver vserver_name -volume volume_name -junction

**Examples**

The following command creates a new volume named users1 on the SVM vs1.example.com and the aggregate aggr1. The new volume is made available at /users. The volume is 750 GB in size, and its volume guarantee is of type volume (by default).

```
cluster1::> volume create -vserver vs1.example.com -volume users -aggregate aggr1 -size 750g -junction-path /users
[Job 1642] Job succeeded: Successful
```

```
cluster1::> volume show -vserver vs1.example.com -volume users -junction

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Volume</th>
<th>Active</th>
<th>Junction Path</th>
<th>Path Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1.example.com</td>
<td>users1</td>
<td>true</td>
<td>/users</td>
<td>RW_volume</td>
</tr>
</tbody>
</table>
```

The following command creates a new volume named “home4” on the SVM “vs1.example.com” and the aggregate “aggr1”. The directory /eng/ already exists in the namespace for the vs1 SVM, and the new volume is made available at /eng/home, which becomes the home directory for the /eng/ namespace. The volume is 750 GB in size, and its volume guarantee is of type volume (by default).

```
cluster1::> volume create -vserver vs1.example.com -volume home4 -aggregate aggr1 -size 750g -junction-path /eng/home
[Job 1642] Job succeeded: Successful
```

```
cluster1::> volume show -vserver vs1.example.com -volume home4 -junction

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Volume</th>
<th>Active</th>
<th>Junction Path</th>
<th>Path Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1.example.com</td>
<td>home4</td>
<td>true</td>
<td>/eng/home</td>
<td>RW_volume</td>
</tr>
</tbody>
</table>
```

**Creating a qtree**

You can create a qtree to contain your data and specify its properties by using the `volume qtree create` command.

**Before you begin**

- The SVM and the volume that will contain the new qtree must already exist.
- The SVM security style must be NTFS, and SMB/CIFS should be set up and running.

**Steps**

1. Create the qtree:
volume qtree create -vserver vserver_name { -volume volume_name -qtree qtree_name | -qtree-path qtree_path } -security-style ntfs

You can specify the volume and qtree as separate arguments or specify the qtree path argument in the format /vol/volume_name/_qtree_name.

2. Verify that the qtree was created with the desired junction path:

volume qtree show -vserver vserver_name { -volume volume_name -qtree qtree_name | -qtree-path qtree_path }

Example

The following example creates a qtree named qt01 located on SVM vs1.example.com that has a junction path /vol/data1:

```
cluster1::> volume qtree create -vserver vs1.example.com -qtree-path /vol/data1/qt01 -security-style ntfs
[Job 1642] Job succeeded: Successful
```

```
cluster1::> volume qtree show -vserver vs1.example.com -qtree-path /vol/data1/qt01
Vserver Name: vs1.example.com
Volume Name: data1
Qtree Name: qt01
Actual (Non-Junction) Qtree Path: /vol/data1/qt01
Security Style: ntfs
Oplock Mode: enable
Unix Permissions: ---rwxr-xr-x
Qtree Id: 2
Qtree Status: normal
Export Policy: default
Is Export Policy Inherited: true
```

Requirements and considerations for creating an SMB share

Before creating an SMB share, you must understand requirements for share paths and share properties, particularly for home directories.

Creating an SMB share entails specifying a directory path structure (using the -path option in the vserver cifs share create command) that clients will access. The directory path corresponds to the junction path for a volume or qtree that you created in the SVM namespace. The directory path and corresponding junction path must exist before creating your share.

Share paths have the following requirements:

• A directory path name can be up to 255 characters long.

• If there is a space in the path name, the entire string must be put in quotes (for example, "/new volume/mount here").

• If the UNC path (\servername\sharename\filepath) of the share contains more than 256 characters (excluding the initial “\" in the UNC path), then the Security tab in the Windows Properties box is unavailable.

  This is a Windows client issue rather than an ONTAP issue. To avoid this issue, do not create shares with UNC paths with more than 256 characters.

Share property defaults can be changed:

• The default initial properties for all shares are oplocks, browsable, changenotify, and show-previous-versions.

• It is optional to specify share properties when you create a share.
However, if you do specify share properties when you create the share, the defaults are not used. If you use the `-share-properties` parameter when you create a share, you must specify all of the share properties that you want to apply to the share using a comma-delimited list.

- To designate a home directory share, use the `homedirectory` property.
  This feature enables you to configure a share that maps to different directories based on the user that connects to it and a set of variables. Instead of having to create separate shares for each user, you can configure a single share with a few home directory parameters to define a user's relationship between an entry point (the share) and their home directory (a directory on the SVM).

  **Note:** You cannot add or remove this property after creating the share.

Home directory shares have the following requirements:

- Before creating SMB home directories, you must add at least one home directory search path by using the `vserver cifs home-directory search-path add` command.
- Home directory shares specified by the value of `homedirectory` on the `-share-properties` parameter must include the `%w` (Windows user name) dynamic variable in the share name. The share name can additionally contain the `%d` (domain name) dynamic variable (for example, `%d/%w`) or a static portion in the share name (for example, `home1_%w`).
- If the share is used by administrators or users to connect to other users' home directories (using options to the `vserver cifs home-directory modify` command), the dynamic share name pattern must be preceded by a tilde (`~`).

The `SMB/CIFS Reference` and `vserver cifs share man` pages have additional information.

**Related information**

`SMB/CIFS management`

### Creating an SMB share

You must create an SMB share before you can share data from an SMB server with SMB clients. When you create a share, you can set share properties, such as designating the share as a home directory. You can also customize the share by configuring optional settings.

**Before you begin**

The directory path for the volume or qtree must exist in the SVM namespace before creating the share.

**About this task**

When you create a share, the default share ACL (default share permissions) is `Everyone / Full Control`. After testing access to the share, you should remove the default share ACL and replace it with a more secure alternative.

**Steps**

1. If necessary, create the directory path structure for the share.
   
   The `vserver cifs share create` command checks the path specified in the `-path` option during share creation. If the specified path does not exist, the command fails.

2. Create an SMB share associated with the specified SVM:
3. Verify that the share was created:

```
vserver cifs share show -share-name share_name
```

### Examples

The following command creates an SMB share named “SHARE1” on SVM “vs1.example.com”. Its directory path is `/users`, and it is created with default properties.

```
cluster1::> vserver cifs share create -vserver vs1.example.com -share-name SHARE1 -path /users
```

```
cluster1::> vserver cifs share show -share-name SHARE1
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Share</th>
<th>Path</th>
<th>Properties</th>
<th>Comment</th>
<th>ACL</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1.example.com</td>
<td>SHARE1</td>
<td>/users</td>
<td>oplocks</td>
<td>-</td>
<td>Everyone / Full</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

browsable
changenotify
show-previous-versions

### Verifying SMB client access

You should verify that you have configured SMB correctly by accessing and writing data to the share. You should test access using the SMB server name and any NetBIOS aliases.

#### Steps

1. Log in to a Windows client.
2. Test access using the SMB server name:
   a. In Windows Explorer, map a drive to the share in the following format: `\SMB_Server_Name\Share_Name`
      
      If the mapping is not successful, it is possible that the DNS mapping has not yet propagated throughout the network. You must test access using the SMB server name later.
   
   **Example**
   
   If the SMB server is named vs1.example.com and the share is named SHARE1, you should enter the following: `\vs0.example.com\SHARE1`
   
   b. On the newly created drive, create a test file, and then delete the file.

   You have verified write access to the share using the SMB server name.

3. Repeat Step 2 for any NetBIOS aliases.
Creating SMB share access control lists

Configuring share permissions by creating access control lists (ACLs) for SMB shares enables you to control the level of access to a share for users and groups.

Before you begin

You must have decided which users or groups will be given access to the share.

About this task

You can configure share-level ACLs by using local or domain Windows user or group names.

Before creating a new ACL, you should delete the default share ACL Everyone / Full Control, which poses a security risk.

In workgroup mode, the local domain name is the SMB server name.

Steps

1. Delete the default share ACL:

   ```
   vserver cifs share access-control delete -vserver vserver_name -share share_name -user-or-group everyone
   ```

2. Configure the new ACL:

   If you want to configure ACLs by using a... Enter the command...
   Windows user vserver cifs share access-control create -vserver vserver_name -share share_name -user-group-type windows -user-or-group Windows_domain_name \user_name -permission access_right

   Windows group vserver cifs share access-control create -vserver vserver_name -share share_name -user-group-type windows -user-or-group Windows_group_name -permission access_right

3. Verify that the ACL applied to the share is correct by using the vserver cifs share access-control show command.

The following command gives Change permissions to the “Sales Team” Windows group for the “sales” share on the “vs1.example.com” SVM:

```
cluster1::> vserver cifs share access-control create -vserver vs1.example.com -share sales -user-or-group "Sales Team" -permission Change
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Share</th>
<th>User/Group</th>
<th>User/Group Type</th>
<th>Access Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs1.example.com</td>
<td>c$</td>
<td>BUILTIN\Administrators</td>
<td>windows</td>
<td>Full_Control</td>
</tr>
<tr>
<td>vs1.example.com</td>
<td>sales</td>
<td>DOMAIN&quot;Sales Team&quot;</td>
<td>windows</td>
<td>Change</td>
</tr>
</tbody>
</table>

The following commands give Change permission to the local Windows group named “Tiger Team” and Full_Control permission to the local Windows user named “Sue Chang” for the “datavol5” share on the “vs1” SVM:
Configuring NTFS file permissions in a share

To enable file access to the users or groups who have access to a share, you must configure NTFS file permissions on files and directories in that share from a Windows client.

Before you begin

The administrator performing this task must have sufficient NTFS permissions to change permissions on the selected objects.

About this task

The *SMB/CIFS Reference* and your Windows documentation contain information about how to set standard and advanced NTFS permissions.

Steps

1. Log in to a Windows client as an administrator.

2. From the *Tools* menu in Windows Explorer, select *Map network drive*.

3. Complete the *Map Network Drive* box:
   a. Select a *Drive* letter.
   b. In the *Folder* box, type the SMB server name containing the share that contains the data to which you want to apply permissions and the name of the share.

   **Example**

   If your SMB server name is SMB_SERVER01 and your share is named “SHARE1”, you would enter `\SMB_SERVER01\SHARE1`.

   **Note:** You can specify the IP address of the data interface for the SMB server instead of the SMB server name.

   c. Click *Finish*.

   The drive you selected is mounted and ready with the Windows Explorer window displaying files and folders contained within the share.

4. Select the file or directory for which you want to set NTFS file permissions.

5. Right-click the file or directory, and then select *Properties*.

6. Select the *Security* tab.
The Security tab displays the list of users and groups for which NTFS permission are set. The Permissions for <Object> box displays a list of Allow and Deny permissions in effect for the selected user or group.

7. Click **Edit**.

The Permissions for <Object> box opens.

8. Perform the desired actions:

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Do the following...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set standard NTFS permissions for</td>
<td>a. Click <strong>Add</strong>. The Select User, Computers, Service Accounts, or Groups window</td>
</tr>
<tr>
<td>a new user or group</td>
<td>opens.</td>
</tr>
<tr>
<td></td>
<td>b. In the <strong>Enter the object names to select</strong> box, type the name of the user or</td>
</tr>
<tr>
<td></td>
<td>group on which you want to add NTFS permission.</td>
</tr>
<tr>
<td></td>
<td>c. Click <strong>OK</strong>.</td>
</tr>
<tr>
<td>Change or remove standard NTFS</td>
<td>In the <strong>Group or user names</strong> box, select the user or group that you want to</td>
</tr>
<tr>
<td>permissions from a user or group</td>
<td>change or remove.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Perform the desired actions:

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Do the following...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set standard NTFS permissions for</td>
<td>In the <strong>Permissions for &lt;Object&gt;</strong> box, select the <strong>Allow</strong> or <strong>Deny</strong> boxes</td>
</tr>
<tr>
<td>a new or existing user or group</td>
<td>for the type of access that you want to allow or not allow for the selected user</td>
</tr>
<tr>
<td></td>
<td>or group.</td>
</tr>
<tr>
<td>Remove a user or group</td>
<td>Click <strong>Remove</strong>.</td>
</tr>
</tbody>
</table>

**Note:** If some or all of the standard permission boxes are not selectable, it is because the permissions are inherited from the parent object. The **Special permissions** box is not selectable. If it is selected, it means that one or more of the granular advanced rights has been set for the selected user or group.

10. After you finish adding, removing, or editing NTFS permissions on that object, click **OK**.

**Related information**

*SMB/CIFS management*

**Verifying user access**

You should test that the users you configured can access the SMB share and the files it contains.

**Steps**

1. On a Windows client, log in as one of the users who now has access to the share.
2. From the **Tools** menu in Windows Explorer, select **Map network drive**.
3. Complete the **Map Network Drive** box:
   a. Select a **Drive** letter.
   b. In the **Folder** box, type the share name you will provide to users.
Example

If your SMB server name is SMB_SERVER01 and your share is named “SHARE1”, you would enter \SMB_SERVER01\share1.

c. Click **Finish**.

The drive you selected is mounted and ready with the Windows Explorer window displaying files and folders contained within the share.

4. Create a test file, verify that it exists, write text to it, and then remove the test file.
Where to find additional information

After you have successfully tested SMB client access, you can perform additional SMB configuration or add SAN access. When protocol access is complete, you should protect the root volume of the SVM. There are express guides, comprehensive guides, and technical reports to help you achieve these goals.

SMB configuration

You can further configure SMB access using the following comprehensive guides and technical reports:

- **SMB/CIFS management**  
  Describes how to configure SMB servers and manage file access using the SMB protocol, including security, file policy management, and SMB client- and server-based services.

  Describes SMB protocol functionality in terms of capabilities, requirements, implementation, and best practices.

- **NetApp KB Article 1000201: Is it possible to disable SMB 1.0 in ONTAP?**  
  Describes how to disable the SMB version 1.0 protocol on NetApp clusters.

- **NetApp KB Article 4550: Clustered Data ONTAP CIFS Expert Recommended articles**  
  Lists all common SMB/CIFS protocol operational and troubleshooting workflows.

Antivirus configuration

After configuring the SMB protocol on the SVM, you should ensure that its data is protected by using the following guide:

- **Antivirus configuration**  
  Describes how to configure and manage the antivirus functionality on ONTAP systems.

Networking configuration

You can further configure networking features and name services using the following comprehensive guides and technical reports:

- **Network and LIF management**  
  Describes how to configure and manage ONTAP networking.

  Describes the implementation of ONTAP network configurations, and provides common network deployment scenarios and best practice recommendations.

  Explains how to configure LDAP, NIS, DNS, and local file configuration for authentication purposes.

NFS and SMB multiprotocol configuration

If you want to provide or modify NFS access to the new SVM, you can use the following express guide:

- **SMB/CIFS and NFS multiprotocol express configuration**
Describes how to quickly configure shared SMB/CIFS and NFSv3 client access to the same files contained in a new volume in either a new SVM or an existing SVM.

**Root volume protection**

After configuring protocols on the SVM, you should ensure that its root volume is protected:

- **Data protection**
  
  Describes how to create a load-sharing mirror to protect the SVM root volume, which is a best practice for NAS-enabled SVMs. Also describes how to quickly recover from volume failures or losses by promoting the SVM root volume from a load-sharing mirror.
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