



# **Install and configure SnapCenter Server**

## SnapCenter software

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# Install and configure SnapCenter Server

## Prepare for installing the SnapCenter Server

### Requirements to install SnapCenter Server

Before you install SnapCenter Server either on Windows or Linux host, you should review and ensure that all the requirements are met for your environment.

#### Domain and workgroup requirements for Windows host

The SnapCenter Server can be installed on a Windows host that is either in a domain or in a workgroup.

The user having admin privileges is allowed to install the SnapCenter server.

- Active Directory domain: You must use a Domain user with local administrator rights. The Domain user must be a member of the local Administrator group on the Windows host.
- Workgroups: You must use a local account that has local administrator rights.

While domain trusts, multi-domain forests, and cross-domain trusts are supported, cross-forest domains are not supported. The Microsoft documentation about Active Directory Domains and Trusts contains more information.






After installing the SnapCenter Server, you should not change the domain in which the SnapCenter host is located. If you remove the SnapCenter Server host from the domain it was in when the SnapCenter Server was installed and then try to uninstall SnapCenter Server, the uninstall operation fails.

### Space and sizing requirements

You should be familiar with the space and sizing requirements.

Item	Windows host requirements	Linux host requirements
Operating Systems	Microsoft Windows  Only English, German, Japanese, and simplified Chinese version of the operating systems are supported.  For the latest information about supported versions, see <a href="#">NetApp Interoperability Matrix Tool</a> .	<ul style="list-style-type: none"><li>• Red Hat Enterprise Linux (RHEL) 8 and 9</li><li>• SUSE Linux Enterprise Server (SLES) 15</li></ul> For the latest information about supported versions, see <a href="#">NetApp Interoperability Matrix Tool</a> .
Minimum CPU count	4 cores	4 cores

Item	Windows host requirements	Linux host requirements
Minimum RAM	8 GB   The MySQL Server buffer pool uses 20 percent of the total RAM.	8 GB
Minimum hard drive space for the SnapCenter Server software and logs	7 GB   If you have the SnapCenter repository in the same drive where SnapCenter Server is installed, then it is recommended to have 15 GB.	15 GB
Minimum hard drive space for the SnapCenter repository	8 GB   NOTE: If you have the SnapCenter Server in the same drive where SnapCenter repository is installed, then it is recommended to have 15 GB.	Not applicable
Required software packages	<ul style="list-style-type: none"> <li>• ASP.NET Core Runtime 8.0.12 (and all subsequent 8.0.x patches) Hosting Bundle</li> <li>• PowerShell 7.4.2 or later</li> </ul> <p>For .NET specific troubleshooting information, see <a href="#">SnapCenter upgrade or install fails for legacy systems that do not have internet connectivity</a>.</p>	<ul style="list-style-type: none"> <li>• .NET Framework 8.0.12 (and all subsequent 8.0.x patches)</li> <li>• PowerShell 7.4.2 or later</li> <li>• Nginx is a web server that can be used as a reverse proxy</li> <li>• Pam-devel</li> </ul> <p>PAM (Pluggable Authentication Modules) is a system security tool which allows system administrators to set authentication policy without having to recompile programs which do authentication.</p>



ASP.NET core needs IIS\_IUSRS to access the temp file system in SnapCenter Server on Windows.

## SAN host requirements

SnapCenter does not include host utilities or a DSM. If the SnapCenter host is part of a SAN (FC/iSCSI) environment, you might need to install and configure additional software on the SnapCenter Server host.

- Host Utilities: The Host Utilities support FC and iSCSI, and it enables you to use MPIO on your Windows Servers. [Learn More](#).
- Microsoft DSM for Windows MPIO: This software works with Windows MPIO drivers to manage multiple paths between NetApp and Windows host computers. A DSM is required for high availability configurations.



If you were using ONTAP DSM, you should migrate to Microsoft DSM. For more information, see [How to migrate from ONTAP DSM to Microsoft DSM](#).

## Browser requirements

SnapCenter software supports Chrome 125 and later and Microsoft Edge 110.0.1587.17 and later.

## Port requirements

The SnapCenter software requires different ports for communication between different components.

- Applications cannot share a port.
- For customizable ports, you can select a custom port during installation if you do not want to use the default port.
- For fixed ports, you should accept the default port number.
- Firewalls
  - Firewalls, proxies, or other network devices should not interfere with connections.
  - If you specify a custom port when you install SnapCenter, you should add a firewall rule on the plug-in host for that port for the SnapCenter Plug-in Loader.

The following table lists the different ports and their default values.

Port Name	Port Numbers	Protocol	Direction	Description
SnapCenter web port	8146	HTTPS	Bidirectional	<p>This port is used for communication between the SnapCenter client (the SnapCenter user) and the SnapCenter Server and is also used for communication from the plug-in hosts to the SnapCenter Server.</p> <p>You can customize the port number.</p>
SnapCenter SMCORE communication port	8145	HTTPS	Bidirectional	<p>This port is used for communication between the SnapCenter Server and the hosts where the SnapCenter plug-ins are installed.</p> <p>You can customize the port number.</p>
Scheduler Service Port	8154	HTTPS		<p>This is port is used to orchestrate the SnapCenter scheduler workflows for all the managed plug-ins within the SnapCenter server host in centralized manner.</p> <p>You can customize the port number.</p>
RabbitMQ Port	5672	TCP		<p>This is the default port that RabbitMQ listens on and it is used for publisher-subscriber model communication between Scheduler service and SnapCenter.</p>

Port Name	Port Numbers	Protocol	Direction	Description
MySQL port	3306	HTTPS		The port is used for communicating with SnapCenter repository database. You can create secured connections from the SnapCenter Server to the MySQL server. <a href="#">Learn more</a>
Windows plug-in hosts	135, 445	TCP		This port is used for communication between the SnapCenter Server and the host on which the plug-in is being installed. Additional dynamic port range specified by Microsoft should also be open.
Linux or AIX plug-in hosts	22	SSH	Unidirectional	This port is used for communication between the SnapCenter Server and the host, initiated from the server to client host.
SnapCenter Plug-ins Package for Windows, Linux or AIX	8145	HTTPS	Bidirectional	This port is used for communication between SMCORE and hosts where the plug-ins package is installed. Customizable.  You can customize the port number.
SnapCenter Plug-in for Oracle Database	27216			The default JDBC port is used by the plug-in for Oracle for connecting to the Oracle database.

Port Name	Port Numbers	Protocol	Direction	Description
SnapCenter Plug-in for Exchange Database	909			The default NET.TCP port is used by the plug-in for Windows for connecting to the Exchange VSS call-backs.
NetApp supported plug-ins for SnapCenter	9090	HTTPS		This is an internal port that is used only on the plug-in host; no firewall exception is required.  Communication between the SnapCenter Server and plug-ins is routed through port 8145.
ONTAP cluster or SVM communication port	<ul style="list-style-type: none"> <li>• 443 (HTTPS)</li> <li>• 80 (HTTP)</li> </ul>	<ul style="list-style-type: none"> <li>• HTTPS</li> <li>• HTTP</li> </ul>	Bidirectional	The port is used by the SAL (Storage Abstraction Layer) for communication between the host running SnapCenter Server and SVM. The port is currently also used by the SAL on SnapCenter for Windows Plug-in hosts for communication between the SnapCenter plug-in host and SVM.
SnapCenter Plug-in for SAP HANA Database	<ul style="list-style-type: none"> <li>• 3instance_number13</li> <li>• 3instance_number15</li> </ul>	<ul style="list-style-type: none"> <li>• HTTPS</li> <li>• HTTP</li> </ul>	Bidirectional	For a multitenant database container (MDC) single tenant, the port number ends with 13; for non MDC, the port number ends with 15.  You can customize the port number.

Port Name	Port Numbers	Protocol	Direction	Description
SnapCenter Plug-in for PostgreSQL	5432			<p>This port is the default PostgreSQL port used for communication by the plug-in for PostgreSQL to the PostgreSQL cluster.</p> <p>You can customize the port number.</p>

## Register to access the SnapCenter software

You should register to access the SnapCenter software if you are new to Amazon FSx for NetApp ONTAP or Azure NetApp Files and do not have an existing NetApp account.

### Before you begin

- You should have access to the corporate email ID.
- If you using Azure NetApp Files, you should have the Azure subscription ID.
- If you are using Amazon FSx for NetApp ONTAP, you should have the File System ID of your FSx for ONTAP file system.

### About this task

Your registration is subject to information validations and may take up to a day to confirm and upgrade new NetApp Support Site (NSS) account to **full** access from **guest** access.

### Steps

1. Click <https://mysupport.netapp.com/site/user/registration> for registration.
2. Enter your corporate email ID, complete the captcha, accept NetApp's privacy policy, and click **Submit**.
3. Authenticate the registration by entering the OTP sent to your email ID and click **Continue**.
4. On the registration completion page, enter the following details to complete the registration.
  - a. Select **NetApp Customer / End User**.
  - b. In the SERIAL NUMBER field, either enter the Azure subscription ID if you are using Azure NetApp Files or the File System ID if you are using Amazon FSx for NetApp ONTAP.



You can raise a ticket at <https://mysupport.netapp.com/site/help> if you face any issue during registration or to know the status.

## Multi-factor authentication (MFA)

### Manage multi-factor authentication (MFA)

You can manage Multi-factor authentication (MFA) functionality in the Active Directory Federation Service (AD FS) Server and SnapCenter Server.

## Enable multi-factor authentication (MFA)

You can enable MFA functionality for SnapCenter Server using PowerShell commands.

### About this task

- SnapCenter supports SSO based logins when other applications are configured in the same AD FS. In certain AD FS configurations, SnapCenter might require user authentication for security reasons depending on the AD FS session persistence.
- The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running `Get-Help command_name`. Alternatively, you can also see [SnapCenter Software Cmdlet Reference Guide](#).

### Before you begin

- Windows Active Directory Federation Service (AD FS) should be up and running in the respective domain.
- You should have an AD FS supported Multi-factor authentication service such as Azure MFA, Cisco Duo, and so on.
- SnapCenter and AD FS server timestamp should be the same regardless of the timezone.
- Procure and configure the authorized CA certificate for SnapCenter Server.

CA Certificate is mandatory for the following reasons:

- Ensures that the ADFS-F5 communications do not break because the self-signed certificates are unique at the node level.
- Ensures that during upgrade, repair, or disaster recovery (DR) in a standalone or high availability configuration, the self-signed certificate does not get recreated thus avoiding MFA reconfiguration.
- Ensures IP-FQDN resolutions.

For information on CA certificate, see [Generate CA Certificate CSR file](#).

### Steps

1. Connect to the Active Directory Federation Services (AD FS) host.
2. Download AD FS federation metadata file from "https://<host FQDN>/FederationMetadata/2007-06/FederationMetadata.xml".
3. Copy the downloaded file to SnapCenter Server to enable MFA feature.
4. Log in to SnapCenter Server as the SnapCenter Administrator user through PowerShell.
5. Using the PowerShell session, generate the SnapCenter MFA metadata file by using the `New-SmMultifactorAuthenticationMetadata -path` cmdlet.

The path parameter specifies the path to save the MFA metadata file in the SnapCenter Server host.

6. Copy the generated file to the AD FS host to configure SnapCenter as the client entity.
7. Enable MFA for SnapCenter Server using the `Set-SmMultiFactorAuthentication` cmdlet.
8. (Optional) Check the MFA configuration status and settings by using `Get-SmMultiFactorAuthentication` cmdlet.
9. Go to the Microsoft management console (MMC) and perform the following steps:
  - a. Click **File > Add/Remove Snapin**.

- b. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
- c. In the Certificates snap-in window, select the **Computer account** option, and then click **Finish**.
- d. Click **Console Root > Certificates – Local Computer > Personal > Certificates**.
- e. Right-click on the CA certificate bound to SnapCenter and then select **All Tasks > Manage Private Keys**.
- f. On the permissions wizard perform the following steps:
  - i. Click **Add**.
  - ii. Click **Locations** and select the concerned host (top of hierarchy).
  - iii. Click **OK** in the **Locations** pop-up window.
  - iv. In the object name field, enter 'IIS\_IUSRS' and click **Check Names** and click **OK**.

If the check is successful, click **OK**.

10. In the AD FS host, open AD FS management wizard and perform the following steps:
  - a. Right click on **Relying Party Trusts > Add Relying Party Trust > Start**.
  - b. Select the second option and browse the SnapCenter MFA Metadata file and click **Next**.
  - c. Specify a display name and click **Next**.
  - d. Choose an access control policy as required and click **Next**.
  - e. Select the settings in the next tab to default.
  - f. Click **Finish**.

SnapCenter is now reflected as a relying party with the provided display name.

11. Select the name and perform the following steps:
  - a. Click **Edit Claim Issuance Policy**.
  - b. Click **Add Rule** and click **Next**.
  - c. Specify a name for the claim rule.
  - d. Select **Active Directory** as the attribute store.
  - e. Select the attribute as **User-Principal-Name** and the outgoing claim type as **Name-ID**.
  - f. Click **Finish**.

12. Run the following PowerShell commands on the ADFS server.

```
Set-AdfsRelyingPartyTrust -TargetName '<Display name of relying party >'
-SigningCertificateRevocationCheck None
```

```
Set-AdfsRelyingPartyTrust -TargetName '<Display name of relying party >'
-EncryptionCertificateRevocationCheck None
```

13. Perform the following steps to confirm that the metadata was imported successfully.
  - a. Right-click the relying party trust and select **Properties**.
  - b. Ensure that the Endpoints, Identifiers, and Signature fields are populated.
14. Close all the browser tabs and reopen a browser to clear the existing or active session cookies, and login again.

SnapCenter MFA functionality can also be enabled using REST APIs.

For troubleshooting information, see [Simultaneous login attempts in multiple tabs shows MFA error](#).

#### Update AD FS MFA Metadata

You should update the AD FS MFA metadata in SnapCenter whenever there is any modification in the AD FS Server, such as upgrade, CA certificate renewal, DR, and so on.

#### Steps

1. Download AD FS federation metadata file from "https://<host FQDN>/FederationMetadata/2007-06/FederationMetadata.xml"
2. Copy the downloaded file to SnapCenter Server to update the MFA configuration.
3. Update the AD FS metadata in SnapCenter by running the following cmdlet:

```
Set-SmMultiFactorAuthentication -Path <location of ADFS MFA metadata xml file>
```

4. Close all the browser tabs and reopen a browser to clear the existing or active session cookies, and login again.

#### Update SnapCenter MFA metadata

You should update the SnapCenter MFA metadata in AD FS whenever there is any modification in ADFS server such as repair, CA certificate renewal, DR, and so on.

#### Steps

1. In the AD FS host, open AD FS management wizard and perform the following steps:
  - a. Select **Relying Party Trusts**.
  - b. Right click on the relying party trust that was created for SnapCenter and select **Delete**.

The user defined name of the relying party trust will be displayed.

- c. Enable Multi-factor authentication (MFA).

See [Enable Multi-factor authentication](#).

2. Close all the browser tabs and reopen a browser to clear the existing or active session cookies, and login again.

#### Disable Multi-factor authentication (MFA)

#### Steps

1. Disable MFA and clean up the configuration files that were created when MFA was enabled by using the `Set-SmMultiFactorAuthentication` cmdlet.
2. Close all the browser tabs and reopen a browser to clear the existing or active session cookies, and login again.

#### Manage multi-factor authentication (MFA) using Rest API, PowerShell, and SCCLI

MFA login is supported from browser, REST API, PowerShell, and SCCLI. MFA is supported through an AD FS identity manager. You can enable MFA, disable MFA, and

configure MFA from GUI, REST API, PowerShell, and SCCLI.

#### Setup AD FS as OAuth/OIDC

#### Configure AD FS using Windows GUI wizard

1. Navigate to **Server Manager Dashboard > Tools > ADFS Management**.
2. Navigate to **ADFS > Application Groups**.
  - a. Right-click on **Application Groups**.
  - b. Select **Add Application group** and enter **Application Name**.
  - c. Select **Server Application**.
  - d. Click **Next**.
3. Copy **Client Identifier**.

This is the Client ID. ... Add Callback URL (SnapCenter Server URL) in Redirect URL. ... Click **Next**.

4. Select **Generate shared secret**.

Copy the secret value. This is the client's secret. ... Click **Next**.

5. On the **Summary** page, click **Next**.
  - a. On the **Complete** page, click **Close**.
6. Right-click on the newly added **Application Group** and select **Properties**.
7. Select **Add application** from App Properties.
8. Click **Add application**.

Select Web API and click **Next**.

9. On the Configure Web API page, enter the SnapCenter Server URL and Client Identifier created in the previous step into the Identifier section.
  - a. Click **Add**.
  - b. Click **Next**.
10. On the **Choose Access Control Policy** page, select control policy based on your requirement (For example, Permit everyone and require MFA) and click **Next**.
11. On the **Configure Application Permission** page, by default openid is selected as a scope, click **Next**.
12. On the **Summary** page, click **Next**.

On the **Complete** page, click **Close**.

13. On the **Sample Application Properties** page, click **OK**.
14. JWT token issued by an authorization server (AD FS) and intended to be consumed by the resource.

The 'aud' or audience claim of this token must match the identifier of the resource or Web API.

15. Edit the selected WebAPI and check that Callback URL (SnapCenter Server URL) and the client identifier were added correctly.

Configure OpenID Connect to provide a username as claims.

16. Open the **AD FS Management** tool located under the **Tools** menu at the top right of the Server Manager.
  - a. Select the **Application Groups** folder from the left sidebar.
  - b. Select the Web API and click **EDIT**.
  - c. Go-to Issuance Transform Rules Tab
17. Click **Add Rule**.
  - a. Select the **Send LDAP Attributes as Claims** in the Claim rule template dropdown.
  - b. Click **Next**.
18. Enter the **Claim rule** name.
  - a. Select **Active Directory** in the Attribute store dropdown.
  - b. Select **User-Principal-Name** in the **LDAP Attribute** dropdown and **UPN** in the O\*utgoing Claim Type\* dropdown.
  - c. Click **Finish**.

### Create Application Group using PowerShell commands

You can create the application group, web API, and add the scope and claims using PowerShell commands. These commands are available in automated script format. For more information see [<link to KB article>](#).

1. Create the new Application Group in AD FS by using the following comamnd.

```
New-AdfsApplicationGroup -Name $ClientRoleIdentifier
-ApplicationGroupIdentifier $ClientRoleIdentifier
```

ClientRoleIdentifier name of your application group

redirectURL valid URL for redirection after authorization

2. Create the AD FS Server Application and generate the client secret.

```
Add-AdfsServerApplication -Name "$ClientRoleIdentifier - Server app"
-ApplicationGroupIdentifier $ClientRoleIdentifier -RedirectUri $redirectURL
-Identifier $identifier -GenerateClientSecret
```

3. Create the ADFS Web API application and configure the policy name it should use.

```
$identifier = (New-Guid).Guid
```

```
Add-AdfsWebApiApplication -ApplicationGroupIdentifier $ClientRoleIdentifier
-Name "App Web API"
```

```
-Identifier $identifier -AccessControlPolicyName "Permit everyone"
```

4. Get the client ID and client secret from the output of the following commands because, it is shown only one time.

```
"client_id = $identifier"
```

```
"client_secret: "$($ADFSApp.ClientSecret)
```

## 5. Grant the AD FS Application the allatclaims and openid permissions.

```
Grant-AdfsApplicationPermission -ClientRoleIdentifier $identifier
-ServerRoleIdentifier $identifier -ScopeNames @('openid')

$transformrule = @"

@RuleTemplate = "LdapClaims"

@RuleName = "AD User properties and Groups"

c:[Type ==
"http://schemas.microsoft.com/ws/2008/06/identity/claims/windowsaccountname",
Issuer ==
"AD AUTHORITY"]

⇒ issue(store = "Active Directory", types =
("http://schemas.xmlsoap.org/ws/2005/05/identity/claims/upn"), query =
";userPrincipalName;{0}", param = c.Value);

"@
```

## 6. Write out the transform rules file.

```
$transformrule | Out-File -FilePath .\issueancetransformrules.tmp -force
-Encoding ascii $relativePath = Get-Item .\issueancetransformrules.tmp
```

## 7. Name the Web API Application and define its Issuance Transform Rules using an external file.

```
Set-AdfsWebApiApplication -Name "$ClientRoleIdentifier - Web API"
-TargetIdentifier

$identifier -Identifier $identifier,$redirectURL -IssuanceTransformRulesFile

$relativePath
```

### Update access token expiry time

You can update the access token expiry time using the PowerShell command.

### About this task

- An access token can be used only for a specific combination of user, client, and resource. Access tokens cannot be revoked and are valid until their expiry.
- By default, the expiry time of an access token is 60 minutes. This minimal expiry time is sufficient and scaled. You must provide sufficient value to avoid any ongoing business-critical jobs.

### Step

To update the access token expiry time for an application group WebApi, use the following command in AD FS server.

```
+ Set-AdfsWebApiApplication -TokenLifetime 3600 -TargetName "<Web API>"
```

### Get the bearer token from AD FS

You should fill the below-mentioned parameters in any REST client (like Postman) and it prompts you to fill in the user credentials. Additionally, you should enter the second-factor authentication (something you have & something you are) to get the bearer token.

+ The validity of the bearer token is configurable from the AD FS server per application and the default validity period is 60 minutes.

Field	Value
Grant type	Authorization Code
Callback URL	Enter your application's base URL if you do not have a callback URL.
Auth URL	[adfs-domain-name]/adfs/oauth2/authorize
Access token URL	[adfs-domain-name]/adfs/oauth2/token
Client ID	Enter the AD FS client ID
Client secret	Enter the AD FS client secret
Scope	OpenID
Client Authentication	Send as Basic AUTH Header
Resource	In the <b>Advance Options</b> tab, add the Resource field with the same value as the Callback URL, which comes as an "aud" value in the JWT token.

### Configure MFA in SnapCenter Server using PowerShell, SCCLI, and REST API

You can configure MFA in SnapCenter Server using PowerShell, SCCLI, and REST API.

#### SnapCenter MFA CLI authentication

In PowerShell and SCCLI, the existing cmdlet (Open-SmConnection) is extended with one more field called "AccessToken" to use the bearer token to authenticate the user.

```
Open-SmConnection -Credential <PSCredential> [-SMSbaseUrl <String>] [-Port <String>] [-RoleName <String>] [-AccessToken <string>]
```

After the above cmdlet is executed, a session is created for the respective user to execute further SnapCenter cmdlets.

## SnapCenter MFA Rest API Authentication

Use bearer token in the format *Authorization=Bearer <access token>* in REST API client (like Postman or swagger) and mention the user RoleName in the header to get a successful response from SnapCenter.

### MFA Rest API Workflow

When MFA is configured with AD FS, you should authenticate using an access (bearer) token to access the SnapCenter application by any Rest API.

### About this task

- You can use any REST client like Postman, Swagger UI or FireCamp.
- Get an access token and use it to authenticate subsequent requests (SnapCenter Rest API) to perform any operation.

### Steps

#### To authenticate through AD FS MFA

1. Configure the REST client to call AD FS endpoint to get the access token.

When you hit the button to get an access token for an application, you will be redirected to the AD FS SSO page where you must provide your AD credentials and authenticate with MFA. 1. In the AD FS SSO page, type your username or email in the Username text box.

+ Usernames must be formatted as user@domain or domain\user.

2. In the Password text box, type your password.
3. Click **Log in**.
4. From the **Sign-in Options** section, select an authentication option and authenticate (depending on your configuration).
  - Push: Approve the push notification that is sent to your phone.
  - QR Code: Use the AUTH Point mobile app to scan the QR code, then type the verification code shown in the app
  - One-Time Password: Type the one-time password for your token.
5. After successful authentication, a popup will open that contains the Access, ID, and Refresh Token.

Copy the access token and use it in the SnapCenter Rest API to perform the operation.

6. In the Rest API, you should pass the access token and role name in the header section.
7. SnapCenter validates this access token from AD FS.

If it is a valid token, SnapCenter decodes it and gets the username.

8. Using the Username and Role Name, SnapCenter authenticates the user for an API execution.

If the authentication succeeds, SnapCenter returns the result else an error message is displayed.

## Enable or disable SnapCenter MFA functionality for Rest API, CLI, and GUI

### GUI

#### Steps

1. Log into the SnapCenter Server as the SnapCenter Administrator.
2. Click **Settings > Global Settings > MultiFactorAuthentication(MFA) Settings**
3. Select the interface (GUI/RST API/CLI) to enable or disable the MFA login.

### PowerShell interface

#### Steps

1. Run the PowerShell or CLI commands for enabling MFA for GUI, Rest API, PowerShell, and SCCLI.

```
Set-SmMultiFactorAuthentication -IsGuiMFAEnabled -IsRestApiMFAEnabled  
-IsCliMFAEnabled -Path
```

The path parameter specifies the location of the AD FS MFA metadata xml file.

Enables MFA for SnapCenter GUI, Rest API, PowerShell, and SCCLI configured with specified AD FS metadata file path.

2. Check the MFA configuration status and settings by using the `Get-SmMultiFactorAuthentication` cmdlet.

### SCCLI Interface

#### Steps

1. # `sccli Set-SmMultiFactorAuthentication -IsGuiMFAEnabled true -IsRESTAPIMFAEnabled true -IsCliMFAEnabled true -Path "C:\ADFS_metadata\abc.xml"`
2. # `sccli Get-SmMultiFactorAuthentication`

### REST APIs

1. Run the following post API for enabling MFA for GUI, Rest API, PowerShell, and SCCLI.

Parameter	Value
Requested URL	/api/4.9/settings/multifactorauthentication
HTTP method	Post
Request Body	{ "IsGuiMFAEnabled": false, "IsRestApiMFAEnabled": true, "IsCliMFAEnabled": false, "ADFSConfigFilePath": "C:\ADFS_metadata\abc.xml" }

Response Body	<pre>{ "MFAConfiguration": { "IsGuiMFAEnabled": false, "ADFSConfigFilePath": "C:\\ADFS_metadata\\abc.xml", "SCConfigFilePath": null, "IsRestApiMFAEnabled": true, "IsCliMFAEnabled": false, "ADFSHostName": "win-adfs-sc49.winscedom2.com" } }</pre>
---------------	--

2. Check the MFA configuration status and settings by using the following API.

Parameter	Value
Requested URL	/api/4.9/settings/multifactorauthentication
HTTP method	Get
Response Body	<pre>{ "MFAConfiguration": { "IsGuiMFAEnabled": false, "ADFSConfigFilePath": "C:\\ADFS_metadata\\abc.xml", "SCConfigFilePath": null, "IsRestApiMFAEnabled": true, "IsCliMFAEnabled": false, "ADFSHostName": "win-adfs-sc49.winscedom2.com" } }</pre>

## Install the SnapCenter Server

### Install the SnapCenter Server on Windows host

You can run the SnapCenter Server installer executable to install the SnapCenter Server.

You can optionally perform several installation and configuration procedures by using PowerShell cmdlets. You should be using PowerShell 7.4.2 or later.



Silent installation of the SnapCenter Server from the command-line is not supported.

#### Before you begin

- The SnapCenter Server host must be up to date with Windows updates with no pending system restarts.
- You should have ensured that MySQL Server is not installed on the host where you plan to install the SnapCenter Server.
- You should have enabled Windows installer debugging.

See the Microsoft web site for information about enabling [Windows installer logging](#).



You should not install the SnapCenter Server on a host that has Microsoft Exchange Server, Active Directory, or Domain Name Servers.

#### Steps

1. Download the SnapCenter Server installation package from [NetApp Support Site](#).

2. Initiate the SnapCenter Server installation by double-clicking the downloaded .exe file.

After you initiate the installation, all the prechecks are performed and if the minimum requirements are not met appropriate error or warning messages are displayed.

You can ignore the warning messages and proceed with installation; however, errors should be fixed.

3. Review the pre-populated values required for the SnapCenter Server installation and modify if required.

You do not have to specify the password for MySQL Server repository database. During SnapCenter Server installation the password is auto generated.



The special character “%” is not supported in the custom path for the repository database. If you include “%” in the path, installation fails.

4. Click **Install Now**.

If you have specified any values that are invalid, appropriate error messages will be displayed. You should reenter the values, and then initiate the installation.



If you click the **Cancel** button, the step that is being executed will be completed, and then start the rollback operation. The SnapCenter Server will be completely removed from the host.

However, if you click **Cancel** when "SnapCenter Server site restart" or "Waiting for SnapCenter Server to start" operations are being performed, installation will proceed without cancelling the operation.

Log files are always listed (oldest first) in the %temp% folder of the admin user. If you want to redirect the log locations, initiate the SnapCenter Server installation from the command prompt by running:  
`C:\installer_location\installer_name.exe /log"C:\\"`

### Features enabled on Windows host during installation

The SnapCenter Server installer enables the Windows features and roles on your Windows host during installation. These might be of interest for troubleshooting and maintaining the host system.

Category	Feature
Web Server	<ul style="list-style-type: none"> <li>• Internet Information Services</li> <li>• World Wide Web Services</li> <li>• Common HTTP Features <ul style="list-style-type: none"> <li>◦ Default Document</li> <li>◦ Directory Browsing</li> <li>◦ HTTP Errors</li> <li>◦ HTTP Redirection</li> <li>◦ Static Content</li> <li>◦ WebDAV Publishing</li> </ul> </li> <li>• Health and Diagnostics <ul style="list-style-type: none"> <li>◦ Custom Logging</li> <li>◦ HTTP Logging</li> <li>◦ Logging Tools</li> <li>◦ Request Monitor</li> <li>◦ Tracing</li> </ul> </li> <li>• Performance Features <ul style="list-style-type: none"> <li>◦ Static Content Compression</li> </ul> </li> <li>• Security <ul style="list-style-type: none"> <li>◦ IP Security</li> <li>◦ Basic Authentication</li> <li>◦ Centralized SSL Certificate Support</li> <li>◦ Client Certificate Mapping Authentication</li> <li>◦ IIS Client Certificate Mapping Authentication</li> <li>◦ IP and Domain Restrictions</li> <li>◦ Request Filtering</li> <li>◦ URL Authorization</li> <li>◦ Windows Authentication</li> </ul> </li> <li>• Application Development Features <ul style="list-style-type: none"> <li>◦ .NET Extensibility 4.5</li> <li>◦ Application Initialization</li> <li>◦ ASP.NET Core Runtime 8.0.12 (and all subsequent 8.0.x patches) Hosting Bundle</li> <li>◦ Server-Side Includes</li> <li>◦ WebSocket Protocol</li> </ul> </li> <li>• Management Tools <ul style="list-style-type: none"> <li>◦ IIS Management Console</li> </ul> </li> </ul>

Category	Feature
IIS Management Scripts and Tools	<ul style="list-style-type: none"> <li>• IIS Management Service</li> <li>• Web Management Tools</li> </ul>
.NET Framework 8.0.12 Features	<ul style="list-style-type: none"> <li>• ASP.NET Core Runtime 8.0.12 (and all subsequent 8.0.x patches) Hosting Bundle</li> <li>• Windows Communication Foundation (WCF) HTTP Activation<sup>45</sup> <ul style="list-style-type: none"> <li>◦ TCP Activation</li> <li>◦ HTTP Activation</li> </ul> </li> </ul> <p>For .NET specific troubleshooting information, see <a href="#">SnapCenter upgrade or install fails for legacy systems that do not have internet connectivity</a>.</p>
Windows Process Activation Service	Process Model
Configuration APIs	All

## Install the SnapCenter Server on Linux host

You can run the SnapCenter Server installer executable to install the SnapCenter Server.

### Before you begin

- If you want to install the SnapCenter Server using non-root user who does not have enough privileges to install SnapCenter, get the sudoers checksum file from the NetApp Support site. You should use appropriate checksum file based on the Linux Version.
- If the sudo package is not available in SUSE Linux, then install the sudo package to avoid authentication failure.
- For SUSE Linux, configure the hostname to avoid the installation failure.
- Check the secure Linux status by running the command `sestatus`. If the *SELinux status* is "enabled" and the *Current mode* is "enforcing", perform the following:

- Run the command: `sudo semanage port -a -t http_port_t -p tcp <WEBAPP_EXTERNAL_PORT_>`

The default value of *WEBAPP\_EXTERNAL\_PORT* is 8146

- If the firewall blocks the port, run `sudo firewall-cmd --add-port <WEBAPP_EXTERNAL_PORT_>/tcp`

The default value of *WEBAPP\_EXTERNAL\_PORT* is 8146

- Run the following commands from the directory where you have read and write permission:
  - `sudo ausearch -c 'nginx' --raw | audit2allow -M my-nginx`

If the command return "nothing to do", rerun the command after installing SnapCenter Server.

- If the command creates *my-nginx.pp*, run the command to make the policy package active: `sudo semodule -i my-nginx.pp`
- The path used for MySQL PID directory is */var/opt/mysqld*. Run the following commands to set the permissions for MySQL installation.
  - `mkdir /var/opt/mysqld`
  - `sudo semanage fcontext -a -t mysqld_var_run_t "/var/opt/mysqld(/.*)?"`
  - `sudo restorecon -Rv /var/opt/mysqld`
- The path used for MySQL Data directory is */INSTALL\_DIR/NetApp/snapcenter/SnapManagerWeb/Repository/MySQL/*. Run the following commands to set the permissions for MySQL data directory.
  - `mkdir -p /INSTALL_DIR/NetApp/snapcenter/SnapManagerWeb/Repository/MySQL`
  - `sudo semanage fcontext -a -t mysqld_db_t "/INSTALL_DIR/NetApp/snapcenter/SnapManagerWeb/Repository/MySQL(/.*)?"`
  - `sudo restorecon -Rv /INSTALL_DIR/NetApp/snapcenter/SnapManagerWeb/Repository/MySQL`

### About this task

- When SnapCenter Server is installed on the Linux host, third-party services such as MySQL, RabbitMq, ErLANG gets installed. You should not uninstall them.
- The SnapCenter Server installed on the Linux host does not support:
  - High availability
  - Windows plug-ins
  - Active Directory (Supports only the local users, both root and non-root user with creds)
  - Key based authentication to log into SnapCenter
- During the installation of .NET runtime, if the installation fails to resolve the dependencies of *libicu* library, then install *libicu* by running the command: `yum install -y libicu`
- If the installation of SnapCenter Server fails due to the non-availability of *Perl*, then install *Perl* by running the command: `yum install -y perl`

### Steps

1. Download the following from [NetApp Support Site](#) to */home* directory.
  - SnapCenter Server installation package - **snapcenter-linux-server-(el8/el9/sles15).bin**
  - Public key file - **snapcenter\_public\_key.pub**
  - Respective signature file - **snapcenter-linux-server-(el8/el9/sles15).bin.sig**
2. Validate the signature file. `$openssl dgst -sha256 -verify snapcenter_public_key.pub -signature <path to signature file> <path to bin file>`
3. For non-root user installation, add the visudo content specified in **snapcenter\_server\_checksum\_(el8/el9/sles15).txt** available along with the .bin installer.
4. Assign the execute permission for the .bin installer. `chmod +x snapcenter-linux-server-(el8/el9/sles15).bin`
5. Perform one of the actions to install SnapCenter Server.

If you want to perform...	Do this...
Interactive installation	<pre>./snapcenter-linux-server- (el8/el9/sles15).bin</pre> <p>You will be prompted to enter the following details:</p> <ul style="list-style-type: none"><li>• The webapp external port that is used to access SnapCenter Server outside the Linux host. The default value is 8146.</li><li>• The SnapCenter Server user who will install SnapCenter Server.</li><li>• The installation directory where packages will be installed.</li></ul>

If you want to perform...	Do this...
Non interactive installation	<pre>sudo ./snapcenter-linux-server- (e18/e19/sles15).bin -i silent -DWEBAPP_EXTERNAL_PORT=&lt;port&gt; -DWEBAPP_INTERNAL_PORT=&lt;port&gt; -DSMCORE_PORT=&lt;port&gt; -DSCHEDULER_PORT=&lt;port&gt; -DSNAPCENTER_SERVER_USER=&lt;user&gt; -DUSER_INSTALL_DIR=&lt;dir&gt; -DINSTALL_LOG_NAME=&lt;filename&gt;</pre> <p>Example: <code>sudo ./snapcenter_linux_server.bin -i silent -DWEBAPP_EXTERNAL_PORT=8146 -DSNAPCENTER_SERVER_USER=root -DUSER_INSTALL_DIR=/opt -DINSTALL_LOG_NAME=InstallerLog.log</code></p> <p>Logs will be stored at <code>/var/opt/snapcenter/logs</code>.</p> <p>Parameters to be passed for installing SnapCenter Server:</p> <ul style="list-style-type: none"> <li>• <code>DWEBAPP_EXTERNAL_PORT</code>: Webapp external port that is used to access SnapCenter Server outside the Linux host. The default value is 8146.</li> <li>• <code>DWEBAPP_INTERNAL_PORT</code>: Webapp internal port that is used to access SnapCenter Server within the Linux host. The default value is 8147.</li> <li>• <code>DSMCORE_PORT</code>: SMCore port on which the smcore services are running. The default value is 8145.</li> <li>• <code>DSCHEDULER_PORT</code>: Scheduler port on which the scheduler services are running. The default value is 8154.</li> <li>• <code>DSNAPCENTER_SERVER_USER</code>: SnapCenter Server user who will install SnapCenter Server. For <code>DSNAPCENTER_SERVER_USER</code>, the default is the user running the installer.</li> <li>• <code>DUSER_INSTALL_DIR</code>: Installation directory where packages will be installed. For <code>DUSER_INSTALL_DIR</code>, the default installation directory is <code>/opt</code>.</li> <li>• <code>DINSTALL_LOG_NAME</code>: Log file name where installation logs will be stored. This is an optional parameter and if specified no logs will be displayed on the console. If you do not specify this parameter, logs will be displayed on the console and also stored in the default log file.</li> </ul> <p>DSELINUX: If the <i>SELinux status</i> is "enabled",<sup>23</sup> the <i>Current mode</i> is "enforcing", and you have</p>

## What's next?

- If the *SELinux status* is "enabled" and the *Current mode* is "enforcing", the **nginx** service fails to start. You should run the the following commands:
    1. Go to home directory.
    2. Run the command: `journalctl -x|grep nginx`.
    3. If the Webapp internal port (8147) is not allowed to listen, run the following commands:
      - `ausearch -c 'nginx' --raw | audit2allow -M my-nginx`
      - `semodule -i my-nginx.pp`
    4. Run `setsebool -P httpd_can_network_connect on`
- DUPGRADE: The default value is 0. Specify this parameter and its value as any integer other than 0 to upgrade the SnapCenter Server.

## Features enabled on Linux host during installation

The SnapCenter Server installs below software packages which can help in troubleshooting and maintaining the host system.

- Rabbitmq
- Erlang

## Register SnapCenter

If you are new to NetApp products and do not have an existing NetApp account, you should register SnapCenter to enable support.

### Steps

1. After installing SnapCenter, navigate to **Help > About**.
2. In the *About SnapCenter* dialog box, make a note of the SnapCenter Instance, a 20 digit number that starts with 971.
3. Click <https://register.netapp.com>.
4. Click **I am not a registered NetApp Customer**.
5. Specify your details to register yourself.
6. Leave the NetApp Reference SN field blank.
7. Select **SnapCenter** from the Product Line drop-down.
8. Select the billing provider.
9. Enter the 20-digit SnapCenter instance ID.
10. Click **Submit**.

## Log in to SnapCenter using RBAC authorization

SnapCenter supports role-based access control (RBAC). SnapCenter admin assigns roles and resources through SnapCenter RBAC to either a user in workgroup or active directory, or to groups in active directory. The RBAC user can now log in to SnapCenter with the assigned roles.

### Before you begin

- You should enable Windows Process Activation Service (WAS) in Windows Server Manager.
- If you want to use Internet Explorer as the browser to log in to the SnapCenter Server, you should ensure that the Protected Mode in Internet Explorer is disabled.
- If SnapCenter Server is installed on Linux host, you should log in using the user account which was used to install the SnapCenter Server.

### About this task

During installation, the SnapCenter Server Install wizard creates a shortcut and places it on the desktop and in the Start menu of the host where SnapCenter is installed. Additionally, at the end of the installation, the Install wizard displays the SnapCenter URL based on the information that you provided during installation, which you can copy if you want to log in from a remote system.



If you have multiple tabs open in your web browser, closing just the SnapCenter browser tab does not log you out of SnapCenter. To end your connection with SnapCenter, you must log out of SnapCenter either by clicking the **Sign out** button, or by closing the entire web browser.

**Best Practice:** For security reasons, it is recommended that you do not enable your browser to save your SnapCenter password.

The default GUI URL is a secure connection to the default port 8146 on the server where the SnapCenter Server is installed (*https://server:8146*). If you provided a different server port during the SnapCenter installation, that port is used instead.

For High Availability (HA) deployment, you must access SnapCenter using the virtual cluster IP *https://Virtual\_Cluster\_IP\_or\_FQDN:8146*. If you do not see the SnapCenter UI when you navigate to *https://Virtual\_Cluster\_IP\_or\_FQDN:8146* in Internet Explorer (IE), you must add the Virtual Cluster IP address or FQDN as a trusted site in IE on each plug-in host, or you must disable IE Enhanced Security on each plug-in host. For more information, see [Unable to access cluster IP address from outside network](#).

In addition to using the SnapCenter GUI, you can use PowerShell cmdlets to create scripts to perform configuration, backup, and restore operations. Some cmdlets might have changed with each SnapCenter release. The [SnapCenter Software Cmdlet Reference Guide](#) has the details.



If you are logging in to SnapCenter for the first time, you must log in using the credentials that you provided during the install process.

### Steps

1. Launch SnapCenter from the shortcut located on your local host desktop, or from the URL provided at the end of the installation, or from the URL provided by your SnapCenter administrator.
2. Enter user credentials.

To specify the following...	Use one of these formats...
Domain administrator	<ul style="list-style-type: none"> <li>• NetBIOS\UserName</li> <li>• UserName@UPN suffix</li> </ul> <p>For example, username@netapp.com</p> <ul style="list-style-type: none"> <li>• Domain FQDN\UserName</li> </ul>

To specify the following...	Use one of these formats...
Local administrator	UserName

- If you are assigned more than one role, from the Role box, select the role that you want to use for this login session.

Your current user and associated role are shown in the upper right of SnapCenter after you are logged in.

## Result

The Dashboard page is displayed.

If the logging fails with the error that site cannot be reached, you should map the SSL certificate to SnapCenter. [Learn more](#)

## After you finish

After logging to SnapCenter Server as an RBAC user for the first time, refresh the resources list.

If you have untrusted Active Directory domains that you want SnapCenter to support, you must register those domains with SnapCenter before configuring the roles for the users on untrusted domains. [Learn more](#).

If you want to add the plug-in host in SnapCenter running on Linux host, you should get the checksum file from the location: `/opt/NetApp/snapcenter/SnapManagerWeb/Repository`.

From 6.0 release, a shortcut for SnapCenter PowerShell is created on the desktop. You can directly access the SnapCenter PowerShell cmdlets by using the shortcut.

## Log in to SnapCenter using Multi-Factor Authentication (MFA)

SnapCenter Server supports MFA for domain account, which is part of the active directory.

### Before you begin

You should have enabled MFA. For information on how to enable MFA, see [Enable Multi-factor authentication](#)

### About this task

- Only FQDN is supported
- Workgroup and cross domain users cannot login using MFA

### Steps

1. Launch SnapCenter from the shortcut located on your local host desktop, or from the URL provided at the end of the installation, or from the URL provided by your SnapCenter administrator.
2. In the AD FS login page, enter Username and Password.

When the username or password invalid error message is displayed on the AD FS page, you should check for the following:

- Whether the username or password is valid

The user account should exist in the Active Directory (AD)

- Whether you exceeded the maximum allowed attempts that was set in AD
- Whether AD and AD FS is up and running

## Modify the SnapCenter default GUI session timeout

You can modify the SnapCenter GUI session timeout period to make it less than or greater than the default timeout period of 20 minutes.

As a security feature, after a default period of 15 minutes of inactivity, SnapCenter warns you that you will be logged out of the GUI session in 5 minutes. By default, SnapCenter logs you out of the GUI session after 20 minutes of inactivity, and you must log in again.

### Steps

1. In the left navigation pane, click **Settings > Global Settings**.
2. In the Global Settings page, click **Configuration Settings**.
3. In the Session Timeout field, enter the new session timeout in minutes, and then click **Save**.

## Secure the SnapCenter web server by disabling SSL 3.0

For security purposes, you should disable Secure Socket Layer (SSL) 3.0 protocol in Microsoft IIS if it is enabled on your SnapCenter web server.

There are flaws in the SSL 3.0 protocol that an attacker can use to cause connection failures, or to perform man-in-the-middle attacks and observe the encryption traffic between your website and its visitors.

### Steps

1. To launch Registry Editor on the SnapCenter web server host, click **Start > Run**, and then enter regedit.
2. In Registry Editor, navigate to HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\SSL 3.0\
  - If the Server key already exists:
    - i. Select the Enabled DWORD, and then click **Edit > Modify**.
    - ii. Change the value to 0, and then click **OK**.
  - If the Server key does not exist:
    - i. Click **Edit > New > Key**, and then name the key Server.
    - ii. With the new Server key selected, click **Edit > New > DWORD**.
    - iii. Name the new DWORD Enabled, and then enter 0 as the value.
3. Close Registry Editor.

# Configure the SnapCenter Server

## Add and provision the storage system

### Add storage systems

You should set up the storage system that gives SnapCenter access to ONTAP storage,

ASA r2 systems, or Amazon FSx for NetApp ONTAP to perform data protection and provisioning operations.

You can either add a stand-alone SVM or a cluster comprising of multiple SVMs. If you are using Amazon FSx for NetApp ONTAP, you can either add FSx admin LIF comprising of multiple SVMs using fsxadmin account or add FSx SVM in SnapCenter.

### Before you begin

- You should have the required permissions in the Infrastructure Admin role to create storage connections.
- You should ensure that the plug-in installations are not in progress.

Host plug-in installations must not be in progress while adding a storage system connection because the host cache might not be updated and databases status might be displayed in the SnapCenter GUI as “Not available for backup” or “Not on NetApp storage”.

- Storage system names should be unique.

SnapCenter does not support multiple storage systems with the same name on different clusters. Each storage system that is supported by SnapCenter should have a unique name and a unique data LIF IP address.

### About this task

- When you configure storage systems, you can also enable Event Management System (EMS) & AutoSupport features. The AutoSupport tool collects data about the health of your system and automatically sends the data to NetApp technical support, enabling them to troubleshoot your system.

If you enable these features, SnapCenter sends AutoSupport information to the storage system and EMS messages to the storage system syslog when a resource is protected, a restore or clone operation finishes successfully, or an operation fails.





- If you are planning to replicate Snapshots to a SnapMirror destination or SnapVault destination, you must set up storage system connections for the destination SVM or Cluster as well as the source SVM or Cluster.



If you change the storage system password, scheduled jobs, on demand backup, and restore operations might fail. After you change the storage system password, you can update the password by clicking **Modify** in the Storage tab.

### Steps

1. In the left navigation pane, click **Storage Systems**.
2. In the Storage Systems page, click **New**.
3. In the Add Storage System page, provide the following information:

For this field...	Do this...
Storage System	<p data-bbox="834 155 1414 191">Enter the storage system name or IP address.</p> <div data-bbox="873 226 1451 548">  <p data-bbox="987 233 1451 541">Storage system names, not including the domain name, must have 15 or fewer characters, and the names must be resolvable. To create storage system connections with names that have more than 15 characters, you can use the <code>Add-SmStorageConnectionPowerShell</code> cmdlet.</p> </div> <div data-bbox="873 596 1442 768">  <p data-bbox="987 596 1442 768">For storage systems with MetroCluster configuration (MCC), it is recommended to register both local and peer clusters for non-disruptive operations.</p> </div> <p data-bbox="834 810 1490 940">SnapCenter does not support multiple SVMs with the same name on different clusters. Each SVM that is supported by SnapCenter must have a unique name.</p> <div data-bbox="873 989 1451 1121">  <p data-bbox="987 989 1451 1121">After adding the storage connection to SnapCenter, you should not rename the SVM or the Cluster using ONTAP.</p> </div> <div data-bbox="873 1178 1451 1310">  <p data-bbox="987 1178 1451 1310">If SVM is added with a short name or FQDN then it has to be resolvable from both the SnapCenter and the plug-in host.</p> </div>
User name/Password	<p data-bbox="834 1373 1451 1472">Enter the credentials of the storage user that has the required privileges to access the storage system.</p>

For this field...	Do this...
Event Management System (EMS) & AutoSupport Settings	<p>If you want to send EMS messages to the storage system syslog or if you want to have AutoSupport messages sent to the storage system for applied protection, completed restore operations, or failed operations, select the appropriate checkbox.</p> <p>When you select the <b>Send AutoSupport Notification for failed operations to storage system</b> checkbox, the <b>Log SnapCenter Server events to syslog</b> checkbox is also selected because EMS messaging is required to enable AutoSupport notifications.</p>

4. Click **More Options** if you want to modify the default values assigned to platform, protocol, port, and timeout.
  - a. In Platform, select one of the options from the drop-down list.

If the SVM is the secondary storage system in a backup relationship, select the **Secondary** checkbox. When the **Secondary** option is selected, SnapCenter does not perform a license check immediately.

If you have added SVM in SnapCenter then, user need to select the platform type from the dropdown manually.
  - b. In Protocol, select the protocol that was configured during SVM or Cluster setup, typically HTTPS.
  - c. Enter the port that the storage system accepts.

The default port 443 typically works.
  - d. Enter the time in seconds that should elapse before communication attempts are halted.

The default value is 60 seconds.
  - e. If the SVM has multiple management interfaces, select the **Preferred IP** checkbox, and then enter the preferred IP address for SVM connections.
  - f. Click **Save**.
5. Click **Submit**.

## Result

In the Storage Systems page, from the **Type** drop-down perform one of the following actions:

- Select **ONTAP SVMs** if you want to view all the SVMs that were added.

If you have added FSx SVMs, the FSx SVMs are listed here.

- Select **ONTAP Clusters** if you want to view all the clusters that were added.

If you have added FSx clusters using fsxadmin, the FSx clusters are listed here.

When you click on the cluster name, all the SVMs that are part of the cluster are displayed in the Storage Virtual Machines section.

If a new SVM is added to the ONTAP cluster using ONTAP GUI, click **Rediscover** to view the newly added SVM.

## After you finish

A cluster administrator must enable AutoSupport on each storage system node to send email notifications from all storage systems to which SnapCenter has access, by running the following command from the storage system command line:

```
autosupport trigger modify -node nodename -autosupport-message client.app.info  
-to enable -noteto enable
```



The Storage Virtual Machine (SVM) administrator has no access to AutoSupport.

## Storage connections and credentials

Before performing data protection operations, you should set up the storage connections and add the credentials that the SnapCenter Server and the SnapCenter plug-ins will use.

### Storage connections

The storage connections give the SnapCenter Server and SnapCenter plug-ins access to the ONTAP storage. Setting up these connections also involves configuring AutoSupport and Event Management System (EMS) features.

### Credentials

- Domain administrator or any member of the administrator group

Specify the domain administrator or any member of the administrator group on the system on which you are installing the SnapCenter plug-in. Valid formats for the Username field are:

- *NetBIOS\UserName*
  - *Domain FQDN\UserName*
  - *UserName@upn*
- Local administrator (for workgroups only)

For systems that belong to a workgroup, specify the built-in local administrator on the system on which you are installing the SnapCenter plug-in. You can specify a local user account that belongs to the local administrators group if the user account has elevated privileges or the User Access control feature is disabled on the host system.

The valid format for the Username field is: *UserName*

- Credentials for individual resource groups

If you set up credentials for individual resource groups and the username does not have full admin privileges, you must assign at least the resource group and backup privileges to the username.

## Provision storage on Windows hosts

### Create and manage igroups

You create initiator groups (igroups) to specify which hosts can access a given LUN on the storage system. You can use SnapCenter to create, rename, modify, or delete an igroup on a Windows host.

### Create an igroup

You can use SnapCenter to create an igroup on a Windows host. The igroup will be available in the Create Disk or Connect Disk wizard when you map the igroup to a LUN.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Igroup**.
3. In the Initiator Groups page, click **New**.
4. In the Create Igroup dialog box, define the igroup:

In this field...	Do this...
Storage System	Select the SVM for the LUN you will map to the igroup.
Host	Select the host on which you want to create the igroup.
Igroup Name	Enter the name of the igroup.
Initiators	Select the initiator.
Type	Select the initiator type, iSCSI, FCP, or mixed (FCP and iSCSI).

5. When you are satisfied with your entries, click **OK**.

SnapCenter creates the igroup on the storage system.

### Rename an igroup

You can use SnapCenter to rename an existing igroup.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Igroup**.
3. In the Initiator Groups page, click in the **Storage Virtual Machine** field to display a list of available SVMs, and then select the SVM for the igroup you want to rename.

4. In the list of igroups for the SVM, select the igroup you want to rename and click **Rename**.
5. In the Rename igroup dialog box, enter the new name for the igroup and click **Rename**.

### Modify an igroup

You can use SnapCenter to add igroup initiators to an existing igroup. While creating an igroup you can add only one host. If you want to create an igroup for a cluster, you can modify the igroup to add other nodes to that igroup.

#### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Igroup**.
3. In the Initiator Groups page, click in the **Storage Virtual Machine** field to display a drop-down list of available SVMs, then select the SVM for the igroup you want to modify.
4. In the list of igroups, select an igroup and click **Add Initiator to igroup**.
5. Select a host.
6. Select the initiators and click **OK**.

### Delete an igroup

You can use SnapCenter to delete an igroup when you no longer need it.

#### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Igroup**.
3. In the Initiator Groups page, click in the **Storage Virtual Machine** field to display a drop-down list of available SVMs, then select the SVM for the igroup you want to delete.
4. In the list of igroups for the SVM, select the igroup you want to delete and click **Delete**.
5. In the Delete igroup dialog box, click **OK**.

SnapCenter deletes the igroup.

### Create and manage disks

The Windows host sees LUNs on your storage system as virtual disks. You can use SnapCenter to create and configure an FC-connected or iSCSI-connected LUN.

- SnapCenter supports only basic disks. The dynamic disks are not supported.
- For GPT only one data partition and for MBR one primary partition is allowed that has one volume formatted with NTFS or CSVFS and has one mount path.
- Supported partition styles: GPT, MBR; in a VMware UEFI VM, only iSCSI disks are supported



SnapCenter does not support renaming a disk. If a disk that is managed by SnapCenter is renamed, SnapCenter operations will not succeed.

## View the disks on a host

You can view the disks on each Windows host you manage with SnapCenter.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the **Host** drop-down list.

The disks are listed.

## View clustered disks

You can view clustered disks on the cluster that you manage with SnapCenter. The clustered disks are displayed only when you select the cluster from the Hosts drop-down.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the cluster from the **Host** drop-down list.

The disks are listed.

## Establish an iSCSI session

If you are using iSCSI to connect to a LUN, you must establish an iSCSI session before you create the LUN to enable communication.

### Before you begin

- You must have defined the storage system node as an iSCSI target.
- You must have started the iSCSI service on the storage system. [Learn more](#)

### About this task

You can establish an iSCSI session only between the same IP versions, either from IPv6 to IPv6, or from IPv4 to IPv4.

You can use a link-local IPv6 address for iSCSI session management and for communication between a host and a target only when both are in the same subnet.

If you change the name of an iSCSI initiator, access to iSCSI targets is affected. After changing the name, you might require to reconfigure the targets accessed by the initiator so that they can recognize the new name. You must ensure to restart the host after changing the name of an iSCSI initiator.

If your host has more than one iSCSI interface, once you have established an iSCSI session to SnapCenter using an IP address on the first interface, you cannot establish an iSCSI session from another interface with a different IP address.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **iSCSI Session**.
3. From the **Storage Virtual Machine** drop-down list, select the storage virtual machine (SVM) for the iSCSI target.
4. From the **Host** drop-down list, select the host for the session.
5. Click **Establish Session**.

The Establish Session wizard is displayed.

6. In the Establish Session wizard, identify the target:

In this field...	Enter...
Target node name	The node name of the iSCSI target  If there is an existing target node name, the name is displayed in read-only format.
Target portal address	The IP address of the target network portal
Target portal port	The TCP port of the target network portal
Initiator portal address	The IP address of the initiator network portal

7. When you are satisfied with your entries, click **Connect**.

SnapCenter establishes the iSCSI session.

8. Repeat this procedure to establish a session for each target.

### Create FC-connected or iSCSI-connected LUNs or disks

The Windows host sees the LUNs on your storage system as virtual disks. You can use SnapCenter to create and configure an FC-connected or iSCSI-connected LUN.

If you want to create and format disks outside of SnapCenter, only NTFS and CSVFS file systems are supported.

#### Before you begin

- You must have created a volume for the LUN on your storage system.

The volume should hold LUNs only, and only LUNs created with SnapCenter.



You cannot create a LUN on a SnapCenter-created clone volume unless the clone has already been split.

- You must have started the FC or iSCSI service on the storage system.
- If you are using iSCSI, you must have established an iSCSI session with the storage system.
- The SnapCenter Plug-ins Package for Windows must be installed only on the host on which you are

creating the disk.

## About this task

- You cannot connect a LUN to more than one host unless the LUN is shared by hosts in a Windows Server failover cluster.
- If a LUN is shared by hosts in a Windows Server failover cluster that uses CSV (Cluster Shared Volumes), you must create the disk on the host that owns the cluster group.

## Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the **Host** drop-down list.
4. Click **New**.

The Create Disk wizard opens.

5. In the LUN Name page, identify the LUN:

In this field...	Do this...
Storage System	Select the SVM for the LUN.
LUN path	Click <b>Browse</b> to select the full path of the folder containing the LUN.
LUN name	Enter the name of the LUN.
Cluster size	Select the LUN block allocation size for the cluster.  Cluster size depends upon the operating system and applications.
LUN label	Optionally, enter descriptive text for the LUN.


6. In the Disk Type page, select the disk type:

Select...	If...
Dedicated disk	The LUN can be accessed by only one host.  Ignore the <b>Resource Group</b> field.
Shared disk	The LUN is shared by hosts in a Windows Server failover cluster.  Enter the name of the cluster resource group in the <b>Resource Group</b> field. You need to create the disk on only one host in the failover cluster.

Select...	If...
Cluster Shared Volume (CSV)	<p>The LUN is shared by hosts in a Windows Server failover cluster that uses CSV.</p> <p>Enter the name of the cluster resource group in the <b>Resource Group</b> field. Make sure that the host on which you are creating the disk is the owner of the cluster group.</p>

7. In the Drive Properties page, specify the drive properties:

Property	Description
Auto assign mount point	<p>SnapCenter automatically assigns a volume mount point based on the system drive.</p> <p>For example, if your system drive is C:, auto assign creates a volume mount point under your C: drive (C:\scmntpt\). Auto assign is not supported for shared disks.</p>
Assign drive letter	Mount the disk to the drive you select in the adjacent drop-down list.
Use volume mount point	<p>Mount the disk to the drive path you specify in the adjacent field.</p> <p>The root of the volume mount point must be owned by the host on which you are creating the disk.</p>
Do not assign drive letter or volume mount point	Choose this option if you prefer to mount the disk manually in Windows.
LUN size	<p>Specify the LUN size; 150 MB minimum.</p> <p>Select MB, GB, or TB in the adjoining drop-down list.</p>
Use thin provisioning for the volume hosting this LUN	<p>Thin provision the LUN.</p> <p>Thin provisioning allocates only as much storage space as is needed at one time, allowing the LUN to grow efficiently to the maximum available capacity.</p> <p>Make sure there is enough space available on the volume to accommodate all the LUN storage you think you will need.</p>

Property	Description
Choose partition type	<p>Select GPT partition for a GUID Partition Table, or MBR partition for a Master Boot Record.</p> <p>MBR partitions might cause misalignment issues in Windows Server failover clusters.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <p>Unified extensible firmware interface (UEFI) partition disks are not supported.</p> </div>

8. In the Map LUN page, select the iSCSI or FC initiator on the host:

In this field...	Do this...
Host	<p>Double-click the cluster group name to display a drop-down list that shows the hosts that belong to the cluster, and then select the host for the initiator.</p> <p>This field is displayed only if the LUN is shared by hosts in a Windows Server failover cluster.</p>
Choose host initiator	<p>Select <b>Fibre Channel</b> or <b>iSCSI</b>, and then select the initiator on the host.</p> <p>You can select multiple FC initiators if you are using FC with multipath I/O (MPIO).</p>

9. In the Group Type page, specify whether you want to map an existing igroup to the LUN, or create a new igroup:

Select...	If...
Create new igroup for selected initiators	You want to create a new igroup for the selected initiators.
Choose an existing igroup or specify a new igroup for selected initiators	<p>You want to specify an existing igroup for the selected initiators, or create a new igroup with the name you specify.</p> <p>Type the igroup name in the <b>igroup name</b> field. Type the first few letters of the existing igroup name to autocomplete the field.</p>

10. In the Summary page, review your selections and then click **Finish**.

SnapCenter creates the LUN and connects it to the specified drive or drive path on the host.

## Resize a disk

You can increase or decrease the size of a disk as your storage system needs change.

### About this task

- For thin provisioned LUN, the ONTAP lun geometry size is shown as the maximum size.
- For thick provisioned LUN, the expandable size (available size in the volume) is shown as the maximum size.
- LUNs with MBR-style partitions have a size limit of 2 TB.
- LUNs with GPT-style partitions have a storage system size limit of 16 TB.
- It is a good idea to make a Snapshot before resizing a LUN.
- If you need to restore a LUN from a Snapshot made before the LUN was resized, SnapCenter automatically resizes the LUN to the size of the Snapshot.

After the restore operation, data added to the LUN after it was resized must be restored from a Snapshot made after it was resized.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the Host drop-down list.

The disks are listed.

4. Select the disk you want to resize and then click **Resize**.
5. In the Resize Disk dialog box, use the slider tool to specify the new size of the disk, or enter the new size in the Size field.



If you enter the size manually, you need to click outside the Size field before the Shrink or Expand button is enabled appropriately. Also, you must click MB, GB, or TB to specify the unit of measurement.

6. When you are satisfied with your entries, click **Shrink** or **Expand**, as appropriate.

SnapCenter resizes the disk.

## Connect a disk

You can use the Connect Disk wizard to connect an existing LUN to a host, or to reconnect a LUN that has been disconnected.

### Before you begin

- You must have started the FC or iSCSI service on the storage system.
- If you are using iSCSI, you must have established an iSCSI session with the storage system.
- You cannot connect a LUN to more than one host unless the LUN is shared by hosts in a Windows Server failover cluster.

- If the LUN is shared by hosts in a Windows Server failover cluster that uses CSV (Cluster Shared Volumes), then you must connect the disk on the host that owns the cluster group.
- The Plug-in for Windows needs to be installed only on the host on which you are connecting the disk.

## Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the **Host** drop-down list.
4. Click **Connect**.

The Connect Disk wizard opens.

5. In the LUN Name page, identify the LUN to connect to:

In this field...	Do this...
Storage System	Select the SVM for the LUN.
LUN path	Click <b>Browse</b> to select the full path of the volume containing the LUN.
LUN name	Enter the name of the LUN.
Cluster size	Select the LUN block allocation size for the cluster.  Cluster size depends upon the operating system and applications.
LUN label	Optionally, enter descriptive text for the LUN.

6. In the Disk Type page, select the disk type:

Select...	If...
Dedicated disk	The LUN can be accessed by only one host.
Shared disk	The LUN is shared by hosts in a Windows Server failover cluster.  You need only connect the disk to one host in the failover cluster.
Cluster Shared Volume (CSV)	The LUN is shared by hosts in a Windows Server failover cluster that uses CSV.  Make sure that the host on which you are connecting to the disk is the owner of the cluster group.

7. In the Drive Properties page, specify the drive properties:

Property	Description
Auto assign	<p>Let SnapCenter automatically assign a volume mount point based on the system drive.</p> <p>For example, if your system drive is C:, the auto assign property creates a volume mount point under your C: drive (C:\scmnt\). The auto assign property is not supported for shared disks.</p>
Assign drive letter	Mount the disk to the drive you select in the adjoining drop-down list.
Use volume mount point	<p>Mount the disk to the drive path you specify in the adjoining field.</p> <p>The root of the volume mount point must be owned by the host on which you are creating the disk.</p>
Do not assign drive letter or volume mount point	Choose this option if you prefer to mount the disk manually in Windows.

8. In the Map LUN page, select the iSCSI or FC initiator on the host:

In this field...	Do this...
Host	<p>Double-click the cluster group name to display a drop-down list that shows the hosts that belong to the cluster, then select the host for the initiator.</p> <p>This field is displayed only if the LUN is shared by hosts in a Windows Server failover cluster.</p>
Choose host initiator	<p>Select <b>Fibre Channel</b> or <b>iSCSI</b>, and then select the initiator on the host.</p> <p>You can select multiple FC initiators if you are using FC with MPIO.</p>

9. In the Group Type page, specify whether you want to map an existing igroup to the LUN or create a new igroup:

Select...	If...
Create new igroup for selected initiators	You want to create a new igroup for the selected initiators.

Select...	If...
Choose an existing igroup or specify a new igroup for selected initiators	<p>You want to specify an existing igroup for the selected initiators, or create a new igroup with the name you specify.</p> <p>Type the igroup name in the <b>igroup name</b> field. Type the first few letters of the existing igroup name to automatically complete the field.</p>

10. In the Summary page, review your selections and click **Finish**.

SnapCenter connects the LUN to the specified drive or drive path on the host.

### Disconnect a disk

You can disconnect a LUN from a host without affecting the contents of the LUN, with one exception: If you disconnect a clone before it has been split off, you lose the contents of the clone.

#### Before you begin

- Make sure that the LUN is not in use by any application.
- Make sure that the LUN is not being monitored with monitoring software.
- If the LUN is shared, make sure to remove the cluster resource dependencies from the LUN and verify that all nodes in the cluster are powered on, functioning properly, and available to SnapCenter.

#### About this task

If you disconnect a LUN in a FlexClone volume that SnapCenter has created and no other LUNs on the volume are connected, SnapCenter deletes the volume. Before disconnecting the LUN, SnapCenter displays a message warning you that the FlexClone volume might be deleted.

To avoid automatic deletion of the FlexClone volume, you should rename the volume before disconnecting the last LUN. When you rename the volume, make sure that you change multiple characters than just the last character in the name.

#### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the **Host** drop-down list.

The disks are listed.

4. Select the disk you want to disconnect, and then click **Disconnect**.
5. In the Disconnect Disk dialog box, click **OK**.

SnapCenter disconnects the disk.

## Delete a disk

You can delete a disk when you no longer need it. After you delete a disk, you cannot undelete it.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Disks**.
3. Select the host from the **Host** drop-down list.

The disks are listed.

4. Select the disk you want to delete, and then click **Delete**.
5. In the Delete Disk dialog box, click **OK**.

SnapCenter deletes the disk.

## Create and manage SMB shares

To configure an SMB3 share on a storage virtual machine (SVM), you can use either the SnapCenter user interface or PowerShell cmdlets.

**Best Practice:** Using the cmdlets is recommended because it enables you to take advantage of templates provided with SnapCenter to automate share configuration.

The templates encapsulate best practices for volume and share configuration. You can find the templates in the Templates folder in the installation folder for the SnapCenter Plug-ins Package for Windows.



If you feel comfortable doing so, you can create your own templates following the models provided. You should review the parameters in the cmdlet documentation before creating a custom template.

## Create an SMB share

You can use the SnapCenter Shares page to create an SMB3 share on a storage virtual machine (SVM).

You cannot use SnapCenter to back up databases on SMB shares. SMB support is limited to provisioning only.

### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Shares**.
3. Select the SVM from the **Storage Virtual Machine** drop-down list.
4. Click **New**.

The New Share dialog opens.

5. In the New Share dialog, define the share:

In this field...	Do this...
Description	Enter descriptive text for the share.
Share name	<p>Enter the share name, for example, test_share.</p> <p>The name you enter for the share will also be used as the volume name.</p> <p>The share name:</p> <ul style="list-style-type: none"> <li>• Must be a UTF-8 string.</li> <li>• Must not include the following characters: control characters from 0x00 to 0x1F (both inclusive), 0x22 (double quotes), and the special characters \ / [ ] : (vertical bar) &lt; &gt; + = ; , ?</li> </ul>
Share path	<ul style="list-style-type: none"> <li>• Click in the field to enter a new file system path, for example, /.</li> <li>• Double-click in the field to select from a list of existing file system paths.</li> </ul>

6. When you are satisfied with your entries, click **OK**.

SnapCenter creates the SMB share on the SVM.

### Delete an SMB share

You can delete an SMB share when you no longer need it.

#### Steps

1. In the left navigation pane, click **Hosts**.
2. In the Hosts page, click **Shares**.
3. In the Shares page, click in the **Storage Virtual Machine** field to display a drop-down with a list of available storage virtual machines (SVMs), then select the SVM for the share you want to delete.
4. From the list of shares on the SVM, select the share you want to delete and click **Delete**.
5. In the Delete Share dialog box, click **OK**.

SnapCenter deletes the SMB share from the SVM.

### Reclaim space on the storage system

Although NTFS tracks the available space on a LUN when files are deleted or modified, it does not report the new information to the storage system. You can run the space reclamation PowerShell cmdlet on the Plug-in for Windows host to ensure that newly freed blocks are marked as available in storage.

If you are running the cmdlet on a remote plug-in host, you must have run the SnapCenterOpen-SMConnection cmdlet to open a connection to the SnapCenter Server.

### Before you begin

- You must ensure that the space reclamation process has completed before performing a restore operation.
- If the LUN is shared by hosts in a Windows Server failover cluster, you must perform space reclamation on the host that owns the cluster group.
- For optimum storage performance, you should perform space reclamation as often as possible.

You should ensure that the entire NTFS file system has been scanned.

### About this task

- Space reclamation is time-consuming and CPU-intensive, so it is usually best to run the operation when storage system and Windows host usage is low.
- Space reclamation reclaims nearly all available space, but not 100 percent.
- You should not run disk defragmentation at the same time as you are performing space reclamation.

Doing so can slow the reclamation process.

### Step

From the application server PowerShell command prompt, enter the following command:

```
Invoke-SdHostVolumeSpaceReclaim -Path drive_path
```

drive\_path is the drive path mapped to the LUN.

### Provision storage using PowerShell cmdlets

If you do not want to use the SnapCenter GUI to perform host provisioning and space reclamation jobs, you can use the PowerShell cmdlets. You can use cmdlets directly or add them to scripts.

If you are running the cmdlets on a remote plug-in host, you must run the SnapCenter Open-SMConnection cmdlet to open a connection to the SnapCenter Server.

The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running *Get-Help command\_name*. Alternatively, you can also refer to the [SnapCenter Software Cmdlet Reference Guide](#).

If SnapCenter PowerShell cmdlets are broken due to removal of SnapDrive for Windows from the server, refer to [SnapCenter cmdlets broken when SnapDrive for Windows is uninstalled](#).

### Provision storage in VMware environments

You can use the SnapCenter Plug-in for Microsoft Windows in VMware environments to create and manage LUNs and manage Snapshots.

## Supported VMware guest OS platforms

- Supported versions of Windows Server
- Microsoft cluster configurations

Support for up to a maximum of 16 nodes supported on VMware when using the Microsoft iSCSI Software Initiator, or up to two nodes using FC

- RDM LUNs

Support for a maximum of 56 RDM LUNs with four LSI Logic SCSI controllers for normal RDMS, or 42 RDM LUNs with three LSI Logic SCSI controllers on a VMware VM MSCS box-to-box Plug-in for Windows configuration

Supports VMware ParaVirtual SCSI Controller. 256 disks can be supported on RDM disks.

## VMware ESXi server-related limitations

- Installing the Plug-in for Windows on a Microsoft cluster on virtual machines using ESXi credentials is not supported.

You should use your vCenter credentials when installing the Plug-in for Windows on clustered virtual machines.

- All clustered nodes must use the same target ID (on the virtual SCSI adapter) for the same clustered disk.
- When you create an RDM LUN outside of the Plug-in for Windows, you must restart the plug-in service to enable it to recognize the newly created disk.
- You cannot use iSCSI and FC initiators at the same time on a VMware guest OS.

## Minimum vCenter privileges required for SnapCenter RDM operations

You should have the following vCenter privileges on the host to perform RDM operations in a guest OS:

- Datastore: Remove File
- Host: Configuration > Storage Partition Configuration
- Virtual Machine: Configuration

You must assign these privileges to a role at the Virtual Center Server level. The role to which you assign these privileges cannot be assigned to any user without root privileges.

After you assign these privileges, you can install the Plug-in for Windows on the guest OS.

## Manage FC RDM LUNs in a Microsoft cluster

You can use the Plug-in for Windows to manage a Microsoft cluster using FC RDM LUNs, but you must first create the shared RDM quorum and shared storage outside the plug-in, and then add the disks to the virtual machines in the cluster.

Starting with ESXi 5.5, you can also use ESX iSCSI and FCoE hardware to manage a Microsoft cluster. The Plug-in for Windows includes out-of-box support for Microsoft clusters.

## Requirements

The Plug-in for Windows provides support for Microsoft clusters using FC RDM LUNs on two different virtual machines that belong to two different ESX or ESXi servers, also known as cluster across boxes, when you meet specific configuration requirements.

- The virtual machines (VMs) must be running the same Windows Server version.
- ESX or ESXi server versions must be the same for each VMware parent host.
- Each parent host must have at least two network adapters.
- There must be at least one VMware Virtual Machine File System (VMFS) datastore shared between the two ESX or ESXi servers.
- VMware recommends that the shared datastore be created on an FC SAN.

If necessary, the shared datastore can also be created over iSCSI.

- The shared RDM LUN must be in physical compatibility mode.
- The shared RDM LUN must be created manually outside of the Plug-in for Windows.

You cannot use virtual disks for shared storage.

- A SCSI controller must be configured on each virtual machine in the cluster in physical compatibility mode:

Windows Server 2008 R2 requires you to configure the LSI Logic SAS SCSI controller on each virtual machine. Shared LUNs cannot use the existing LSI Logic SAS controller if only one of its type exists and it is already attached to the C: drive.

SCSI controllers of type paravirtual are not supported on VMware Microsoft clusters.



When you add a SCSI controller to a shared LUN on a virtual machine in physical compatibility mode, you must select the **Raw Device Mappings** (RDM) option and not the **Create a new disk** option in the VMware Infrastructure Client.

- Microsoft virtual machine clusters cannot be part of a VMware cluster.
- You must use vCenter credentials and not ESX or ESXi credentials when you install the Plug-in for Windows on virtual machines that belongs to a Microsoft cluster.
- The Plug-in for Windows cannot create a single igroup with initiators from multiple hosts.

The igroup containing the initiators from all ESXi hosts must be created on the storage controller prior to creating the RDM LUNs that will be used as shared cluster disks.

- Ensure that you create an RDM LUN on ESXi 5.0 using an FC initiator.

When you create an RDM LUN, an initiator group is created with ALUA.

## Limitations

The Plug-in for Windows supports Microsoft clusters using FC/iSCSI RDM LUNs on different virtual machines belonging to different ESX or ESXi servers.



This feature is not supported in releases before ESX 5.5i.

- The Plug-in for Windows does not support clusters on ESX iSCSI and NFS datastores.
- The Plug-in for Windows does not support mixed initiators in a cluster environment.

Initiators must be either FC or Microsoft iSCSI, but not both.

- ESX iSCSI initiators and HBAs are not supported on shared disks in a Microsoft cluster.
- The Plug-in for Windows does not support virtual machine migration with vMotion if the virtual machine is part of a Microsoft cluster.
- The Plug-in for Windows does not support MPIO on virtual machines in a Microsoft cluster.

### Create a shared FC RDM LUN

Before you can use FC RDM LUNs to share storage between nodes in a Microsoft cluster, you must first create the shared quorum disk and shared storage disk, and then add them to both virtual machines in the cluster.

The shared disk is not created using the Plug-in for Windows. You should create and then add the shared LUN to each virtual machine in the cluster.

#### Related information

Refer to [Broadcom Technical Documentation](#) and search for documentation on clustering virtual machines across physical hosts and creating shared FC RDM LUNs for Microsoft clusters.

### Add SnapCenter Standard controller-based licenses

A SnapCenter Standard controller-based license is required if you are using FAS, AFF, or ASA storage controllers.

The controller-based license has the following characteristics:

- SnapCenter Standard entitlement included with purchase of Premium or Flash Bundle (not with the base pack)
- Unlimited storage usage
- Added directly to the FAS, AFF, or ASA storage controller by using either ONTAP System Manager or the ONTAP CLI.



You do not enter any license information in the SnapCenter user interface for the SnapCenter controller-based licenses.

- Locked to the controller's serial number

For information on the licenses required, see [SnapCenter licenses](#).

### Step 1: Verify if the SnapManager Suite license is installed

You can use the SnapCenter user interface to check if a SnapManager Suite license is installed on FAS, AFF, or ASA primary storage systems and identify which systems that need licenses. SnapManager Suite licenses apply only to FAS, AFF, and ASA SVMs or clusters on primary storage systems.



If you already have a SnapManager Suite license on your controller, SnapCenter automatically provides the Standard controller-based license entitlement. The names SnapManagerSuite license and SnapCenter Standard controller-based license are used interchangeably, but they refer to the same license.



### Steps

1. In the left navigation pane, select **Storage Systems**.
2. In the Storage Systems page, from the **Type** drop-down, select whether to view all the SVMs or clusters that were added:
  - To view all of the SVMs that were added, select **ONTAP SVMs**.
  - To view all of the clusters that were added, select **ONTAP Clusters**.

When you select the cluster name, all of the SVMs that are part of the cluster are displayed in the Storage Virtual Machines section.

3. In the Storage Connections list, locate the Controller License column.

The Controller License column displays the following status:

-  indicates that a SnapManager Suite license is installed on a FAS, AFF, or ASA primary storage system.
-  indicates that a SnapManager Suite license is not installed on a FAS, AFF, or ASA primary storage system.
- Not applicable indicates that a SnapManager Suite license is not applicable because the storage controller is on Amazon FSx for NetApp ONTAP, Cloud Volumes ONTAP, ONTAP Select, or Secondary storage platforms.

### Step 2: Identify the licenses installed on the controller

You can use the ONTAP command line to view all the licenses installed on your controller. You should be a cluster administrator on the FAS, AFF, or ASA system.



The controller displays the SnapCenter Standard controller-based license as the SnapManagerSuite license.

### Steps

1. Log in to the NetApp controller using the ONTAP command line.
2. Enter the license show command, and then view the output to see if the SnapManagerSuite license is installed.

## Example output

```
cluster1::> license show
(system license show)

Serial Number: 1-80-0000xx
Owner: cluster1
Package          Type          Description          Expiration
-----
Base             site         Cluster Base License -

Serial Number: 1-81-00000000000000000000000000xx
Owner: cluster1-01
Package          Type          Description          Expiration
-----
NFS              license      NFS License         -
CIFS             license      CIFS License        -
iSCSI           license      iSCSI License       -
FCP              license      FCP License         -
SnapRestore     license      SnapRestore License -
SnapMirror      license      SnapMirror License  -
FlexClone       license      FlexClone License   -
SnapVault       license      SnapVault License   -
SnapManagerSuite license      SnapManagerSuite License -
```

In the example, the SnapManagerSuite license is installed, therefore, no additional SnapCenter licensing action is required.

### Step 3: Retrieve the controller serial number

Get the controller serial number using the ONTAP command line. You must be a cluster administrator on the FAS, AFF, or ASA system to get your controller-based license serial number.

#### Steps

1. Log in to the controller using the ONTAP command line.
2. Enter the system show -instance command, and then review the output to locate the controller serial number.

## Example output

```
cluster1::> system show -instance

Node: fasxxxx-xx-xx-xx
Owner:
Location: RTP 1.5
Model: FAS8080
Serial Number: 123451234511
Asset Tag: -
Uptime: 143 days 23:46
NVRAM System ID: xxxxxxxxxx
System ID: xxxxxxxxxx
Vendor: NetApp
Health: true
Eligibility: true
Differentiated Services: false
All-Flash Optimized: false

Node: fas8080-41-42-02
Owner:
Location: RTP 1.5
Model: FAS8080
Serial Number: 123451234512
Asset Tag: -
Uptime: 144 days 00:08
NVRAM System ID: xxxxxxxxxx
System ID: xxxxxxxxxx
Vendor: NetApp
Health: true
Eligibility: true
Differentiated Services: false
All-Flash Optimized: false
2 entries were displayed.
```

3. Record the serial numbers.

### Step 4: Retrieve the serial number of the controller-based license

If you are using FAS, ASA, or AFF storage, you can retrieve the SnapCenter controller-based license from the NetApp Support Site before you install it using the ONTAP command line.

#### Before you begin

- You should have a valid NetApp Support Site login credentials.

If you do not enter valid credentials, the system does not return any information for your search.

- You should have the controller serial number.

### Steps

1. Log in to the [NetApp Support Site](#).
2. Navigate to **Systems > Software Licenses**.
3. In the Selection Criteria area, ensure Serial Number (located on back of unit) is selected, enter the controller serial number, and then select **Go!**.

**Software Licenses**

**Selection Criteria**

Choose a method by which to search

▶ Serial Number (located on back of unit) ▾ Enter Value:  **Go!**

Enter the Cluster Serial Number value without dashes.

- OR -

▶ Show Me All: Serial Numbers with Licenses ▾ For Company:  **Go!**

A list of licenses for the specified controller is displayed.

4. Locate and record the SnapCenter Standard or SnapManagerSuite license.

### Step 5: Add controller-based license

You can use the ONTAP command line to add a SnapCenter controller-based license when you are using FAS, AFF, or ASA systems, and you have a SnapCenter Standard or SnapManagerSuite license.

#### Before you begin

- You should be a cluster administrator on the FAS, AFF, or ASA system.
- You should have the SnapCenter Standard or SnapManagerSuite license.

#### About this task

If you want to install SnapCenter on a trial basis with FAS, AFF, or ASA storage, you can obtain a Premium Bundle evaluation license to install on your controller.

If you want to install SnapCenter on a trial basis, you should contact your sales representative to obtain a Premium Bundle evaluation license to install on your controller.

### Steps

1. Log in to the NetApp cluster using the ONTAP command line.
2. Add the SnapManagerSuite license key:

```
system license add -license-code license_key
```

This command is available at the admin privilege level.

3. Verify that the SnapManagerSuite license is installed:

```
license show
```

## Step 6: Remove the trial license

If you are using a controller-based SnapCenter Standard license and need to remove the capacity-based trial license (serial number ending with “50”), you should use MySQL commands to remove the trial license manually. The trial license cannot be deleted using the SnapCenter user interface.



Removing a trial license manually is only required if you are using a SnapCenter Standard controller-based license.

### Steps

1. On the SnapCenter Server, open a PowerShell window to reset the MySQL password.
  - a. Run the `Open-SmConnection` cmdlet to establish connection with the SnapCenter Server for a `SnapCenterAdmin` account.
  - b. Run the `Set-SmRepositoryPassword` to reset the MySQL password.

For information about the cmdlets, see [SnapCenter Software Cmdlet Reference Guide](#).

2. Open the command prompt and run `mysql -u root -p` to log into MySQL.

MySQL prompts you for the password. Enter the credentials you provided while resetting the password.

3. Remove the trial license from the database:

```
use nsm;DELETE FROM nsm_License WHERE nsm_License_Serial_Number='510000050';
```

## Configure High Availability

### Configure SnapCenter Servers for High Availability

To support High Availability (HA) in SnapCenter running either on Windows or on Linux, you can install the F5 load balancer. F5 enables the SnapCenter Server to support active-passive configurations in up to two hosts that are in the same location. To use F5 Load Balancer in SnapCenter, you should configure the SnapCenter Servers and configure F5 load balancer.

You can also configure Network Load Balancing (NLB) to set up SnapCenter High Availability. You should manually configure NLB outside of SnapCenter installation for high availability.

For cloud environment, you can configure high availability using either Amazon Web Services (AWS) Elastic Load Balancing (ELB) and Azure load balancer.

### Configure high availability using F5

For instruction to configure SnapCenter Servers for high availability using F5 load balancer, refer to [How to configure SnapCenter Servers for high availability using F5 Load Balancer](#).

You must be a member of the Local Administrators group on the SnapCenter Servers (in addition to being assigned to the SnapCenterAdmin role) to use the following cmdlets for adding and removing F5 clusters:

- Add-SmServerCluster
- Add-SmServer
- Remove-SmServerCluster

For more information, refer to [SnapCenter Software Cmdlet Reference Guide](#).

#### Additional information

- After you install and configure SnapCenter for high availability, edit the SnapCenter desktop shortcut to point to the F5 cluster IP.
- If a failover occurs between SnapCenter Servers and if there is also an existing SnapCenter session, you must close the browser and log on to SnapCenter again.
- In load balancer setup (NLB or F5), if you add a host that is partially resolved by the NLB or F5 host and if the SnapCenter host is not able to reach out to this host, then the SnapCenter host page switches between hosts down and running state frequently. To resolve this issue, you should ensure that both the SnapCenter hosts are able to resolve the host in NLB or F5 host.
- SnapCenter commands for MFA settings should be executed on all the hosts. Relying party configuration should be done in the Active Directory Federation Services (AD FS) server using F5 cluster details. The host level SnapCenter UI access will be blocked after MFA is enabled.
- During failover, the audit log settings will not reflect on the second host. Hence, you should manually repeat the audit log settings on F5 passive host when it becomes active.

### Configure high availability using Network Load Balancing (NLB)

You can configure Network Load Balancing (NLB) to set up SnapCenter High Availability. You should manually configure NLB outside of SnapCenter installation for high availability.

For information about how to configure Network Load Balancing (NLB) with SnapCenter refer to [How to configure NLB with SnapCenter](#).

### Configure high availability using AWS Elastic Load Balancing (ELB)

You can configure high availability SnapCenter environment in Amazon Web Services (AWS) by setting up two SnapCenter servers in separate availability zones (AZs) and configuring them for automatic failover. The architecture includes virtual private IP addresses, routing tables, and synchronization between active and standby MySQL databases.

#### Steps

1. Configure virtual private overlay IP in AWS. For information, refer to [Configure virtual private overlay IP](#).
2. Prepare your Windows host
  - a. Force IPv4 being prioritized above IPv6:
    - Location: HKLM\SYSTEM\CurrentControlSet\Services\Tcpip6\Parameters

- Key: DisabledComponents
  - Type: REG\_DWORD
  - Value: 0x20
- b. Ensure that the fully qualified domain names can be resolved via DNS or via local host configuration to the IPv4 addresses.
  - c. Ensure that you do not have a system proxy configured.
  - d. Ensure that the administrator password is same on both the Windows Server when using a setup without an Active Directory and the servers are not in one domain.
  - e. Add virtual IP on both Windows Servers.
3. Create the SnapCenter cluster.
    - a. Start Powershell and connect to SnapCenter. `Open-SmConnection`
    - b. Create the cluster. `Add-SmServerCluster -ClusterName <cluster_name> -ClusterIP <cluster_ip> -PrimarySCServerIP <primary_ip> -Verbose -Credential administrator`
    - c. Add the secondary server. `Add-SmServer -ServerName <server_name> -ServerIP <server_ip> -CleanUpSecondaryServer -Verbose -Credential administrator`
    - d. Get the high availability details. `Get-SmServerConfig`
  4. Create the Lambda function to adjust the routing table in case the virtual private IP endpoint becomes unavailable, monitored by AWS CloudWatch. For information, refer to [Create a Lambda function](#).
  5. Create a monitor in CloudWatch to monitor the availability of the SnapCenter endpoint. An alarm is configured to trigger a Lambda function if the endpoint is unreachable. The Lambda function adjusts the routing table to redirect traffic to the active SnapCenter server. For information, refer to [Create synthetic canaries](#).
  6. Implement workflow using a step function as an alternative to CloudWatch monitoring, providing smaller failover times. The workflow includes a Lambda probe function to test the SnapCenter URL, a DynamoDB table for storing failure counts, and the Step Function itself.
    - a. Use a lambda function for probing the SnapCenter URL. For information, refer to [Create Lambda function](#).
    - b. Create a DynamoDB table for storing the failure count between two Step Function iterations. For information, refer to [Get started with DynamoDB table](#).
    - c. Create the Step Function. For information, refer to [Step Function documentation](#).
    - d. Test a single step.
    - e. Test the complete function.
    - f. Create IAM Role and adjust permissions to be allowed to execute Lambda function.
    - g. Create schedule to trigger Step Function. For information, refer to [Using Amazon EventBridge Scheduler to start a Step Functions](#).

### Configure high availability using Azure load balancer

You can configure high availability SnapCenter environment using Azure load balancer.

#### Steps

1. Create virtual machines in a scale set using Azure portal. The Azure virtual machine scale set allows you to create and manage a group of load balanced virtual machines. The number of virtual machine

instances can automatically increase or decrease in response to demand or a defined schedule. For information, refer to [Create virtual machines in a scale set using Azure portal](#).

2. After configuring the virtual machines, log into each virtual machine in VM set and install SnapCenter Server in both the nodes.
3. Create the cluster in host 1. `Add-SmServerCluster -ClusterName <cluster_name> -ClusterIP <specify the load balancer front end virtual ip> -PrimarySCServerIP <ip address> -Verbose -Credential <credentials>`
4. Add the secondary server. `Add-SmServer -ServerName <name of node2> -ServerIP <ip address of node2> -Verbose -Credential <credentials>`
5. Obtain the high availability details. `Get-SmServerConfig`
6. If required, rebuild the secondary host. `Set-SmRepositoryConfig -RebuildSlave -Verbose`
7. Failover to the second host. `Set-SmRepositoryConfig ActiveMaster <name of node2> -Verbose`

== Switch from NLB to F5 for high availability

You can change your SnapCenter HA configuration from Network Load Balancing (NLB) to use F5 Load Balancer.

### Steps

1. Configure SnapCenter Servers for high availability using F5. [Learn more](#).
2. On the SnapCenter Server host, launch PowerShell.
3. Start a session by using the `Open-SmConnection` cmdlet, and then enter your credentials.
4. Update the SnapCenter Server to point to the F5 cluster IP address using the `Update-SmServerCluster` cmdlet.

The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running `Get-Help command_name`. Alternatively, you can also refer to the [SnapCenter Software Cmdlet Reference Guide](#).

## High availability for the SnapCenter MySQL repository

MySQL replication is a feature of MySQL Server that enables you to replicate data from one MySQL database server (master) to another MySQL database server (slave). SnapCenter supports MySQL replication for high availability only on two Network Load Balancing-enabled (NLB-enabled) nodes.

SnapCenter performs read or write operations on the master repository and routes its connection to the slave repository when there is a failure on the master repository. The slave repository then becomes the master repository. SnapCenter also supports reverse replication, which is enabled only during failover.

If you want to use the MySQL high availability (HA) feature, you must configure Network Load Balancer (NLB) on the first node. The MySQL repository is installed on this node as part of the installation. While installing SnapCenter on the second node, you must join to the F5 of the first node and create a copy of the MySQL repository on the second node.

SnapCenter provides the `Get-SmRepositoryConfig` and `Set-SmRepositoryConfig` PowerShell cmdlets to

manage MySQL replication.

The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running *Get-Help command\_name*. Alternatively, you can also refer to the [SnapCenter Software Cmdlet Reference Guide](#).

You must be aware of the limitations related to the MySQL HA feature:

- NLB and MySQL HA are not supported beyond two nodes.
- Switching from a SnapCenter standalone installation to an NLB installation or vice versa and switching from a MySQL standalone setup to MySQL HA are not supported.
- Automatic failover is not supported if the slave repository data is not synchronized with the master repository data.

You can initiate a forced failover by using the *Set-SmRepositoryConfig* cmdlet.

- When failover is initiated, jobs that are running might fail.

If failover happens because MySQL Server or SnapCenter Server is down, then any jobs that are running might fail. After failing over to the second node, all subsequent jobs run successfully.

For information about configuring high availability, see [How to configure NLB and ARR with SnapCenter](#).

## Configure role-based access control (RBAC)

### Create a role

In addition to using the existing SnapCenter roles, you can create your own roles and customize the permissions.

To create your own roles, it is necessary to log in as the "SnapCenterAdmin" role.

### Steps

1. In the left navigation pane, click **Settings**.
2. In the Settings page, click **Roles**.
3. Click **+**.
4. Specify a name and description for the new role.



Only the following special characters can be used in user names and group names: space ( ), hyphen (-), underscore (\_), and colon (:).

5. Select **All members of this role can see other members' objects** to enable other members of the role to see resources such as volumes and hosts after they refresh the resources list.

You should deselect this option if you do not want members of this role to see objects to which other members are assigned.



When this option is enabled, assigning users access to objects or resources is not required if users belong to the same role as the user who created the objects or resources.

6. In the Permissions page, select the permissions that you want to assign to the role, or click **Select All** to grant all permissions to the role.
7. Click **Submit**.

### Add an NetApp ONTAP RBAC role using security login commands

You can use the security login commands to add a NetApp ONTAP RBAC role when your storage systems are running clustered ONTAP.

#### Before you begin

- Identify the task (or tasks) that you want to perform and the privileges required to perform these tasks.
- Grant privileges to commands and/or command directories.

There are two levels of access for each command/command directory: all-access and read-only.

You must always assign the all-access privileges first.

- Assign roles to users.
- Identify your configuration depending on whether your SnapCenter plug-ins are connected to the Cluster Administrator IP for the entire cluster or directly connected to a SVM within the cluster.

#### About this task

To simplify the configuration of these roles on storage systems, you can use the RBAC User Creator for NetApp ONTAP tool, which is posted on the NetApp Communities Forum.

This tool automatically handles setting up the ONTAP privileges correctly. For example, RBAC User Creator for NetApp ONTAP tool automatically adds the privileges in the correct order so that the all-access privileges appear first. If you add the read-only privileges first and then add the all-access privileges, ONTAP marks the all-access privileges as duplicates and ignores them.



If you later upgrade SnapCenter or ONTAP, you should re-run the RBAC User Creator for NetApp ONTAP tool to update the user roles you created previously. User roles created for an earlier version of SnapCenter or ONTAP do not work properly with upgraded versions. When you re-run the tool, it automatically handles the upgrade. You do not need to recreate the roles.

More information about setting up ONTAP RBAC roles, see the [ONTAP 9 Administrator Authentication and RBAC Power Guide](#).

#### Steps

1. On the storage system, create a new role by entering the following command:

```
security login role create <role_name\> -cmddirname "command" -access all  
-vserver <svm_name\>
```

- `svm_name` is the name of the SVM. If you leave this blank, it defaults to cluster administrator.
- `role_name` is the name you specify for the role.
- `command` is the ONTAP capability.



You must repeat this command for each permission. Remember that all-access commands must be listed before read-only commands.

For information about the list of permissions, see [ONTAP CLI commands for creating roles and assigning permissions](#).

2. Create a user name by entering the following command:

```
security login create -username <user_name\> -application ontapi -authmethod <password\> -role <name_of_role_in_step_1\> -vserver <svm_name\> -comment "user_description"
```

- `user_name` is the name of the user you are creating.
- `<password>` is your password. If you do not specify a password, the system will prompt you for one.
- `svm_name` is the name of the SVM.

3. Assign the role to the user by entering the following command:

```
security login modify username <user_name\> -vserver <svm_name\> -role <role_name\> -application ontapi -application console -authmethod <password\>
```

- `<user_name>` is the name of the user you created in Step 2. This command lets you modify the user to associate it with the role.
- `<svm_name>` is the name of the SVM.
- `<role_name>` is the name of the role you created in Step 1.
- `<password>` is your password. If you do not specify a password, the system will prompt you for one.

4. Verify that the user was created correctly by entering the following command:

```
security login show -vserver <svm_name\> -user-or-group-name <user_name\>
```

`user_name` is the name of the user you created in Step 3.

## Create SVM roles with minimum privileges

There are several ONTAP CLI commands you must run when you create a role for a new SVM user in ONTAP. This role is required if you configure SVMs in ONTAP to use with SnapCenter and you do not want to use the `vsadmin` role.

### Steps

1. On the storage system, create a role and assign all the permissions to the role.

```
security login role create -vserver <svm_name\>- role <SVM_Role_Name\> -cmddirname <permission\>
```



You should repeat this command for each permission.

2. Create a user and assign the role to that user.

```
security login create -user <user_name\> -vserver <svm_name\> -application ontapi -authmethod password -role <SVM_Role_Name\>
```

3. Unlock the user.

```
security login unlock -user <user_name\> -vserver <svm_name\>
```

## ONTAP CLI commands for creating SVM roles and assigning permissions

There are several ONTAP CLI commands you should run to create SVM roles and assign permissions.

- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "snapmirror list-destinations" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "event generate-autosupport-log" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "job history show" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "job show" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "job stop" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "lun" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup add" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup rename" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup show" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping add-reporting-nodes" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "lun mapping create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping remove-reporting-nodes" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping show" -access all`

- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun modify" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun move-in-volume" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun offline" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun online" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun resize" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun serial" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "network interface" -access readonly
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy add-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy modify-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy remove-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror restore" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "snapmirror show-history" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror update" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror update-ls-set" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "version" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume clone create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume clone show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname

```

"volume clone split start" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume clone split stop" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume destroy" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume file clone create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume file show-disk-usage" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume modify" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume offline" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume online" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume qtree create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume qtree delete" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume qtree modify" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume qtree show" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume restrict" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume show" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume snapshot create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume snapshot delete" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume snapshot modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"volume snapshot modify-snaplock-expiry-time" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume snapshot rename" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
"volume snapshot restore" -access all

```

- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume snapshot restore-file" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume snapshot show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume snapshot show-delta" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume unmount" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share delete" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy delete" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy rule create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy rule show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "vserver iscsi connection show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver" -access readonly
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver iscsi" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "volume clone split status" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume managed-feature" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "nvme subsystem map" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname

```

"nvme subsystem create" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme subsystem delete" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme subsystem modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme subsystem host" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme subsystem controller" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme subsystem show" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme namespace create" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme namespace delete" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme namespace modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
"nvme namespace show" -access all

```

### Create SVM roles for ASA r2 systems

There are several ONTAP CLI commands you must run to create a role for a new SVM user in ASA r2 systems. This role is required if you configure SVMs in ASA r2 systems to use with SnapCenter and you do not want to use the vsadmin role.

#### Steps

1. On the storage system, create a role and assign all the permissions to the role.

```

security login role create -vserver <svm_name\>- role <SVM_Role_Name\>
-cmddirname <permission\>

```



You should repeat this command for each permission.

2. Create a user and assign the role to that user.

```

security login create -user <user_name\> -vserver <svm_name\> -application
http -authmethod password -role <SVM_Role_Name\>

```

3. Unlock the user.

```

security login unlock -user <user_name\> -vserver <svm_name\>

```

## ONTAP CLI commands for creating SVM roles and assigning permissions

There are several ONTAP CLI commands you should run to create SVM roles and assign permissions.

- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "snapmirror list-destinations" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "event generate-autosupport-log" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "job history show" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "job show" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "job stop" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "lun" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup add" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup rename" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun igroup show" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping add-reporting-nodes" -access all`
- `security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname "lun mapping create" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping delete" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping remove-reporting-nodes" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun mapping show" -access all`
- `security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname "lun modify" -access all`

- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun move-in-volume" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun offline" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun online" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun resize" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun serial" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "lun show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "network interface" -access readonly
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy add-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy modify-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy remove-rule" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror policy show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror restore" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "snapmirror show-history" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror update" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "snapmirror update-ls-set" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "version" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume clone create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume clone show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume clone split start" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname

```

"volume clone split stop" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume destroy" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume file clone create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume file show-disk-usage" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume modify" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume offline" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume online" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume qtree create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume qtree delete" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume qtree modify" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume qtree show" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume restrict" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume show" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot create" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot delete" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "volume snapshot modify-snaplock-expiry-time" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot rename" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot restore" -access all
• security login role create -vserver SVM_name -role SVM_Role_Name -cmddirname
  "volume snapshot restore-file" -access all

```

- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume snapshot show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume snapshot show-delta" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume unmount" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share delete" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs share show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver cifs show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy delete" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy rule create" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy rule show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy show" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "vserver iscsi connection show" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver" -access readonly
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver export-policy" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "vserver iscsi" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "volume clone split status" -access all
- security login role create -vserver SVM\_name -role SVM\_Role\_Name -cmddirname "volume managed-feature" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "nvme subsystem map" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname "nvme subsystem create" -access all
- security login role create -vserver SVM\_Name -role SVM\_Role\_Name -cmddirname

```

"nvme subsystem delete" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme subsystem modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme subsystem host" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme subsystem controller" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme subsystem show" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme namespace create" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme namespace delete" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme namespace modify" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "nvme namespace show" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "storage-unit show" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "consistency-group" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "snapmirror protect" -access all
• security login role create -vserver SVM_Name -role SVM_Role_Name -cmddirname
  "volume delete" -access all
• security login create -user-or-group-name user_name -application http
  -authentication-method password -role SVM_Role_Name -vserver SVM_Name
• security login create -user-or-group-name user_name -application ssh
  -authentication-method password -role SVM_Role_Name -vserver SVM_Name

```

### Create ONTAP cluster roles with minimum privileges

You should create an ONTAP cluster role with minimum privileges so that you do not have to use the ONTAP admin role to perform operations in SnapCenter. You can run several ONTAP CLI commands to create the ONTAP cluster role and assign minimum privileges.

#### Steps

1. On the storage system, create a role and assign all the permissions to the role.

```

security login role create -vserver <cluster_name>- role <role_name>
-cmddirname <permission>

```



You should repeat this command for each permission.

## 2. Create a user and assign the role to that user.

```
security login create -user <user_name\> -vserver <cluster_name\> -application  
ontapi http -authmethod password -role <role_name\>
```

## 3. Unlock the user.

```
security login unlock -user <user_name\> -vserver <cluster_name\>
```

### ONTAP CLI commands for creating cluster roles and assigning permissions

There are several ONTAP CLI commands you should run to create cluster roles and assign permissions.

- `security login role create -vserver Cluster_name or cluster_name -role Role_Name -cmddirname "metrocluster show" -access readonly`
- `security login role create -vserver Cluster_name or cluster_name -role Role_Name -cmddirname "cluster identity modify" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster identity show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster modify" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster peer show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "event generate-autosupport-log" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "job history show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "job show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "job stop" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "lun" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "lun create" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "lun delete" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "lun igroup add" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname`

```

"lun igroup create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun igroup delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun igroup modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun igroup rename" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun igroup show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun mapping add-reporting-nodes" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun mapping create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun mapping delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun mapping remove-reporting-nodes" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun mapping show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun move-in-volume" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun offline" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun online" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun persistent-reservation clear" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun resize" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun serial" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface create" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface delete" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface modify" -access readonly

```

- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "network interface show" -access readonly
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem map" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem host" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem controller" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme subsystem show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme namespace create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme namespace delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme namespace modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "nvme namespace show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "security login" -access readonly
- security login role create -role Role\_Name -cmddirname "snapmirror create" -vserver Cluster\_name -access all
- security login role create -role Role\_Name -cmddirname "snapmirror list-destinations" -vserver Cluster\_name -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy add-rule" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy modify-rule" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname

```

"snapmirror policy remove-rule" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror policy show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror restore" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror show-history" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror update" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "snapmirror update-ls-set" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system license add" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system license clean-up" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system license delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system license show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system license status show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system node modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system node show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system status show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "version" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone split start" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone split stop" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume create" -access all

```

- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume destroy" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume file clone create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume file show-disk-usage" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot modify-snaplock-expiry-time" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume offline" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume online" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume qtree create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume qtree delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume qtree modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume qtree show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume restrict" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot promote" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot rename" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot restore" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot restore-file" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname

```

"volume snapshot show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"volume snapshot show-delta" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"volume unmount" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs share modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs share create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs share delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs share modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs share show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver cifs show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy rule create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy rule delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy rule modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy rule show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"vserver export-policy show" -access all

```

- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "vserver iscsi connection show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "vserver modify" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "vserver show" -access all`

## Create ONTAP cluster roles for ASA r2 systems

You should create an ONTAP cluster role with minimum privileges so that you do not have to use the ONTAP admin role to perform operations in SnapCenter. You can run several ONTAP CLI commands to create the ONTAP cluster role and assign minimum privileges.

### Steps

1. On the storage system, create a role and assign all the permissions to the role.

```
security login role create -vserver <cluster_name\>- role <role_name\>
-cmddirname <permission\>
```



You should repeat this command for each permission.

2. Create a user and assign the role to that user.

```
security login create -user <user_name\> -vserver <cluster_name\> -application
http -authmethod password -role <role_name\>
```

3. Unlock the user.

```
security login unlock -user <user_name\> -vserver <cluster_name\>
```

## ONTAP CLI commands for creating cluster roles and assigning permissions

There are several ONTAP CLI commands you should run to create cluster roles and assign permissions.

- `security login role create -vserver Cluster_name or cluster_name -role Role_Name -cmddirname "metrocluster show" -access readonly`
- `security login role create -vserver Cluster_name or cluster_name -role Role_Name -cmddirname "cluster identity modify" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster identity show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster modify" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster peer show" -access all`
- `security login role create -vserver Cluster_name -role Role_Name -cmddirname "cluster show" -access all`

- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "event generate-autosupport-log" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "job history show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "job show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "job stop" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup add" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup rename" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun igroup show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun mapping add-reporting-nodes" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun mapping create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun mapping delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun mapping remove-reporting-nodes" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun mapping show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "lun move-in-volume" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname

```

"lun offline" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun online" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun persistent-reservation clear" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun resize" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun serial" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"lun show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface create" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface delete" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface modify" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"network interface show" -access readonly
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem map" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem host" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem controller" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme subsystem show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme namespace create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme namespace delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme namespace modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
"nvme namespace show" -access all

```

- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "security login" -access readonly
- security login role create -role Role\_Name -cmddirname "snapmirror create" -vserver Cluster\_name -access all
- security login role create -role Role\_Name -cmddirname "snapmirror list-destinations" -vserver Cluster\_name -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy add-rule" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy modify-rule" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy remove-rule" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror policy show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror restore" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror show-history" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror update" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror update-ls-set" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "system license add" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "system license clean-up" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "system license delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "system license show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "system license status show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname

```

"system node modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system node show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "system status show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "version" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone split start" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume clone split stop" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume destroy" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume file clone create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume file show-disk-usage" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume snapshot modify-snaplock-expiry-time" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume offline" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume online" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume qtree create" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume qtree delete" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume qtree modify" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume qtree show" -access all
• security login role create -vserver Cluster_name -role Role_Name -cmddirname
  "volume restrict" -access all

```

- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot promote" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot rename" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot restore" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot restore-file" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume snapshot show-delta" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume unmount" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs share modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs share create" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs share delete" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs share modify" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver cifs share show" -access all
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname

- ```
"vserver cifs show" -access all
```
- security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver create" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy create" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy delete" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy rule create" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy rule delete" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy rule modify" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy rule show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver export-policy show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver iscsi connection show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver modify" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "vserver show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "storage-unit show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "consistency-group" show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "snapmirror protect" show" -access all
  - security login role create -vserver Cluster\_name -role Role\_Name -cmddirname "volume delete" show" -access all

### **Add a user or group and assign role and assets**

To configure role-based access control for SnapCenter users, you can add users or groups and assign role. The role determines the options that SnapCenter users can access.

#### **Before you begin**

- You must have logged in as the "SnapCenterAdmin" role.
- You must have created the user or group accounts in Active Directory in the operating system or database. You cannot use SnapCenter to create these accounts.



You can include only the following special characters in user names and group names: space ( ), hyphen (-), underscore (\_), and colon (:).

- SnapCenter includes several predefined roles.

You can either assign these roles to the user or create new roles.

- AD Users and AD Groups that are added to SnapCenter RBAC must have the READ permission on the Users Container and the Computers Container in the Active Directory.
- After you assign a role to a user or group that contains the appropriate permissions, you must assign the user access to SnapCenter assets, such as hosts and storage connections.

This enables users to perform the actions for which they have permissions on the assets that are assigned to them.

- You should assign a role to the user or group at some point to take advantage of RBAC permissions and efficiencies.
- You can assign assets like host, resource groups, policy, storage connection, plug-in, and credential to the user while creating the user or group.
- The minimum assets that you should assign an user to perform certain operations are as follows:

| Operation               | Assets assignment            |
|-------------------------|------------------------------|
| Protect resources       | host, policy                 |
| Backup                  | host, resource group, policy |
| Restore                 | host, resource group         |
| Clone                   | host, resource group, policy |
| Clone lifecycle         | host                         |
| Create a Resource Group | host                         |

- When a new node is added to a Windows cluster or a DAG (Exchange Server Database Availability Group) asset and if this new node is assigned to a user, you must reassign the asset to the user or group to include the new node to the user or group.

You should reassign the RBAC user or group to the cluster or DAG to include the new node to the RBAC user or group. For example, you have a two-node cluster and you have assigned an RBAC user or group to the cluster. When you add another node to the cluster, you should reassign the RBAC user or group to the cluster to include the new node for the RBAC user or group.

- If you are planning to replicate Snapshots, you must assign the storage connection for both the source and destination volume to the user performing the operation.





You should add assets before assigning access to the users.



If you are using the SnapCenter Plug-in for VMware vSphere functions to protect VMs, VMDKs, or datastores, you should use the VMware vSphere GUI to add a vCenter user to a SnapCenter Plug-in for VMware vSphere role. For information about VMware vSphere roles, see [Predefined roles packaged with SnapCenter Plug-in for VMware vSphere](#).

## Steps

1. In the left navigation pane, click **Settings**.
2. In the Settings page, click **Users and Access** > **+**.
3. In the Add Users/Groups from Active Directory or Workgroup page:

| For this field... | Do this...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Access Type       | <p>Select either Domain or workgroup</p> <p>For Domain authentication type, you should specify the domain name of the user or group to which you want to add the user to a role.</p> <p>By default, it is pre-populated with the logged in domain name.</p> <p> You must register the untrusted domain in the <b>Settings &gt; Global Settings &gt; Domain Settings</b> page.</p>                                                                                                                          |
| Type              | <p>Select either User or Group</p> <p> SnapCenter supports only security group and not the distribution group.</p>                                                                                                                                                                                                                                                                                                                                                                                       |
| User Name         | <p>a. Type the partial user name, and then click <b>Add</b>.</p> <p> The user name is case-sensitive.</p> <p>b. Select the user name from the search list.</p> <p> When you add users from a different domain or an untrusted domain, you should type the user name fully because there is no search list for cross domain users.</p> <p>Repeat this step to add additional users or groups to the selected role.</p> |
| Roles             | Select the role to which you want to add the user.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

4. Click **Assign**, and then in the Assign Assets page:

- a. Select the type of asset from the **Asset** drop-down list.
- b. In the Asset table, select the asset.

The assets are listed only if the user has added the assets to SnapCenter.

- c. Repeat this procedure for all of the required assets.
  - d. Click **Save**.
5. Click **Submit**.

After adding users or groups and assigning roles, refresh the resources list.

## Configure audit log settings

Audit logs are generated for each and every activity of the SnapCenter Server. By default, audit logs are secured in the default installed location *C:\Program Files\NetApp\SnapCenter WebApp\audit\*.

Audit logs are secured by means of generating digitally signed digest for each and every audit events to protect it from the unauthorized modification. The generated digest's are maintained in the separate audit checksum file and it under goes periodic integrity checks to ensure the integrity of the content.

You should have logged in as the "SnapCenterAdmin" role.

### About this task

- Alerts are sent in the following scenarios:
  - Audit log integrity check schedule or Syslog server is enabled or disabled
  - Audit log integrity check, audit log, or Syslog server log failure
  - Low disk space
- Email is sent only when integrity check fails.
- You should modify both audit log directory and audit checksum log directory paths together. You cannot modify only one of them.
- When audit log directory and audit checksum log directory paths are modified, the integrity check cannot be performed on audit logs present in the earlier location.
- Audit log directory and Audit checksum log directory paths should be on the local drive of SnapCenter Server.

Shared or network mounted drives are not supported.

- If UDP protocol is used in the Syslog server settings, errors due to port is down or unavailable cannot be captured as either an error or an alert in SnapCenter.
- You can use `Set-SmAuditSettings` and `Get-SmAuditSettings` commands to configure the audit logs.

The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running `Get-Help cmdlet_name`. Alternatively, you can also refer the [SnapCenter Software Cmdlet Reference Guide](#).

### Steps

1. In the **Settings** page, navigate to **Settings > Global Settings > Audit log Settings**.
2. In the Audit log section, enter the details.
3. Enter the **Audit log directory** and **Audit checksum log directory**
  - a. Enter the Maximum file size
  - b. Enter the Maximum log files
  - c. Enter the percentage of disk space usage to send an alert
4. (Optional) Enable **Log UTC time**.
5. (Optional) Enable **Audit Log Integrity Check Schedule** and click **Start Integrity Check** for on demand integrity check.

You can also run **Start-SmAuditIntegrityCheck** command to start on demand integrity check.

6. (Optional) Enable Forwarded audit logs to remote syslog server and enter the Syslog Server details.

You should import the certificate from the Syslog server into the 'Trusted Root' for TLS 1.2 protocol.

- a. Enter Syslog Server Host
  - b. Enter Syslog Server Port
  - c. Enter Syslog Server Protocol
  - d. Enter RFC Format
7. Click **Save**.
  8. You can see audit integrity checks and disk space checks by clicking **Monitor > Jobs**.

## Configure secured MySQL connections with SnapCenter Server

You can generate Secure Sockets Layer (SSL) certificates and key files if you want to secure the communication between SnapCenter Server and MySQL Server in standalone configurations or Network Load Balancing (NLB) configurations.

### Configure secured MySQL connections for standalone SnapCenter Server configurations

You can generate Secure Sockets Layer (SSL) certificates and key files, if you want to secure the communication between SnapCenter Server and MySQL Server. You must configure the certificates and key files in the MySQL Server and SnapCenter Server.

The following certificates are generated:

- CA certificate
- Server public certificate and private key file
- Client public certificate and private key file

### Steps

1. Set up the SSL certificates and key files for MySQL servers and clients on Windows by using the openssl command.

For information, see [MySQL Version 5.7: Creating SSL Certificates and Keys Using openssl](#)



The common name value that is used for the server certificate, client certificate, and key files must each differ from the common name value that is used for the CA certificate. If the common name values are the same, the certificate and key files fail for servers that are compiled by using OpenSSL.

**Best Practice:** You should use the server fully qualified domain name (FQDN) as the common name for the server certificate.

2. Copy the SSL certificates and key files to the MySQL Data folder.

The default MySQL Data folder path is `C:\ProgramData\NetApp\SnapCenter\MySQL Data\Data\`.

3. Update the CA certificate, server public certificate, client public certificate, server private key, and client private key paths in the MySQL server configuration file (`my.ini`).

The default MySQL server configuration file (`my.ini`) path is

`C:\ProgramData\NetApp\SnapCenter\MySQL Data\my.ini`.



You must specify the CA certificate, server public certificate, and server private key paths in the `[mysqld]` section of the MySQL server configuration file (`my.ini`).

You must specify the CA certificate, client public certificate, and client private key paths in the `[client]` section of the MySQL server configuration file (`my.ini`).

The following example shows the certificates and key files copied to the `[mysqld]` section of the `my.ini` file in the default folder `C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data`.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
key.pem"
```

The following example shows the paths updated in the `[client]` section of the `my.ini` file.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/client-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/client-  
key.pem"
```

4. Stop the SnapCenter Server web application in the Internet Information Server (IIS).
5. Restart the MySQL service.
6. Update the value of the MySQLProtocol key in the SnapManager.Web.UI.dll.config file.

The following example shows the value of the MySQLProtocol key updated in the SnapManager.Web.UI.dll.config file.

```
<add key="MySQLProtocol" value="SSL" />
```

7. Update the SnapManager.Web.UI.dll.config file with the paths that were provided in the [client] section of the my.ini file.

The following example shows the paths updated in the [client] section of the my.ini file.

```
<add key="ssl-client-cert" value="C:/ProgramData/NetApp/SnapCenter/MySQL  
Data/Data/client-cert.pem" />
```

```
<add key="ssl-client-key" value="C:/ProgramData/NetApp/SnapCenter/MySQL  
Data/Data/client-key.pem" />
```

```
<add key="ssl-ca" value="C:/ProgramData/NetApp/SnapCenter/MySQL  
Data/Data/ca.pem" />
```

8. Start the SnapCenter Server web application in the IIS.

## Configure secured MySQL connections for HA configurations

You can generate Secure Sockets Layer (SSL) certificates and key files for both the High Availability (HA) nodes if you want to secure the communication between SnapCenter Server and MySQL servers. You must configure the certificates and key files in the MySQL servers and on the HA nodes.

The following certificates are generated:

- CA certificate

A CA certificate is generated on one of the HA nodes, and this CA certificate is copied to the other HA node.

- Server public certificate and server private key files for both the HA nodes
- Client public certificate and client private key files for both the HA nodes

## Steps

1. For the first HA node, set up the SSL certificates and key files for MySQL servers and clients on Windows by using the `openssl` command.

For information, see [MySQL Version 5.7: Creating SSL Certificates and Keys Using openssl](#)



The common name value that is used for the server certificate, client certificate, and key files must each differ from the common name value that is used for the CA certificate. If the common name values are the same, the certificate and key files fail for servers that are compiled by using OpenSSL.

**Best Practice:** You should use the server fully qualified domain name (FQDN) as the common name for the server certificate.

2. Copy the SSL certificates and key files to the MySQL Data folder.

The default MySQL Data folder path is `C:\ProgramData\NetApp\SnapCenter\MySQL Data\Data\`.

3. Update the CA certificate, server public certificate, client public certificate, server private key, and client private key paths in the MySQL server configuration file (`my.ini`).

The default MySQL server configuration file (`my.ini`) path is `C:\ProgramData\NetApp\SnapCenter\MySQL Data\my.ini`.



You must specify CA certificate, server public certificate, and server private key paths in the `[mysqld]` section of the MySQL server configuration file (`my.ini`).

You must specify CA certificate, client public certificate, and client private key paths in the `[client]` section of the MySQL server configuration file (`my.ini`).

The following example shows the certificates and key files copied to the `[mysqld]` section of the `my.ini` file in the default folder `C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data`.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
key.pem"
```

The following example shows the paths updated in the `[client]` section of the `my.ini` file.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/client-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/client-  
key.pem"
```

4. For the second HA node, copy the CA certificate and generate server public certificate, server private key files, client public certificate, and client private key files. perform the following steps:

- a. Copy the CA certificate generated on the first HA node to the MySQL Data folder of the second NLB node.

The default MySQL Data folder path is C:\ProgramData\NetApp\SnapCenter\MySQL Data\Data\.



You must not create a CA certificate again. You should create only the server public certificate, client public certificate, server private key file, and client private key file.

- b. For the first HA node, set up the SSL certificates and key files for MySQL servers and clients on Windows by using the openssl command.

#### [MySQL Version 5.7: Creating SSL Certificates and Keys Using openssl](#)



The common name value that is used for the server certificate, client certificate, and key files must each differ from the common name value that is used for the CA certificate. If the common name values are the same, the certificate and key files fail for servers that are compiled by using OpenSSL.

It is recommended to use the server FQDN as the common name for the server certificate.

- c. Copy the SSL certificates and key files to the MySQL Data folder.
- d. Update the CA certificate, server public certificate, client public certificate, server private key, and client private key paths in the MySQL server configuration file (my.ini).



You must specify the CA certificate, server public certificate, and server private key paths in the [mysqld] section of the MySQL server configuration file (my.ini).

You must specify the CA certificate, client public certificate, and client private key paths in the [client] section of the MySQL server configuration file (my.ini).

The following example shows the certificates and key files copied to the [mysqld] section of the my.ini file in the default folder C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
key.pem"
```

The following example shows the paths updated in the [client] section of the my.ini file.

```
ssl-ca="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/ca.pem"
```

```
ssl-cert="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
cert.pem"
```

```
ssl-key="C:/ProgramData/NetApp/SnapCenter/MySQL Data/Data/server-  
key.pem"
```

5. Stop the SnapCenter Server web application in the Internet Information Server (IIS) on both the HA nodes.
6. Restart the MySQL service on both the HA nodes.
7. Update the value of the MySQLProtocol key in the SnapManager.Web.UI.dll.config file for both the HA nodes.

The following example shows the value of MySQLProtocol key updated in the SnapManager.Web.UI.dll.config file.

```
<add key="MySQLProtocol" value="SSL" />
```

8. Update the SnapManager.Web.UI.dll.config file with the paths that you specified in the [client] section of the my.ini file for both the HA nodes.

The following example shows the paths updated in the [client] section of the my.ini files.

```
<add key="ssl-client-cert" value="C:/ProgramData/NetApp/SnapCenter/MySQL  
Data/Data/client-cert.pem" />
```

```
<add key="ssl-client-key" value="C:/ProgramData/NetApp/SnapCenter/MySQL  
Data/Data/client-key.pem" />
```

```
<add key="ssl-ca" value="C:/ProgramData/NetApp/SnapCenter/MySQL
Data/Data/ca.pem" />
```

9. Start the SnapCenter Server web application in the IIS on both the HA nodes.
10. Use the Set-SmRepositoryConfig -RebuildSlave -Force PowerShell cmdlet with the -Force option on one of the HA nodes to establish secured MySQL replication on both the HA nodes.

Even if the replication status is healthy, the -Force option allows you to rebuild the slave repository.

## Configure Certificate-based authentication

Certificate-based authentication enhances security by verifying the identity of both the SnapCenter Server and plug-in hosts, ensuring secure and encrypted communication.

### Enable Certificate-based authentication

To enable certificate-based authentication for SnapCenter Server and the Windows plug-in hosts, run the following PowerShell cmdlet. For the Linux plug-in hosts, the certificate-based authentication will be enabled when you enable the two-way SSL.

- To enable client certificate-based authentication:

```
Set-SmConfigSettings -Agent -configSettings
@{"EnableClientCertificateAuthentication"="true"} -HostName [hostname]
```

- To disable client certificate-based authentication:

```
Set-SmConfigSettings -Agent -configSettings
@{"EnableClientCertificateAuthentication"="false"} -HostName [hostname]`
```

### Export Certificate Authority (CA) certificates from SnapCenter Server

You should export the CA certificates from the SnapCenter Server to the plug-in hosts using the Microsoft management console (MMC).

#### Before you begin

You should have configured the two-way SSL.

#### Steps

1. Go to the Microsoft management console (MMC), and then click **File > Add/Remove Snapin**.
2. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
3. In the Certificates Snap-in window, select the **Computer Account** option, and then click **Finish**.
4. Click **Console Root > Certificates - Local Computer > Personal > Certificates**.
5. Right-click on the procured CA certificate, which is used for SnapCenter Server and then select **All Tasks > Export** to start the export wizard.
6. Perform the following actions in the wizard.

For this option...	Do the following...
Export Private Key	Select <b>No, do not export the private key</b> , and then click <b>Next</b> .
Export File Format	Click <b>Next</b> .
File Name	Click <b>Browse</b> and specify the file path to save the certificate, and click <b>Next</b> .
Completing the Certificate Export Wizard	Review the summary, and then click <b>Finish</b> to start the export.



Certificate based authentication is not supported for SnapCenter HA configurations and SnapCenter Plug-in for VMware vSphere.

## Import CA certificate to the Windows plug-in hosts

To use the exported SnapCenter Server CA certificate, you should import the related certificate to the SnapCenter Windows plug-in hosts using the Microsoft management console (MMC).

### Steps

1. Go to the Microsoft management console (MMC), and then click **File > Add/Remove Snapin**.
2. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
3. In the Certificates Snap-in window, select the **Computer Account** option, and then click **Finish**.
4. Click **Console Root > Certificates - Local Computer > Personal > Certificates**.
5. Right-click on the folder "Personal", and then select **All Tasks > Import** to start the import wizard.
6. Perform the following actions in the wizard.

For this option...	Do the following...
Store Location	Click <b>Next</b> .
File to Import	Select the SnapCenter Server certificate that ends with .cer extension.
Certificate Store	Click <b>Next</b> .
Completing the Certificate Export Wizard	Review the summary, and then click <b>Finish</b> to start the import.

## Import CA Certificate to the UNIX plug-in hosts

You should import the CA certificate to the UNIX plug-in hosts.

### About this task

- You can manage the password for SPL keystore, and the alias of the CA signed key pair in use.
- The password for SPL keystore and for all the associated alias password of the private key should be same.

## Steps

1. You can retrieve SPL keystore default password from SPL property file. It is the value corresponding to the key `SPL_KEYSTORE_PASS`.
2. Change the keystore password: `$ keytool -storepasswd -keystore keystore.jks`
3. Change the password for all aliases of private key entries in the keystore to the same password used for the keystore: `$ keytool -keypasswd -alias "<alias_name>" -keystore keystore.jks`
4. Update the same for the key `SPL_KEYSTORE_PASS` in `spl.properties`` file.
5. Restart the service after changing the password.

## Configure root or intermediate certificates to SPL trust-store

You should configure the root or intermediate certificates to SPL trust-store. You should add the root CA certificate and then the intermediate CA certificates.

## Steps

1. Navigate to the folder containing the SPL keystore: `/var/opt/snapcenter/spl/etc`.
2. Locate the file `keystore.jks`.
3. List the added certificates in the keystore: `$ keytool -list -v -keystore keystore.jks`
4. Add a root or intermediate certificate: `$ keytool -import -trustcacerts -alias <AliasNameForCertificateToBeImported> -file /<CertificatePath> -keystore keystore.jks`
5. Restart the service after configuring the root or intermediate certificates to SPL trust-store.

## Configure CA signed key pair to SPL trust-store

You should configure the CA signed key pair to SPL trust-store.

## Steps

1. Navigate to the folder containing the SPL's keystore `/var/opt/snapcenter/spl/etc`.
2. Locate the file `keystore.jks``.
3. List the added certificates in the keystore: `$ keytool -list -v -keystore keystore.jks`
4. Add the CA certificate having both private and public key. `$ keytool -importkeystore -srckeystore <CertificatePathToImport> -srcstoretype pkcs12 -destkeystore keystore.jks -deststoretype JKS`
5. List the added certificates in the keystore. `$ keytool -list -v -keystore keystore.jks`
6. Verify that the keystore contains the alias corresponding to the new CA certificate, which was added to the keystore.
7. Change the added private key password for CA certificate to the keystore password.

Default SPL keystore password is the value of the key `SPL_KEYSTORE_PASS` in `spl.properties` file.

```
$ keytool -keypasswd -alias "<aliasNameOfAddedCertInKeystore>" -keystore keystore.jks`
```

8. If the alias name in the CA certificate is long and contains space or special characters ("\*", ";"), change the alias name to a simple name: `$ keytool -changealias -alias "<OriginalAliasName>" -destalias "<NewAliasName>" -keystore keystore.jks``
9. Configure the alias name from the keystore located in `spl.properties` file. Update this value against the key `SPL_CERTIFICATE_ALIAS`.
10. Restart the service after configuring the CA signed key pair to SPL trust-store.

## Export SnapCenter certificates

You should export the SnapCenter certificates in `.pfx` format.

### Steps

1. Go to the Microsoft management console (MMC), and then click **File > Add/Remove Snap-in**.
2. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
3. In the Certificates snap-in window, select the **My user account** option, and then click **Finish**.
4. Click **Console Root > Certificates - Current User > Trusted Root Certification Authorities > Certificates**.
5. Right-click the certificate that has the SnapCenter Friendly Name, and then select **All Tasks > Export** to start the export wizard.
6. Complete the wizard, as follows:

In this wizard window...	Do the following...
Export Private Key	Select the option <b>Yes, export the private key</b> , and then click <b>Next</b> .
Export File Format	Make no changes; click <b>Next</b> .
Security	Specify the new password to be used for the exported certificate, and then click <b>Next</b> .
File to Export	Specify a file name for the exported certificate (you must use <code>.pfx</code> ), and then click <b>Next</b> .
Completing the Certificate Export Wizard	Review the summary, and then click <b>Finish</b> to start the export.

## Configure CA Certificate for Windows host

## Generate CA Certificate CSR file

You can generate a Certificate Signing Request (CSR) and import the certificate that can be obtained from a Certificate Authority (CA) using the generated CSR. The certificate will have a private key associated with it.

CSR is a block of encoded text that is given to an authorized certificate vendor to procure the signed CA certificate.



CA Certificate RSA key length must be minimum 3072 bits.

For information to generate a CSR, see [How to generate CA Certificate CSR file](#).



If you own the CA certificate for your domain (\*.domain.company.com) or your system (machine1.domain.company.com), you can skip generating the CA Certificate CSR file. You can deploy the existing CA certificate with SnapCenter.

For cluster configurations, the cluster name (virtual cluster FQDN), and the respective host names should be mentioned in the CA certificate. The certificate can be updated by filling the Subject Alternative Name (SAN) field before procuring the certificate. For a wild card certificate (\*.domain.company.com), the certificate will contain all the hostnames of the domain implicitly.

## Import CA certificates

You must import the CA certificates to the SnapCenter Server and the Windows host plug-ins using the Microsoft management console (MMC).

### Steps

1. Go to the Microsoft management console (MMC), and then click **File > Add/Remove Snapin**.
2. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
3. In the Certificates snap-in window, select the **Computer account** option, and then click **Finish**.
4. Click **Console Root > Certificates – Local Computer > Trusted Root Certification Authorities > Certificates**.
5. Right-click on the folder “Trusted Root Certification Authorities”, and then select **All Tasks > Import** to start the import wizard.
6. Complete the wizard, as follows:

In this wizard window...	Do the following...
Import Private Key	Select the option <b>Yes</b> , import the private key, and then click <b>Next</b> .
Import File Format	Make no changes; click <b>Next</b> .
Security	Specify the new password to be used for the exported certificate, and then click <b>Next</b> .

In this wizard window...	Do the following...
Completing the Certificate Import Wizard	Review the summary, and then click <b>Finish</b> to start the import.



Importing certificate should be bundled with the private key (supported formats are: \*.pfx, \*.p12, and \*.p7b).

7. Repeat Step 5 for the “Personal” folder.

## Get the CA certificate thumbprint

A certificate thumbprint is a hexadecimal string that identifies a certificate. A thumbprint is calculated from the content of the certificate using a thumbprint algorithm.

### Steps

1. Perform the following on the GUI:
  - a. Double-click the certificate.
  - b. In the Certificate dialog box, click the **Details** tab.
  - c. Scroll through the list of fields and click **Thumbprint**.
  - d. Copy the hexadecimal characters from the box.
  - e. Remove the spaces between the hexadecimal numbers.

For example, if the thumbprint is: "a9 09 50 2d d8 2a e4 14 33 e6 f8 38 86 b0 0d 42 77 a3 2a 7b", after removing the spaces, it will be: "a909502dd82ae41433e6f83886b00d4277a32a7b".

2. Perform the following from PowerShell:
  - a. Run the following command to list the thumbprint of the installed certificate and identify the recently installed certificate by the subject name.

```
Get-ChildItem -Path Cert:\LocalMachine\My
```

- b. Copy the thumbprint.

## Configure CA certificate with Windows host plug-in services

You should configure the CA certificate with Windows host plug-in services to activate the installed digital certificate.

Perform the following steps on the SnapCenter Server and all the plug-in hosts where CA certificates are already deployed.

### Steps

1. Remove the existing certificate binding with SMCore default port 8145, by running the following command:

```
> netsh http delete sslcert ipport=0.0.0.0: _<SMCore Port>
```

For example:

```
> netsh http delete sslcert ipport=0.0.0.0:8145
```

2. Bind the newly installed certificate with the Windows host plug-in services, by running the following commands:

```
> $cert = "_<certificate thumbprint>_"  
> $guid = [guid]::NewGuid().ToString("B")  
> netsh http add sslcert ipport=0.0.0.0: _<SMCore Port>_ certhash=$cert  
appid="$guid"
```

For example:

```
> $cert = "a909502dd82ae41433e6f83886b00d4277a32a7b"  
> $guid = [guid]::NewGuid().ToString("B")  
> netsh http add sslcert ipport=0.0.0.0: _<SMCore Port>_ certhash=$cert  
appid="$guid"
```

## Configure CA certificate with SnapCenter site

You should configure the CA certificate with SnapCenter site on Windows host.

### Steps

1. Open IIS Manager on the Windows Server where SnapCenter is installed.
2. In the left navigation pane, click **Connections**.
3. Expand the name of the server and **Sites**.
4. Select the SnapCenter website on which you want to install the SSL Certificate.
5. Navigate to **Actions > Edit Site**, click **Bindings**.
6. In the Bindings page, select **binding for https**.
7. Click **Edit**.
8. From the SSL certificate drop-down list, select the recently imported SSL Certificate.
9. Click **OK**.



The SnapCenter Scheduler site (default port: 8154, HTTPS) is configured with self-signed certificate. This port is communicating within the SnapCenter Server host and it is not mandatory to configure with a CA certificate. However, if your environment mandates you to use a CA Certificate, repeat steps 5 to 9 using the SnapCenter Scheduler site.



If the recently deployed CA certificate is not listed in the drop-down menu, check if the CA certificate is associated with the private key.



Ensure that the certificate is added using the following path: **Console Root > Certificates – Local Computer > Trusted Root Certification Authorities > Certificates.**

## Enable CA certificates for SnapCenter

You should configure the CA certificates and enable the CA certificate validation for the SnapCenter Server.

### Before you begin

- You can enable or disable the CA certificates using the `Set-SmCertificateSettings` cmdlet.
- You can display the certificate status for the SnapCenter Server using the `Get-SmCertificateSettings` cmdlet.

The information regarding the parameters that can be used with the cmdlet and their descriptions can be obtained by running `Get-Help command_name`. Alternatively, you can refer to the [SnapCenter Software Cmdlet Reference Guide](#).

### Steps

1. In the Settings page, navigate to **Settings > Global Settings > CA Certificate Settings**.
2. Select **Enable Certificate Validation**.
3. Click **Apply**.

### After you finish

The Managed Hosts tab host displays a padlock and the color of the padlock indicates the status of the connection between SnapCenter Server and the plug-in host.

- indicates that there is no CA certificate enabled or assigned to the plug-in host.
- indicates that the CA certificate is successfully validated.
- indicates that the CA certificate could not be validated.
- indicates that the connection information could not be retrieved.



When the status is yellow or green, the data protection operations completes successfully.

## Configure CA Certificate for Linux host

After installing the SnapCenter Server on Linux, the installer creates the self-signed certificate. If you want to use the CA certificate, you should configure the certificates for nginx reverse proxy, audit logging, and SnapCenter.

### Configure nginx certificate

#### Steps

1. Navigate to `/etc/nginx/conf.d`: `cd /etc/nginx/conf.d`
2. Open `snapcenter.conf` using `vi` or any text editor.
3. Navigate to the server section in the configuration file.

4. Modify the paths of `ssl_certificate` and `ssl_certificate_key` to point to CA certificate.
5. Save and close the file.
6. Reload nginx: `$nginx -s reload`

## Configure audit log certificate

### Steps

1. Open `INSTALL_DIR/NetApp/snapcenter/SnapManagerWeb/SnapManager.Web.UI.dll.config` using vi or any text editor.

The default value of `INSTALL_DIR` is `/opt`.

2. Edit the **AUDILOG\_CERTIFICATE\_PATH** and **AUDILOG\_CERTIFICATE\_PASSWORD** keys to include the CA certificate path and password respectively.

Only `.pfx` format is supported for audit log certificate.

3. Save and close the file.
4. Restart the **snapmanagerweb** service: `$ systemctl restart snapmanagerweb`

## Configure SnapCenter certificate

### Steps

1. Open the following configuration files using using vi or any text editor.

- `INSTALL_DIR/NetApp/snapcenter/SnapManagerWeb/SnapManager.Web.UI.dll.config`
- `INSTALL_DIR/NetApp/snapcenter/SMCore/SMCoreServiceHost.dll.config`
- `INSTALL_DIR/NetApp/snapcenter/Scheduler/Scheduler.Api.dll.config`

The default value of `INSTALL_DIR` is `/opt`.

2. Edit the **SERVICE\_CERTIFICATE\_PATH** and **SERVICE\_CERTIFICATE\_PASSWORD** keys to include the CA certificate path and password respectively.

Only `.pfx` format is supported for SnapCenter certificate.

3. Save and close the files.
4. Restart all the services.
  - `$ systemctl restart snapmanagerweb`
  - `$ systemctl restart smcore`
  - `$ systemctl restart scheduler`

## Configure and enable two-way SSL communication on Windows host

### Configure two-way SSL communication on Windows host

You should configure the two-way SSL communication to secure the mutual

communication between SnapCenter Server on Windows host and the plug-ins.

### Before you begin

- You should have generated the CA Certificate CSR file with the minimum supported key length of 3072.
- The CA certificate should support server authentication and client authentication.
- You should have a CA certificate with private key and thumbprint details.
- You should have enabled the one-way SSL configuration.

For more details, see [Configure CA certificate section](#).

- You must have enabled two-way SSL communication on all the plug-in hosts and the SnapCenter Server.

Environment with some hosts or server not enabled for two-way SSL communication is not supported.

### Steps

1. To bind the port, perform the following steps on SnapCenter Server host for SnapCenter IIS web server port 8146 (default) and once again for SMCORE port 8145 (default) using PowerShell commands.

- a. Remove the existing SnapCenter self-signed certificate port binding using the following PowerShell command.

```
> netsh http delete sslcert ipport=0.0.0.0:<SMCore port/IIS port>
```

For example,

```
> netsh http delete sslcert ipport=0.0.0.0:8145
```

```
> netsh http delete sslcert ipport=0.0.0.0:8146
```

- b. Bind the newly procured CA certificate with the SnapCenter server and SMCORE port.

```
> $cert = "<CA_certificate_thumbprint>"
```

```
> $guid = [guid]::NewGuid().ToString("B")
```

```
> netsh http add sslcert ipport=0.0.0.0: <SMCore Port/IIS port>  
certhash=$cert appid="$guid" clientcertnegotiation=enable  
verifyclientcertrevocation=disable
```

```
> netsh http show sslcert ipport=0.0.0.0:<SMCore Port/IIS port>
```

For example,

```
> $cert = "abc123abc123abc123abc123"
```

```
> $guid = [guid]::NewGuid().ToString("B")
```

```
> netsh http add sslcert ipport=0.0.0.0:8146 certhash=$cert appid="$guid"  
clientcertnegotiation=enable verifyclientcertrevocation=disable
```

```
> $guid = [guid]::NewGuid().ToString("B")
```

```
> netsh http add sslcert ipport=0.0.0.0:8145 certhash=$cert appid="$guid"
clientcertnegotiation=enable verifyclientcertrevocation=disable

> netsh http show sslcert ipport=0.0.0.0:8146

> netsh http show sslcert ipport=0.0.0.0:8145
```

2. To access permission to the CA certificate, add the SnapCenter's default IIS web server user "**IIS AppPool\SnapCenter**" in the certificate permission list by performing the following steps to access the newly procured CA certificate.
  - a. Go to the Microsoft management console (MMC), and then click **File > Add/Remove SnapIn**.
  - b. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
  - c. In the Certificates snap-in window, select the **Computer account** option, and then click **Finish**.
  - d. Click **Console Root > Certificates – Local Computer > Personal > Certificates**.
  - e. Select the SnapCenter certificate.
  - f. To start the add user\permission wizard, right-click on the CA certificate and select **All Tasks > Manage private keys**.
  - g. Click on **Add**, on Select users and groups wizard change the location to local computer name (top most in the hierarchy)
  - h. Add the IIS AppPool\SnapCenter user, give full control permissions.
3. For **CA certificate IIS permission**, add the new DWORD registry keys entry in SnapCenter Server from the following path:

In the windows registry editor, traverse to the below mentioned path,

```
HKey_Local_Machine\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL
```

4. Create new DWORD registry key entry under the context of SCHANNEL registry configuration.

```
SendTrustedIssuerList = 0
```

```
ClientAuthTrustMode = 2
```

## Configure SnapCenter Windows plug-in for Two-way SSL communication

You should configure SnapCenter Windows plug-in for two-way SSL communication using PowerShell commands.

### Before you begin

Ensure that the CA certificate thumbprint is available.

### Steps

1. To bind the port, perform the following actions on Windows plug-in host for SMCore port 8145 (default).
  - a. Remove the existing SnapCenter self-signed certificate port binding using the following PowerShell command.

```
> netsh http delete sslcert ipport=0.0.0.0:<SMCore port>
```

For example,

```
> netsh http delete sslcert ipport=0.0.0.0:8145
```

b. Bind the newly procured CA certificate with the SMCore port.

```
> $cert = "<CA_certificate_thumbprint>"
```

```
> $guid = [guid]::NewGuid().ToString("B")
```

```
> netsh http add sslcert ipport=0.0.0.0: <SMCore Port> certhash=$cert  
appid="$guid" clientcertnegotiation=enable  
verifyclientcertrevocation=disable
```

```
> netsh http show sslcert ipport=0.0.0.0:<SMCore Port>
```

For example,

```
> $cert = "abc123abc123abc123abc123"
```

```
> $guid = [guid]::NewGuid().ToString("B")
```

```
> netsh http add sslcert ipport=0.0.0.0:8145 certhash=$cert appid="$guid"  
clientcertnegotiation=enable verifyclientcertrevocation=disable
```

```
> netsh http show sslcert ipport=0.0.0.0:8145
```

## Enable two-way SSL communication on Windows host

You can enable two-way SSL communication to secure the mutual communication between SnapCenter Server on Windows host and the plug-ins using PowerShell commands.

### Before you begin

Execute the commands for all the plug-ins and the SMCore agent first and then for server.

### Steps

1. To enable the two-way SSL communication, run the following commands on the SnapCenter Server for the plug-ins, server, and for each of the agents for which the two-way SSL communication is required.

```
> Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="true"}  
-HostName <Plugin_HostName>
```

```
> Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="true"}  
-HostName localhost
```

```
> Set-SmConfigSettings -Server -configSettings @{"EnableTwoWaySSL"="true"}
```

2. Perform the IIS SnapCenter Application pool recycle operation by using the following command. 

```
> Restart-WebAppPool -Name "SnapCenter"
```
3. For Windows plug-ins, restart the SMCore service by running the following PowerShell command:

```
> Restart-Service -Name SnapManagerCoreService
```

## Disable two-way SSL Communication

You can disable the two-way SSL communication using PowerShell commands.

### About this task

- Execute the commands for all the plug-ins and the SMCore agent first and then for server.
- When you disable the two-way SSL communication, the CA certificate and its configuration are not removed.
- To add a new host to SnapCenter Server, you must disable the two-way SSL for all plug-in hosts.
- NLB and F5 are not supported.

### Steps

1. To disable the two-way SSL communication, run the following commands on SnapCenter Server for all the plug-in hosts and the SnapCenter host.

```
> Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="false"}  
-HostName <Agent_HostName>
```

```
> Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="false"}  
-HostName localhost
```

```
> Set-SmConfigSettings -Server -configSettings @{"EnableTwoWaySSL"="false"}
```

2. Perform the IIS SnapCenter Application pool recycle operation by using the following command. >  
`Restart-WebAppPool -Name "SnapCenter"`
3. For Windows plug-ins, restart the SMCore service by running the following PowerShell command:

```
> Restart-Service -Name SnapManagerCoreService
```

## Configure and enable two-way SSL communication on Linux host

### Configure two-way SSL communication on Linux host

You should configure the two-way SSL communication to secure the mutual communication between SnapCenter Server on Linux host and the plug-ins.

#### Before you begin

- You should have configured the CA certificate for Linux host.
- You must have enabled two-way SSL communication on all the plug-in hosts and the SnapCenter Server.

#### Steps

1. Copy **certificate.pem** to `/etc/pki/ca-trust/source/anchors/`.
2. Add the certificates in the trust list of your Linux host.

- `cp root-ca.pem /etc/pki/ca-trust/source/anchors/`
  - `cp certificate.pem /etc/pki/ca-trust/source/anchors/`
  - `update-ca-trust extract`
3. Verify if the certificates were added to the trust list. `trust list | grep "<CN of your certificate>"`
  4. Update **ssl\_certificate** and **ssl\_certificate\_key** in the SnapCenter **nginx** file and restart.
    - `vim /etc/nginx/conf.d/snapcenter.conf`
    - `systemctl restart nginx`
  5. Refresh the SnapCenter Server GUI link.
  6. Update the values of the following keys in **SnapManager.Web.UI.dll.config** located at `_/<installation path>/NetApp/snapcenter/SnapManagerWeb_` and **SMCoreServiceHost.dll.config** located at `_/<installation path>/NetApp/snapcenter/SMCore`.
    - `<add key="SERVICE_CERTIFICATE_PATH" value="<path of certificate.pfx>" />`
    - `<add key="SERVICE_CERTIFICATE_PASSWORD" value="<password>" />`
  7. Restart the following services.
    - `systemctl restart smcore.service`
    - `systemctl restart snapmanagerweb.service`
  8. Verify that the certificate is attached to the SnapManager web port. `openssl s_client -connect localhost:8146 -brief`
  9. Verify that the certificate is attached to the smcore port. `openssl s_client -connect localhost:8145 -brief`
  10. Manage password for SPL keystore and alias.
    - a. Retrieve SPL keystore default password assigned to the **SPL\_KEYSTORE\_PASS** key in SPL property file.
    - b. Change the keystore password. `keytool -storepasswd -keystore keystore.jks`
    - c. Change the password for all the aliases of private key entries. `keytool -keypasswd -alias "<alias_name>" -keystore keystore.jks`
    - d. Update the same password for the key **SPL\_KEYSTORE\_PASS** in `spl.properties`.
    - e. Restart the service.
  11. On plug-in Linux host, add the root and intermediate certificates in SPL plug-in's keystore.
    - `keytool -import -trustcacerts -alias <any preferred alias name> -file <path of root-ca.pem> -keystore <path of keystore.jks mentioned in spl.properties file>`
    - `keytool -importkeystore -srckeystore <path of certificate.pfx> -srcstoretype pkcs12 -destkeystore <path of keystore.jks mentioned in spl.properties file> -deststoretype JKS`
      - a. Check the entries in `keystore.jks`. `keytool -list -v -keystore <path to keystore.jks>`
      - b. Rename any alias if required. `keytool -changealias -alias "old-alias" -destalias`


```
"new-alias" -keypass keypass -keystore </path/to/keystore> -storepass storepas
```

12. Update the value of **SPL\_CERTIFICATE\_ALIAS** in *spl.properties* file with the alias of **certificate.pfx** stored in *keystore.jks* and restart the SPL service: `systemctl restart spl`
13. Verify that the certificate is attached to the smcore port. `openssl s_client -connect localhost:8145 -brief`

## Enable SSL communication on Linux host

You can enable two-way SSL communication to secure the mutual communication between SnapCenter Server on Linux host and the plug-ins using PowerShell commands.

### Step

1. Perform the following to enable one-way SSL communication.
  - a. Log into SnapCenter GUI.
  - b. Click **Settings > Global Settings** and select **Enable certificate validation on SnapCenter Server**.
  - c. Click **Hosts > Managed Hosts** and select the plug-in host for which you want to enable one-way SSL.
  - d. Click  icon, and then click **Enable certificate validation**.
2. Enable two-way SSL communication from the SnapCenter Server Linux host.
  - `Open-SmConnection`
  - `Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="true"} -HostName <Plugin Host Name>`
  - `Set-SmConfigSettings -Agent -configSettings @{"EnableTwoWaySSL"="true"} -HostName localhost`
  - `Set-SmConfigSettings -Server -configSettings @{"EnableTwoWaySSL"="true"}`

## Configure Active Directory, LDAP, and LDAPS

### Register untrusted Active Directory domains

You should register the Active Directory with SnapCenter Server to manage hosts, users, and groups from multiple untrusted Active Directory domains.

#### Before you begin

#### LDAP and LDAPS protocols

- You can register the untrusted active directory domains using either LDAP or LDAPS protocol.
- You should have enabled bidirectional communication between the plug-in hosts and the SnapCenter Server.
- DNS resolution should be set up from the SnapCenter Server to the plug-in hosts and vice-versa.

#### LDAP protocol

- The fully qualified domain name (FQDN) should be resolvable from SnapCenter Server.

You can register an untrusted domain with the FQDN. If the FQDN is not resolvable from the SnapCenter Server, you can register with a domain controller IP address and this should be resolvable from SnapCenter Server.

## LDAPS protocol

- CA certificates are required for LDAPS to provide end-to-end encryption during the active directory communication.


[Configure CA client certificate for LDAPS](#)

- Domain controller host names (DCHostName) should be reachable from SnapCenter Server.

## About this task

- You can use either the SnapCenter user interface, PowerShell cmdlets, or REST API to register an untrusted domain.

## Steps

1. In the left navigation pane, click **Settings**.
2. In the Settings page, click **Global Settings..**
3. In the Global Settings page, click **Domain Settings**.
4. Click  to register a new domain.
5. In the Register New Domain page, select either **LDAP** or **LDAPS**.
  - a. If you select **LDAP**, specify the information that is required for registering the untrusted domain for LDAP:

For this field...	Do this...
Domain Name	Specify the NetBIOS name for the domain.
Domain FQDN	Specify the FQDN and click <b>Resolve</b> .
Domain controller IP addresses	<p>If the domain FQDN is not resolvable from the SnapCenter Server, specify one or more domain controller IP addresses.</p> <p>For more information, see <a href="#">Add domain controller IP for untrusted domain from GUI</a>.</p>

- b. If you select **LDAPS**, specify the information that is required for registering the untrusted domain for LDAPS:

For this field...	Do this...
Domain Name	Specify the NetBIOS name for the domain.

For this field...	Do this...
Domain FQDN	Specify the FQDN.
Domain controller Names	Specify one or more domain controller names and click <b>Resolve</b> .
Domain controller IP addresses	If the domain controller names is not resolvable from SnapCenter Server, you should rectify the DNS resolutions.

6. Click **OK**.

## Configure IIS Application Pools to enable Active Directory read permissions

You can configure Internet Information Services (IIS) on your Windows Server to create a custom Application Pool account when you need to enable Active Directory read permissions for SnapCenter.

### Steps

1. Open IIS Manager on the Windows Server where SnapCenter is installed.
2. In the left navigation pane, click **Application Pools**.
3. Select SnapCenter in the Application Pools list, and then click **Advanced Settings** in the Actions pane.
4. Select Identity, and then click ... to edit the SnapCenter application pool identity.
5. In the Custom Account field, enter a domain user or domain admin account name with Active Directory read permission.
6. Click **OK**.

The custom account replaces the built-in ApplicationPoolIdentity account for the SnapCenter application pool.

## Configure CA client certificate for LDAPS

You should configure the CA client certificate for LDAPS on the SnapCenter Server when the Windows Active Directory LDAPS is configured with the CA certificates.

### Steps

1. Go to the Microsoft management console (MMC), and then click **File > Add/Remove Snapin**.
2. In the Add or Remove Snap-ins window, select **Certificates** and then click **Add**.
3. In the Certificates snap-in window, select the **Computer account** option, and then click **Finish**.
4. Click **Console Root > Certificates – Local Computer > Trusted Root Certification Authorities > Certificates**.
5. Right-click on the folder “Trusted Root Certification Authorities”, and then select **All Tasks > Import** to start the import wizard.

6. Complete the wizard, as follows:

In this wizard window...	Do the following...
In the second page of the wizard	Click <b>Browse</b> , select the <i>Root Certificate</i> and click <b>Next</b> .
Completing the Certificate Import Wizard	Review the summary, and then click <b>Finish</b> to start the import.

7. Repeat Steps 5 and 6 for the intermediate certificates.

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