



SAN provisioning

ONTAP 9

NetApp
February 20, 2026

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SAN provisioning

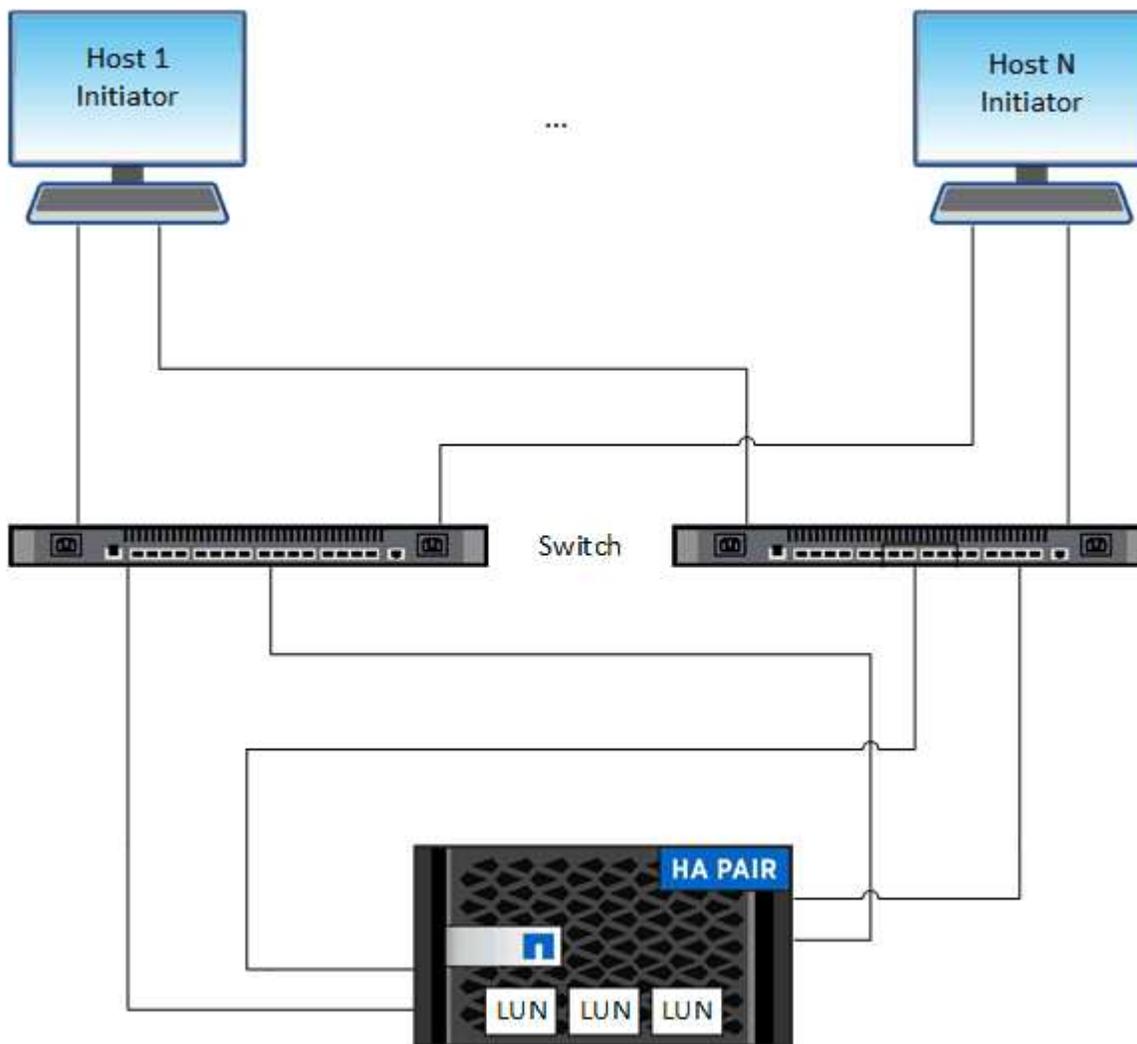
SAN management overview

The content in this section shows you how to configure and manage SAN environments with the ONTAP command line interface (CLI) and System Manager in ONTAP 9.7 and later releases.

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

- [iSCSI protocol](#)
- [FC/FCoE protocol](#)

You can use the iSCSI and FC protocols to provide storage in a SAN environment.



With iSCSI and FC, storage targets are called LUNs (logical units) and are presented to hosts as standard block devices. You create LUNs and then map them to initiator groups (igroups). Initiator groups are tables of FC host WWPns and iSCSI host node names and control which initiators have access to which LUNs.

FC targets connect to the network through FC switches and host-side adapters and are identified by world-wide port names (WWPNs). iSCSI targets connect to the network through standard Ethernet network adapters

(NICs), TCP offload engine (TOE) cards with software initiators, converged network adapters (CNAs) or dedicated host bus adapters (HBAs) and are identified by iSCSI qualified names (IQNs).

For more information

If you have an ASA r2 storage system (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, or ASA A20), see the [ASA r2 storage system documentation](#).

Learn about All-Flash SAN Array configurations

The NetApp All-Flash SAN Arrays (ASAs) are available beginning with ONTAP 9.7. ASAs are all-flash SAN-only solutions built on proven AFF NetApp platforms.

ASA platforms include the following:

- ASA A150
- ASA A250
- ASA A400
- ASA A800
- ASA A900
- ASA C250
- ASA C400
- ASA C800



Beginning with ONTAP 9.16.0, a simplified ONTAP experience specific to SAN-only customers is available on ASA r2 systems (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, or ASA A20). If you have an ASA r2 system, see the [ASA r2 system documentation](#).

ASA platforms use symmetric active-active for multipathing. All paths are active/optimized so in the event of a storage failover, the host does not need to wait for the ALUA transition of the failover paths to resume I/O. This reduces time to failover.

Set up an ASA

All-Flash SAN Arrays (ASAs) follow the same setup procedure as non-ASA systems.

System Manager guides you through the procedures necessary to initialize your cluster, create a local tier, configure protocols, and provision storage for your ASA.

[Get started with ONTAP cluster set up.](#)

ASA host settings and utilities

Host settings for setting up All-Flash SAN Arrays (ASAs) are the same as those for all other SAN hosts.

You can download the [NetApp Host Utilities software](#) for your specific hosts from the support site.

Ways to identify an ASA system

You can identify an ASA system using System Manager or using the ONTAP command line interface (CLI).

- **From the System Manager dashboard:** Click **Cluster > Overview** and then select the system node.

The **PERSONALITY** is displayed as **All-Flash SAN Array**.

- **From the CLI:** Enter the `san config show` command.

The "All-Flash SAN Array" value returns as true for ASA systems.

Learn more about `san config show` in the [ONTAP command reference](#).

Related information

- [Technical Report 4968: NetApp All-SAN Array Data Availability and Integrity](#)
- [NetApp Technical Report 4080: Best Practices for Modern SAN](#)

Configure switches for FCoE

You must configure your switches for FCoE before your FC service can run over the existing Ethernet infrastructure.

Before you begin

- Your SAN configuration must be supported.

For more information about supported configurations, see the [NetApp Interoperability Matrix Tool](#).

- A Unified Target Adapter (UTA) must be installed on your storage system.

If you are using a UTA2, it must be set to `cna` mode.

- A converged network adapter (CNA) must be installed on your host.

Steps

1. Use your switch documentation to configure your switches for FCoE.
2. Verify that the DCB settings for each node in the cluster have been correctly configured.

```
run -node node1 -command dcb show
```

DCB settings are configured on the switch. Consult your switch documentation if the settings are incorrect.

3. Verify that the FCoE login is working when the FC target port online status is `true`.

```
fcp adapter show -fields node,adapter,status,state,speed,fabric-established,physical-protocol
```

If the FC target port online status is `false`, consult your switch documentation.

Related information

- [NetApp Interoperability Matrix Tool](#)

- [NetApp Technical Report 3800: Fibre Channel over Ethernet \(FCoE\) End-to-End Deployment Guide](#)
- [Cisco MDS 9000 NX-OS and SAN-OS Software Configuration Guides](#)
- [Brocade products](#)

System Requirements

Setting up LUNs involves creating a LUN, creating an igroup, and mapping the LUN to the igroup. Your system must meet certain prerequisites before you can set up your LUNs.

- The Interoperability Matrix must list your SAN configuration as supported.
- Your SAN environment must meet the SAN host and controller configuration limits specified in [NetApp Hardware Universe](#) for your version of the ONTAP software.
- A supported version of Host Utilities must be installed.

The Host Utilities documentation provides more information.

- You must have SAN LIFs on the LUN owning node and the owning node's HA partner.

Related information

- [NetApp Interoperability Matrix Tool](#)
- [ONTAP SAN Host Configuration](#)
- [NetApp Technical Report 4017: Fibre Channel SAN Best Practices](#)

What to know before you create a LUN

Before you begin setting up your LUNs on your cluster, you need to review these LUN guidelines.

Why actual LUN sizes slightly vary

You should be aware of the following regarding the size of your LUNs.

- When you create a LUN, the actual size of the LUN might vary slightly based on the OS type of the LUN. The LUN OS type cannot be modified after the LUN is created.
- If you create a LUN at the max LUN size, be aware that the actual size of the LUN might be slightly less. ONTAP rounds down the limit to be slightly less.
- The metadata for each LUN requires approximately 64 KB of space in the containing aggregate. When you create a LUN, you must ensure that the containing aggregate has enough space for the LUN's metadata. If the aggregate does not contain enough space for the LUN's metadata, some hosts might not be able to access the LUN.

Guidelines for assigning LUN IDs

Typically, the default LUN ID begins with 0 and is assigned in increments of 1 for each additional mapped LUN. The host associates the LUN ID with the location and path name of the LUN. The range of valid LUN ID numbers depends on the host. For detailed information, see the documentation provided with your Host Utilities.

Guidelines for mapping LUNs to igroups

- You can map a LUN only once to an igroup.
- As a best practice, you should map a LUN to only one specific initiator through the igroup.
- You can add a single initiator to multiple igroups, but the initiator can be mapped to only one LUN.
- You cannot use the same LUN ID for two LUNs mapped to the same igroup.
- You should use the same protocol type for igroups and port sets.

Verify and add your protocol FC or iSCSI license

Before you can enable block access for a storage virtual machine (SVM) with FC or iSCSI, you must have a license. The FC and iSCSI licenses are included with [ONTAP One](#).

Example 1. Steps

System Manager

If you don't have ONTAP One, verify and add your FC or iSCSI license with ONTAP System Manager (9.7 and later).

1. In System Manager, select **Cluster > Settings > Licenses**
2. If the license is not listed, select **+ Add** and enter the license key.
3. Select **Add**.

CLI

If you don't have ONTAP One, verify and add your FC or iSCSI license with the ONTAP CLI.

1. Verify that you have a active license for FC or iSCSI.

```
system license show
```

Package	Type	Description	Expiration
Base	site	Cluster Base License	-
NFS	site	NFS License	-
CIFS	site	CIFS License	-
iSCSI	site	iSCSI License	-
FCP	site	FCP License	-

2. If you do not have a active license for FC or iSCSI, add your license code.

```
license add -license-code <your_license_code>
```

Provision SAN storage

This procedure creates new LUNs on an existing storage VM which already has the FC or iSCSI protocol configured.

About this task

This procedure applies to FAS, AFF, and ASA systems. If you have an ASA r2 system (ASA A1K, ASA A90, ASA A70, ASA A50, ASA A30, ASA A20, or ASA C30), follow [these steps](#) to provision your storage. ASA r2 systems provide a simplified ONTAP experience specific to SAN-only customers.

If you need to create a new storage VM and configure the FC or iSCSI protocol, see [Configure an SVM for FC](#) or [Configure an SVM for iSCSI](#).

If the FC license is not enabled, the LIFs and SVMs appear to be online but the operational status is down.

LUNs appear to your host as disk devices.



Asymmetric logical unit access (ALUA) is always enabled during LUN creation. You cannot change the ALUA setting.

You must use single initiator zoning for all of the FC LIFs in the SVM to host the initiators.

Beginning with ONTAP 9.8, when you provision storage, QoS is enabled by default. You can disable QoS, or choose a custom QoS policy during the provisioning process or at a later time.

Example 2. Steps

System Manager

Create LUNs to provide storage for a SAN host using the FC or iSCSI protocol with ONTAP System Manager (9.7 and later).

To complete this task using System Manager Classic (available with 9.7 and earlier) refer to [iSCSI configuration for Red Hat Enterprise Linux](#)

Steps

1. Install the appropriate [SAN host utilities](#) on your host.
2. In System Manager, click **Storage > LUNs** and then click **Add**.
3. Enter the required information to create the LUN.
4. You can click **More Options** to do any of the following, depending upon your version of ONTAP.

Option	Available beginning with
<ul style="list-style-type: none">• Assign QoS policy to LUNs instead of parent volume<ul style="list-style-type: none">◦ More Options > Storage and Optimization◦ Select Performance Service Level.◦ To apply the QoS policy to individual LUNs instead of the entire volume, select Apply these performance limits enforcements to each LUN.<p>By default, performance limits are applied at the volume level.</p>	ONTAP 9.10.1
<ul style="list-style-type: none">• Create a new initiator group using existing initiator groups<ul style="list-style-type: none">◦ More Options > HOST INFORMATION◦ Select New initiator group using existing initiator groups.<div data-bbox="337 1297 396 1356"></div><p>The OS type for an igroup containing other igroups cannot be changed after it has been created.</p>	ONTAP 9.9.1
<ul style="list-style-type: none">• Add a description to your igroup or host initiator<p>The description serves as an alias for the igroup or host initiator.</p><ul style="list-style-type: none">◦ More Options > HOST INFORMATION	ONTAP 9.9.1
<ul style="list-style-type: none">• Create your LUN on an existing volume<p>By default, a new LUN is created in a new volume.</p><ul style="list-style-type: none">◦ More Options > Add LUNs◦ Select Group related LUNs.	ONTAP 9.9.1

- Disable QoS or choose a custom QoS policy
 - **More Options > Storage and Optimization**
 - Select **Performance Service Level**.

ONTAP 9.8



In ONTAP 9.9.1 and later, if you select a custom QoS policy, you can also select manual placement on a specified local tier.

5. For FC, zone your FC switches by WWPN. Use one zone per initiator and include all target ports in each zone.

6. Discover LUNs on your host.

For VMware vSphere, use Virtual Storage Console (VSC) to discover and initialize your LUNs.

7. Initialize the LUNs and optionally, create file systems.

8. Verify that the host can write and read data on the LUN.

CLI

Create LUNs to provide storage for a SAN host using the FC or iSCSI protocol with the ONTAP CLI.

1. Verify that you have a license for FC or iSCSI.

```
system license show
```

Package	Type	Description	Expiration
Base	site	Cluster Base License	-
NFS	site	NFS License	-
CIFS	site	CIFS License	-
iSCSI	site	iSCSI License	-
FCP	site	FCP License	-

2. If you do not have a license for FC or iSCSI, use the `license add` command.

```
license add -license-code <your_license_code>
```

3. Enable your protocol service on the SVM:

For iSCSI:

```
vserver iscsi create -vserver <svm_name> -target-alias <svm_name>
```

For FC:

```
vserver fcp create -vserver <svm_name> -status-admin up
```

4. Create two LIFs for the SVMs on each node:

```
network interface create -vserver <svm_name> -lif <lif_name> -role  
data -data-protocol <iscsi|fc> -home-node <node_name> -home-port  
<port_name> -address <ip_address> -netmask <netmask>
```

NetApp supports a minimum of one iSCSI or FC LIF per node for each SVM serving data. However, two LIFS per node are required for redundancy. For iSCSI, it is recommended that you configure a minimum of two LIFs per node in separate Ethernet networks.

5. Verify that your LIFs have been created and that their operational status is online:

```
network interface show -vserver <svm_name> <lif_name>
```

6. Create your LUNs:

```
lun create -vserver <svm_name> -volume <volume_name> -lun <lun_name>  
-size <lun_size> -ostype linux -space-reserve <enabled|disabled>
```

Your LUN name cannot exceed 255 characters and cannot contain spaces.



The NVFAIL option is automatically enabled when a LUN is created in a volume.

7. Create your igroups:

```
igroup create -vserver <svm_name> -igroup <igroup_name> -protocol  
<fcp|iscsi|mixed> -ostype linux -initiator <initiator_name>
```

8. Map your LUNs to igroups:

```
lun mapping create -vserver <svm_name> -volume <volume_name> -lun  
<lun_name> -igroup <igroup_name>
```

9. Verify that your LUNs are configured correctly:

```
lun show -vserver <svm_name>
```

10. Optionally, [Create a port set and bind to an igroup](#).
11. Follow steps in your host documentation for enabling block access on your specific hosts.
12. Use the Host Utilities to complete the FC or iSCSI mapping and to discover your LUNs on the host.

Related information

- [SAN Administration overview](#)
- [ONTAP SAN Host Configuration](#)
- [View and manage SAN initiator groups in System Manager](#)
- [NetApp Technical Report 4017: Fibre Channel SAN Best Practices](#)

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