



SAN provisioning

ONTAP 9

NetApp
May 23, 2023

Table of Contents

- SAN provisioning 1
 - SAN management overview..... 1
 - Configure switches for FCoE 2
 - System Requirements 2
 - What to know before you create a LUN 3
 - Verify and add your protocol FC or iSCSI license 4
 - Provision SAN storage..... 4

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).

Configure switches for FCoE

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

What you'll need

- 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. Use the `dcb show` command to 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. Use the `fcp adapter show` command to verify that the FCoE login is working when the FC target port online status is `true`.

```
cluster1::> 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

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.

Example 1. Steps

System Manager

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

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.

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.

Unresolved directive in san-admin/provision-storage.adoc -
include::_include/98_qos_enabled_by_default.adoc[]

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.

Unresolved directive in san-admin/provision-storage.adoc -
include::_include/san_add_lun_more_options.adoc[]

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.

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>
```

. Optionally, [xref:{relative_path}create-port-sets-binding-igroups-task.html](#)[Create a port set and bind to an igroup].

. Follow steps in your host documentation for enabling block access on your specific hosts.

. 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](#)

Copyright information

Copyright © 2023 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.