



Fibre Channel and FCoE zoning

ONTAP 9

NetApp
June 15, 2023

Table of Contents

- Fibre Channel and FCoE zoning 1
 - Fibre Channel and FCoE zoning overview. 1
 - World Wide Name-based zoning 1
 - Individual zones 2
 - Single-fabric zoning 2
 - Dual-fabric HA pair zoning 3
 - Zoning restrictions for Cisco FC and FCoE switches. 4

Fibre Channel and FCoE zoning

Fibre Channel and FCoE zoning overview

An FC, FC-NVMe or FCoE zone is a logical grouping of one or more ports within a fabric. For devices to be able to see each other, connect, create sessions with one another, and communicate, both ports need to have a common zone membership. Single initiator zoning is recommended.

Reasons for zoning

- Zoning reduces or eliminates *crosstalk* between initiator HBAs.

This occurs even in small environments and is one of the best arguments for implementing zoning. The logical fabric subsets created by zoning eliminate crosstalk problems.

- Zoning reduces the number of available paths to a particular FC, FC-NVMe, or FCoE port and reduces the number of paths between a host and a particular LUN that is visible.

For example, some host OS multipathing solutions have a limit on the number of paths they can manage. Zoning can reduce the number of paths that an OS multipathing driver sees. If a host does not have a multipathing solution installed, you need to verify that only one path to a LUN is visible by using either zoning in the fabric or a combination of Selective LUN Mapping (SLM) and portsets in the SVM.

- Zoning increases security by limiting access and connectivity to end-points that share a common zone.

Ports that have no zones in common cannot communicate with one another.

- Zoning improves SAN reliability by isolating problems that occur and helps to reduce problem resolution time by limiting the problem space.

Recommendations for zoning

- You should implement zoning any time, if four or more hosts are connected to a SAN or if SLM is not implemented on the nodes to a SAN.
- Although World Wide Node Name zoning is possible with some switch vendors, World Wide Port Name zoning is required to properly define a specific port and to use NPIV effectively.
- You should limit the zone size while still maintaining manageability.

Multiple zones can overlap to limit size. Ideally, a zone is defined for each host or host cluster.

- You should use single-initiator zoning to eliminate crosstalk between initiator HBAs.

World Wide Name-based zoning

Zoning based on World Wide Name (WWN) specifies the WWN of the members to be included within the zone. When zoning in ONTAP, you must use World Wide Port Name (WWPN) zoning.

WWPN zoning provides flexibility because access is not determined by where the device is physically

connected to the fabric. You can move a cable from one port to another without reconfiguring zones.

For Fibre Channel paths to storage controllers running ONTAP, be sure the FC switches are zoned using the WWPNs of the target logical interfaces (LIFs), not the WWPNs of the physical ports on the node. For more information on LIFs, see the *ONTAP Network Management Guide*.

Network management

Individual zones

In the recommended zoning configuration, there is one host initiator per zone. The zone consists of the host initiator port and one or more target LIFs on the storage nodes that are providing access to the LUNs up to the desired number of paths per target. This means that hosts accessing the same nodes cannot see each other's ports, but each initiator can access any node.

You should add all LIF's from the storage virtual machine (SVM) into the zone with the host initiator. This allows you to move volumes or LUNs without editing your existing zones or creating new zones.

For Fibre Channel paths to nodes running ONTAP, be sure that the FC switches are zoned using the WWPNs of the target logical interfaces (LIFs), not the WWPNs of the physical ports on the node. The WWPNs of the physical ports start with "50" and the WWPNs of the LIFs start with "20".

Single-fabric zoning

In a single-fabric configuration, you can still connect each host initiator to each storage node. Multipathing software is required on the host to manage multiple paths. Each host should have two initiators for multipathing to provide resiliency in the solution.

Each initiator should have a minimum of one LIF from each node that the initiator can access. The zoning should allow at least one path from the host initiator to the HA pair of nodes in the cluster to provide a path for LUN connectivity. This means that each initiator on the host might only have one target LIF per node in its zone configuration. If there is a requirement for multipathing to the same node or multiple nodes in the cluster, then each node will have multiple LIFs per node in its zone configuration. This enables the host to still access its LUNs if a node fails or a volume containing the LUN is moved to a different node. This also requires the reporting nodes to be set appropriately.

Single-fabric configurations are supported, but are not considered highly available. The failure of a single component can cause loss of access to data.

In the following figure, the host has two initiators and is running multipathing software. There are two zones:



The naming convention used in this figure is just a recommendation of one possible naming convention that you can choose to use for your ONTAP solution.

- Zone 1: HBA 0, LIF_1, and LIF_3
- Zone 2: HBA 1, LIF_2, and LIF_4

If the configuration included more nodes, the LIFs for the additional nodes would be included in these zones.



In this example, you could also have all four LIFs in each zone. In that case, the zones would be as follows:

- Zone 1: HBA 0, LIF_1, LIF_2, LIF_3, and LIF_4
- Zone 2: HBA 1, LIF_1, LIF_2, LIF_3, and LIF_4



The host operating system and multipathing software have to support the number of supported paths that are being used to access the LUNs on the nodes. To determine the number of paths used to access the LUNs on nodes, see the SAN configuration limits section.

Related information

[NetApp Hardware Universe](#)

Dual-fabric HA pair zoning

In dual-fabric configurations, you can connect each host initiator to each cluster node. Each host initiator uses a different switch to access the cluster nodes. Multipathing software is required on the host to manage multiple paths.

Dual-fabric configurations are considered high availability because access to data is maintained if a single component fails.

In the following figure, the host has two initiators and is running multipathing software. There are two zones. SLM is configured so that all nodes are considered as reporting nodes.



The naming convention used in this figure is just a recommendation of one possible naming convention that you can choose to use for your ONTAP solution.

- Zone 1: HBA 0, LIF_1, LIF_3, LIF_5, and LIF_7
- Zone 2: HBA 1, LIF_2, LIF_4, LIF_6, and LIF_8

Each host initiator is zoned through a different switch. Zone 1 is accessed through Switch 1. Zone 2 is accessed through Switch 2.

Each initiator can access a LIF on every node. This enables the host to still access its LUNs if a node fails. SVMs have access to all iSCSI and FC LIFs on every node in a clustered solution based on the setting for Selective LUN Map (SLM) and the reporting node configuration. You can use SLM, portsets, or FC switch zoning to reduce the number of paths from an SVM to the host and the number of paths from an SVM to a LUN.

If the configuration included more nodes, the LIFs for the additional nodes would be included in these zones.



The host operating system and multipathing software have to support the number of paths that is being used to access the LUNs on the nodes.

Related information

[NetApp Hardware Universe](#)

Zoning restrictions for Cisco FC and FCoE switches

When using Cisco FC and FCoE switches, a single fabric zone must not contain more than one target LIF for the same physical port. If multiple LIFs on the same port are in the same zone, then the LIF ports might fail to recover from a connection loss.

Regular FC switches are used for the FC-NVMe protocol in the exact same way they are used for the FC protocol.

- Multiple LIFs for the FC and FCoE protocols, can share physical ports on a node as long as they are in different zones.

- FC-NVMe and FCoE cannot share the same physical port.
- FC and FC-NVMe can share the same 32 Gb physical port.
- Cisco FC and FCoE switches require each LIF on a given port to be in a separate zone from the other LIFs on that port.
- A single zone can have both FC and FCoE LIFs. A zone can contain a LIF from every target port in the cluster, but be careful to not exceed the host's path limits and verify the SLM configuration.
- LIFs on different physical ports can be in the same zone.
- Cisco switches require that LIFs be separated.

Though not required, separating LIFs is recommended for all switches

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.