ONTAP® 9

FlexArray® Virtualization Implementation Guide for NetApp® E-Series Storage

August 2018 | 215-11151_D0
doccomments@netapp.com
Where to find information for configurations with storage arrays

When planning your configuration for using ONTAP systems with storage arrays, you should check various sources for information about array LUN configuration in addition to the product documentation.

Tools available on the NetApp Support Site provide, in a central location, specific information about which features, configurations, and storage array models are supported in particular releases.

Where to find information about ONTAP support for storage arrays

Not all ONTAP releases support the same features, configurations, system models, and storage array models. During your deployment planning, you must check ONTAP support information to verify that your deployment conforms to ONTAP hardware and software requirements for all systems in the deployment.

The following table lists the information sources that contain the details of the hardware and software requirements associated with ONTAP systems:

<table>
<thead>
<tr>
<th>For information about...</th>
<th>You should look here...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks for ONTAP implementation with storage arrays, including the following:</td>
<td>FlexArray virtualization installation requirements and reference</td>
</tr>
<tr>
<td>• Planning the implementation</td>
<td></td>
</tr>
<tr>
<td>• Connecting the ONTAP systems and the array</td>
<td></td>
</tr>
<tr>
<td>• Verifying the installation</td>
<td></td>
</tr>
<tr>
<td>ONTAP working with devices, including the following:</td>
<td>NetApp Interoperability Matrix Tool</td>
</tr>
<tr>
<td>• Supported storage arrays and storage array firmware</td>
<td>You can view information about advanced feature support for E-Series storage arrays with FlexArray Virtualization by referring to the appropriate notes on the V-Series and FlexArray Virtualization for Back-end Storage solution page of the Interoperability Matrix</td>
</tr>
<tr>
<td>• Supported switches and switch firmware</td>
<td></td>
</tr>
<tr>
<td>• Whether your storage array supports nondisruptive (live) upgrade of the storage array firmware</td>
<td></td>
</tr>
<tr>
<td>• Whether a MetroCluster configuration is supported with your storage array</td>
<td></td>
</tr>
<tr>
<td>For information about...</td>
<td>You should look here...</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>ONTAP limits for releases and platforms, including the following:</td>
<td>NetApp Hardware Universe</td>
</tr>
<tr>
<td>• Minimum and maximum array LUN sizes, including the minimum array LUN size for the root volume and spare core array LUNs</td>
<td></td>
</tr>
<tr>
<td>• Minimum aggregate size for aggregates with array LUNs</td>
<td></td>
</tr>
<tr>
<td>• Supported block size</td>
<td></td>
</tr>
<tr>
<td>• Minimum and maximum capacity</td>
<td></td>
</tr>
<tr>
<td>• Neighborhood limits</td>
<td></td>
</tr>
<tr>
<td>Setting up E-Series storage arrays, including the following:</td>
<td>The following E-Series documentation:</td>
</tr>
<tr>
<td>• Site preparation requirements</td>
<td>• E-Series Storage Systems Site Preparation Guide</td>
</tr>
<tr>
<td>• Cabling instructions</td>
<td>• E-Series Storage Systems Hardware Cabling Guide</td>
</tr>
<tr>
<td>• SANtricity software installation and configuration instructions</td>
<td>• SANtricity ES Storage Manager documentation</td>
</tr>
<tr>
<td></td>
<td>You can access these documents from the NetApp Support site.</td>
</tr>
<tr>
<td></td>
<td>NetApp Support</td>
</tr>
</tbody>
</table>

**Related references**

 Required host type for E-Series storage arrays on page 7
ONTAP systems that can use array LUNs on storage arrays

You can use supported FAS and V-Series systems with array LUNs.

The NetApp Interoperability Matrix Tool lists the supported combinations of hardware and software.

Related information

*NetApp Interoperability Matrix Tool*
Requirements for configuring E-Series storage arrays

There are system parameters that you must set and considerations to keep in mind when configuring a storage array to work with an ONTAP system.

Required host type for E-Series storage arrays

You must set the appropriate host type option for the E-Series storage array to communicate with the ONTAP systems. You can use SANtricity Storage Manager to set the host type.

For a given ONTAP release, you can set the required host type based on the version of the storage array firmware.

If your firmware version is 08.10.15.00 and later, then set the host type to Data ONTAP (ALUA).

Note: The minimum supported version of SANtricity Storage Manager for firmware version 08.10.15.00 and later is 11.10.0G00.0026.

When using E-Series Controller Firmware 8.25, ONTAP RDAC is no longer supported as a host type on the E-Series system. Therefore, if you are using ONTAP RDAC, then before upgrading the backend array to CFW 8.25 or later you must follow this Knowledge Base article to convert it to ONTAP ALUA.

Related information

NetApp KB Article 1014974: How to resolve issues during storage controller motherboard replacement and head upgrades with iSCSI and FCP
Supported fabric-attached configurations for E-Series storage arrays

You can connect only certain E-Series storage arrays in fabric-attached configurations with ONTAP systems.

The Interoperability Matrix contains additional information about specific array models.

**Related information**

*NetApp Interoperability Matrix Tool*

Stand-alone basic configuration

The stand-alone basic configuration of an ONTAP system that uses array LUNs is a simple, fabric-attached configuration with a single FC initiator port pair accessing a single LUN group.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

The following illustration shows this configuration:

![Diagram of stand-alone basic configuration](image)

**Related information**

*NetApp Interoperability Matrix Tool*

Stand-alone system with two 2-port array LUN groups

In a stand-alone ONTAP system that is in a fabric-attached simple configuration, each FC initiator port pair present on the ONTAP system accesses a separate array LUN group.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

The following illustration shows fabric-attached simple configuration:
Related information

*NetApp Interoperability Matrix Tool*

**Single 4-port array LUN group configuration**

This configuration contains a single, 4-port LUN group with each target port accessed by a single ONTAP FC initiator port from the HA pair. Due to zoning, only two paths are allowed to a specific array LUN from each of the ONTAP system.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

The following illustration shows this configuration:
Two 4-port array LUN group configuration

In this configuration, each ONTAP FC initiator port pair accesses a separate array LUN group. The zoning is a single ONTAP FC initiator to a single array target port.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

The following illustration shows a block diagram of this configuration:

Eight-port array LUN group configuration

An eight-port LUN group configuration is supported on clustered V-Series systems and on ONTAP systems that can use array LUNs.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

There are two ways of deploying this configuration: crossed and uncrossed back-end connections.
**Crossed back-end connections**

In this configuration with the back-end connections crossed, the FC connections from the same storage array controller go to both fabric switches (redundant).

In this illustration of crossed back-end connections, note how the nodes are attached to the switches and to the storage array. Vs1 uses switch 1 when attaching to the storage array Controller 1 port 1A and Controller 2 port 2C, and uses switch 2 when attaching to storage array Controller 2 ports 2A and Controller 1 port 1C. This optimizes the use of switch ports and array ports, which reduces the impact of a switch or storage array controller failure.

**Back-end connections are not crossed**

In this configuration in which the back-end connections are not crossed, the FC connections from the same storage array controller go to only one fabric switch.

The following illustration shows this configuration when the back-end connections are not crossed.
Attaching FC initiator port to multiple targets ports

You can connect an FC initiator port on an ONTAP system to multiple target ports on separate storage arrays within the same family. This configuration is supported with MetroCluster configurations in ONTAP.

ONTAP supports sharing an FC initiator port with multiple target ports in both HA pairs and in stand-alone systems. This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

**Note:** For details about sharing an FC initiator port with multiple target ports and zoning, see the information in the *FlexArray Virtualization Installation Requirements and Reference*

Single ONTAP FC initiator port connecting to target ports on separate storage arrays

The following example shows an HA pair in which a single ONTAP FC initiator port connects to multiple target ports on different storage arrays:

---

**Related information**

*NetApp Interoperability Matrix Tool*
Related information

*NetApp Interoperability Matrix Tool*
*FlexArray virtualization installation requirements and reference*
*Fabric-attached MetroCluster installation and configuration*

**Sharing a target port with two FC initiator ports**

A maximum of two ONTAP FC initiator ports across nodes can be attached to a single target port on the storage array. This configuration is supported with MetroCluster configurations in ONTAP.

This configuration is supported for use with all storage arrays listed in the Interoperability Matrix as supported for the release of ONTAP running on your system.

The following illustration shows a shared target port configuration with an HA pair. Sharing a target port with two FC initiator ports is supported with both stand-alone systems and HA pairs.

*Note:* For details about sharing an FC initiator port with multiple target ports and zoning, see the *FlexArray Virtualization Installation Requirements and Reference*

**Shared target port attached to FC initiator ports**

The following example shows an HA pair in which a single target port connects to two FC initiator ports:
The initiator ports 0a of controllers vs1 and vs2 are connected to the storage array port 1A and ports 0c of the controllers are connected to the storage array port 2A.

**Related information**

*NetApp Interoperability Matrix Tool*

*FlexArray virtualization installation requirements and reference*
Supported direct-attached configurations with E-Series storage arrays

You can connect ONTAP systems in direct-attached configurations with E-Series storage arrays. You must verify redundancy in connections between the ONTAP systems and the storage arrays to avoid the possibility of a single point of failure. FlexArray Stretch MetroCluster supports direct-attached configurations with E-Series storage arrays. For more information see, Interoperability Matrix and Stretch MetroCluster Installation and Configuration Guide.

The Interoperability Matrix contains information about the specific E-Series array models that are supported in direct-attached configurations with ONTAP system.

ONTAP supports the following direct-attached configurations with E-Series storage arrays:

- **Stand-alone basic configuration** on page 15
- **Four-port array LUN group** on page 15
- **Eight-port array LUN group** on page 17

**Stand-alone basic configuration**

In a stand-alone basic configuration, two FC initiator ports from the ONTAP system access the ports of a two-port array LUN group.

The following illustration shows a direct-attached configuration where the ONTAP FC initiator ports 0a and 0h access the target ports of a two-port array LUN group:

![Diagram of stand-alone basic configuration]

**Four-port array LUN group**

Two FC initiator ports from each ONTAP system in an HA pair access different storage array ports in a four-port array LUN group for redundancy in connections.

The following illustration shows a direct-attached configuration where the ONTAP FC initiator ports access the target ports of a four-port array LUN group.

![Diagram of four-port array LUN group]
You can also connect four FC initiator ports from each ONTAP system in the HA pair to two different four-port array LUN groups such that each FC initiator port in a port pair accesses the alternate LUN group.

The following illustration shows a direct-attached configuration where the ONTAP FC initiator ports access the target ports of two four-port array LUN groups:
**Eight-port array LUN group**

Four FC initiator ports from each ONTAP system in an HA pair access different storage array ports in an eight-port array LUN group for redundancy in connections.

The following illustration shows a direct-attached configuration where the ONTAP FC initiator ports access the target ports of an eight-port array LUN group:

![Diagram of eight-port array LUN group]

**Related information**

*NetApp Interoperability Matrix Tool*
*NetApp Interoperability Matrix Tool*
*Stretch MetroCluster installation and configuration*
Copyright information

Copyright © 2018 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.

Data contained herein pertains to a commercial item (as defined in FAR 2.101) and is proprietary to NetApp, Inc. The U.S. Government has a non-exclusive, non-transferrable, non-sublicensable, 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).
Trademark information

NETAPP, the NETAPP logo, and the marks listed on the NetApp Trademarks page are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.

How to send comments about documentation and receive update notifications

You can help us to improve the quality of our documentation by sending us your feedback. You can receive automatic notification when production-level (GA/FCS) documentation is initially released or important changes are made to existing production-level documents.

If you have suggestions for improving this document, send us your comments by email.

doccomments@netapp.com

To help us direct your comments to the correct division, include in the subject line the product name, version, and operating system.

If you want to be notified automatically when production-level documentation is released or important changes are made to existing production-level documents, follow Twitter account @NetAppDoc.

You can also contact us in the following ways:

- NetApp, Inc., 1395 Crossman Ave., Sunnyvale, CA 94089 U.S.
- Telephone: +1 (408) 822-6000
- Fax: +1 (408) 822-4501
- Support telephone: +1 (888) 463-8277
Index

A
attaching FC initiator ports
   supported with MetroCluster configuration 12

B
back-end storage arrays
   where to find information about ONTAP support for 4

C
comments
   how to send feedback about documentation 20
configuration requirements
   E-Series storage arrays 7
configurations
   storage arrays
      where to find information for configuring 4
      where to find information for storage arrays 4
configurations supported with storage arrays
   FC initiator port attaching to multiple targets ports 12
   single 4-port array LUN group 9
   stand-alone basic configuration 8

D
documentation
   how to receive automatic notification of changes to 20
   how to send feedback about 20

E
E-Series
   setting the host type 7
E-Series storage arrays
   configuration requirements 7
   supported direct-attached configurations with 15
   supported fabric-attached configurations 8
eight-port array LUN group configuration
   support on 10

F
fabric-attached simple configurations
   stand-alone system with two 2-port array LUN groups 8
FC initiator port
   attaching to multiple target ports 12
FC initiator port pair
   separate array LUN group 10
   single array target port 10
   single FC initiator 10
FC initiator ports
   sharing target port 13

H
hardware requirements
   where to find information about ONTAP support for back-end storage arrays 4
host type
   settings for E-Series 7

I
information
   how to send feedback about improving documentation 20
initiator ports
   attaching to multiple target ports 12

L
LUN group configuration
   contains single 4-port array 9
LUNs (array)
   systems running ONTAP that can use 6
LUNs, array 6

P
ports
   attaching initiator port with target ports 12
   sharing target port with FC initiator ports 13

S
sharing target port
   supported configuration 13
single 4-port array LUN group
single FC initiator port 9
single FC initiator port LUN group configuration 9
single target port
   sharing with two FC initiator ports 13
software requirements
   where to find information about ONTAP support for back-end storage arrays 4
stand-alone basic configuration
   support for 8
stand-alone system with two 2-port array LUN groups configuration
   support for 8
suggestions
   how to send feedback about documentation 20
supported configuration with storage arrays
   two 4-port array LUN groups 10
supported configurations with storage arrays
eight-port array LUN group 10
FC initiator port attaching to multiple targets ports 12
sharing target port with two FC initiator ports 13
stand-alone basic configuration 8
stand-alone system with two 2-port array LUN groups 8
supported direct-attached configurations with storage arrays
   eight-port HA pair configuration 15
   four-port HA pair configuration 15
   two-port stand-alone configuration 15
supported fabric-attached configurations
   E-Series storage arrays 8
   switches
   where to find information about ONTAP support for back-end storage arrays 4
   systems that can use array LUN 10

T
   target port
     sharing with two FC initiator ports 13
Twitter
     how to receive automatic notification of documentation changes 20
   two 4-port array LUN groups configuration
     supported with storage arrays 10

Z
   zoning
     attached FC initiator port supported configuration 12