Troubleshooting configurations with storage arrays

ONTAP FlexArray

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Troubleshooting configurations with storage arrays

You should validate your configuration during initial installation so you can resolve issues before your configuration is put into a production environment.

Getting started with troubleshooting an ONTAP configuration with array LUNs

While troubleshooting an ONTAP configuration with array LUNs, you should follow a systematic approach to determine the cause of the issue.

This procedure suggests an order for approaching troubleshooting.

> As you continue with the troubleshooting steps, you should save any information that you gather about the issue so that you can provide this information to technical support in the case of an escalation.

Steps

1. Determine whether the issue is with the *front end* (an ONTAP issue that affects all the corresponding platforms) or the *back end* (an issue with the switch or storage array configuration).

   For example, if you are trying to use an ONTAP feature and it is not working as you expected, the issue is likely to be with the front end.

2. Take appropriate action to address the issue, depending on its nature:

If the ONTAP configuration has a…	Then do this…
Front end issue	Proceed with troubleshooting the ONTAP feature by following instructions in the ONTAP guides. ONTAP 9 Documentation

If the ONTAP configuration has a…	Then do this…
Back end issue	a. Check the Interoperability Matrix to ensure that the following are supported: configuration, storage array, storage array firmware, switch, and switch firmware. NetApp Interoperability Matrix Tool b. Use the `storage array config show` command to check whether there are any common back-end configuration errors that the system can detect. If ONTAP detects a back-end configuration error, you must run the `storage errors show` command to obtain details about the error.

3. If the cause of the issue is still not clear, check the following sources to ensure that your system is compliant with the requirements for working with storage arrays:
   - Verifying an installation with storage arrays
   - FlexArray virtualization implementation for third-party storage
   - FlexArray virtualization implementation for NetApp E-Series storage
   - NetApp Interoperability Matrix Tool
   - NetApp Hardware Universe
4. If you still need help resolving the issue, contact technical support.

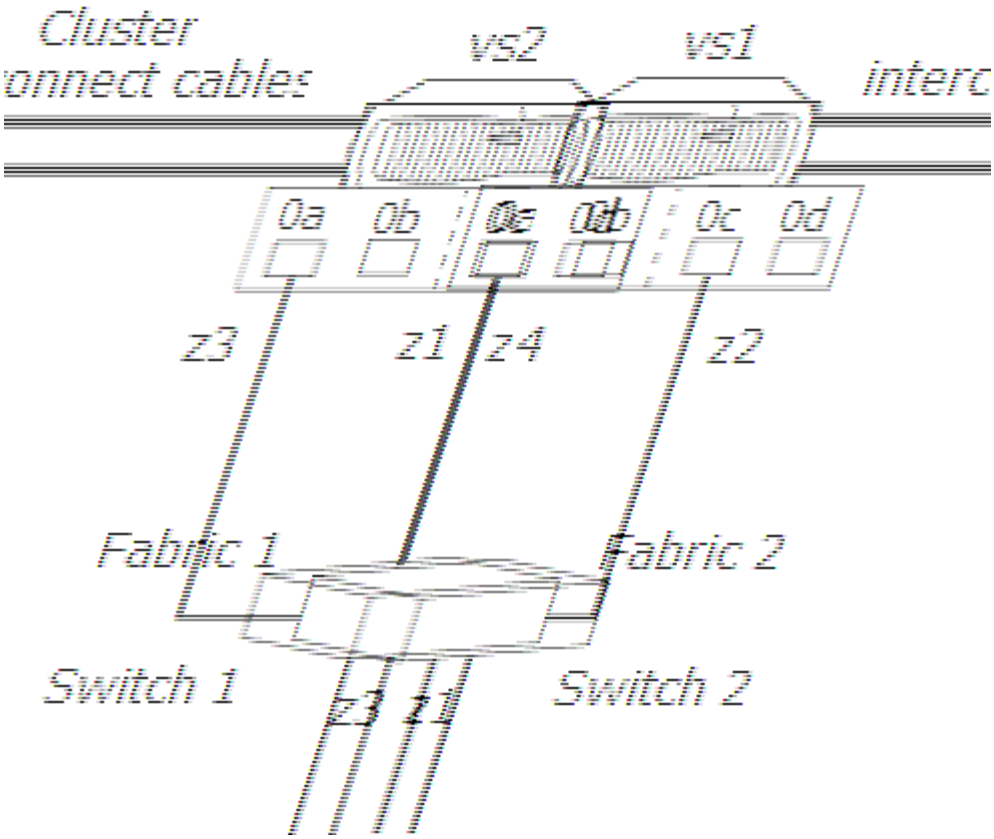
Invalid path setup examples

Path setup can be invalid because paths to an array LUN are not redundant or the number of paths to an array LUN does not meet ONTAP requirements.

Invalid path setup: alternate paths are not configured

It is important to set up alternate paths to all array LUNs from both FC initiators on the ONTAP system, thereby avoiding a single point of failure (SPOF).

The following configuration is invalid because it does not provide alternate paths from each FC initiator port on the ONTAP systems to each LUN on the storage array. Both FC initiator ports from the same ONTAP system are connected to the storage array through the same switch.



Assume that the following zoning is in place in this invalid example:

- For vs1:
  - 0a is zoned to see Controller 1 Port A.
  - 0c is zoned to see Controller 1 Port B.
- For vs2:
  - 0a is zoned to see Controller 2 Port A.
  - 0c is zoned to see Controller 2 Port B.

In this sample configuration, each switch becomes a SPOF.

To make this a valid configuration, the following changes must be made:

- vs1's FC initiator port 0c must be connected to Switch 2.
- vs2's FC initiator port 0a must be connected to Switch 1.
- Appropriate zoning must be configured.

  If you are using multiple ports on a storage array that supports configuring a specific set of LUNs on a selected set of ports, a given FC initiator port must be able to see all array LUNs presented on the fabric.

What happens when a link failure occurs

ONTAP monitors a link's usage periodically. The ONTAP response to a link failure differs depending on where the failure occurs.

The following table shows what occurs if there is a failure in a fabric-attached configuration:

If a failure occurs in the link between the…	Then…
ONTAP system and the switch	ONTAP receives notification immediately and sends traffic to the other path immediately.
Switch and the storage array	ONTAP is not immediately aware that there is a link failure because the link is still established between the ONTAP system and the switch. ONTAP becomes aware that there is a failure when the I/O times out. ONTAP retries three times to send the traffic on the original path, then it fails over the traffic to the other path.

Relationship between zoning and host group configuration

When you fix zoning configuration errors you sometimes have to change host group configuration also, and the reverse.

Dependency between zone and host group definitions

Errors made in zone definitions can require reconfiguration of host group definitions and the reverse.

When a zone definition is constructed, two ports are specified: the WWPN of the FC initiator port on the ONTAP system and the storage array port WWPN or WWNN for that zone. Likewise, when the host group for the ONTAP system is configured on the storage array, the WWPNs of the FC initiator ports that you want to be members of the host group are specified.

The typical ordering of configuration is as follows:

1. Construct a zone definition.
2. Construct the host group on the storage array (by picking the WWPN of the FC initiator port on the ONTAP system from the picklist).
3. Present array LUNs to the ports.

However, host groups are sometimes configured before zone definitions, which requires manually entering WWPNs in the host group configuration on the storage array.

Common errors

In ONTAP output, the FC initiator ports on the ONTAP system are identified by adapter number—for example, 0a, 0b, 0c, 0d, and so on for models with onboard ports. WWPNs are shown in the switch GUI and the storage array GUI. Because WWPNs are long and in hexadecimal format, the following errors are common:

How WWPNs are specified	Common error
The administrator types in WWPNs	A typing mistake is made.

How WWPNs are specified	Common error
WWPNs are automatically discovered by the switch	The wrong FC initiator port WWPN is selected from the picklist.

When the ONTAP systems, switches, and storage array are cabled together, the switch automatically discovers the WWPNs of the ONTAP systems and storage array ports. The WWPNs are then available in picklists in the switch GUI, enabling selection of the WWPN of each zone member rather than typing it. To eliminate the possibility of typing errors, it is recommended that the switch discover WWPNs.

Cascading effect of errors

An obvious first step when troubleshooting problems with a fabric-attached configuration is to check whether zoning was configured correctly. Considering the relationship between the host group and zone definitions is also important. Fixing a problem might require reconfiguring both the zone definition and the host group definition, depending on where the error was made during the configuration process.

If the switch is automatically discovering WWPNs and zone definitions are configured first, the WWPNs of the FC initiator ports that will be used to access LUNs on the storage array are automatically propagated to the host group configuration picklists in the storage array GUI. Therefore, any zoning errors are also propagated to the storage array host group picklists. The picklists show the long, hexadecimal WWPNs instead of the short FC initiator port labels that are visible on the ONTAP system (for example, 0a, 0b, and so on). Therefore, it is not easy to see that the WWPN you expected to be listed is not there.

The following table shows the effects of certain errors:

Zone definition on the switch	Host group configuration on the storage array	Symptom in ONTAP output
The FC initiator port in the zone definition is incorrect. This caused the incorrect FC initiator port WWPN to be propagated to the host group configuration.	The WWPN of the FC initiator port shown in the picklist was selected, not the WWPN you intended.	Array LUNs are not visible over the FC initiator port on which the expected LUNs would be visible.
The zone definition includes the correct FC initiator port.	The WWPN in the host group definition is incorrect because of either of the following: • The wrong WWPN was selected. • Host groups were configured manually before the zone definition was configured and a typing error was made when typing in the WWPN of the FC initiator port.	

Example of cascading zoning and host group configuration errors

Errors made in zone definitions can impact host group definitions, and vice versa. When LUNs are not visible over a path, you need to check for both zoning and host group configuration errors.

Assume that your configuration sequence is as follows:

1. The zone definition was created on the switch.

   The WWPN for FC initiator port 0a of the ONTAP system was put in the zone definition. However, the intention was that the WWPN for FC initiator port 0c was to be put into the zone definition.

2. The host group was created on the storage array.

   The WWPN for FC initiator port 0a was selected (because that was the only WWPN available and it was not obvious that it was the WWPN for 0a and not 0c).

3. In ONTAP, you looked at array LUNs over the FC initiator ports, expecting to see array LUNs over 0c.

   However, there were no array LUNs over 0c because both the zone definition and the host group definition incorrectly include the WWPN for FC initiator port 0a.

   > ⓘ You used the `storage array config show` command to view the array LUN information.

4. You start troubleshooting because you cannot see LUNs over the initiator over which you expected to see them.

You need to check both the zoning and host group configuration but it does not matter which of the following procedures you start with first. You might see different messages, depending on whether you start fixing things from the host group first or the zoning first.

Troubleshooting by checking the zoning first

1. Check the zone definitions for the ONTAP system.

   You realize that you have two zones with the WWPN for FC initiator port 0a in it and no zones with the WWPN for 0c in it.

2. Fix the incorrect zone definitions and activate them.

   > ⓘ You would not be able to see the array LUNs over the initiator ports when running `storage array config show`.

3. Go to the array and reconfigure the host group to include the WWPN for FC initiator port 0c.

   Now that the WWPN for 0c is in a zone definition that has been activated, the WWPN for 0c shows up in the picklist in the host group configuration on the storage array.

4. On the ONTAP system, run `storage array config show` to check the array LUNs over the FC initiator ports to confirm that array LUNs are shown over 0c.

Troubleshooting by checking the host group first

1. From the console of the ONTAP system, run `storage show adapteradapter#`, then write down the WWPN of the adapter that is missing—0c in this example.
2. Go to the storage array and compare the WWPN you wrote down to the WWPNs shown in the host group picklist to see whether the WWPN of the FC initiator port you expected is listed.

   If the WWPN you expected does not appear, then the initiator you intended is not in the zone definition.

3. If the storage array allows you to modify WWPNs in the host group, you could modify the WWPN shown to be the WWPN that you wrote down.

   If the storage array does not let you modify WWPNs in the host group, you need to modify the host group definition after modifying the zone definition.

   You still cannot see LUNs over the initiator you were intending because the zoning has not been fixed yet.

4. Go to the switch and replace the incorrect WWPN with the correct FC port initiator, and then activate the zone definition.
5. If you could not correct the WWPN in the host group definition earlier in the process, go to the storage array and reconfigure the host group to include the WWPN for FC initiator port 0c.

   Now that the WWPN for 0c is in a zone definition that has been activated, the WWPN for 0c shows up in the picklist in the host group configuration on the storage array.

6. On the ONTAP system, run `storage array config show` to check the array LUNs over the FC initiator ports to confirm that array LUNs are shown over 0c.

   You should now see access to the LUNs over the FC initiator port.

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