NetApp

Verifying installation with storage arrays

ONTAP FlexArray

NetApp
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Verifying installation with storage arrays

It is important to detect and resolve any back-end configuration errors before you deploy your system in a production environment.

The two stages for verifying back-end configuration are as follows:

1. Checking for any back-end configuration errors that prevent ONTAP from operating with the storage array.

   These are the errors that are flagged by `storage errors show`. You must fix these errors.

2. Checking to ensure that the configuration is as you intended.

   There are a number of situations that are not errors from the system perspective but might not be what you intended. For example, the `storage array config show` output shows two LUN groups but you only intended one LUN group. This document refers to such situations as situations that do not meet your "intentions".

The following illustration shows the workflow in which you first verify that there are no configuration errors from the system perspective and then you verify that installation is as you intended.

Checking for back-end configuration errors preventing system operation

ONTAP requires you to fix common back-end configuration errors that would prevent a storage array and an ONTAP system from operating together normally. Using the `storage array config show` command helps you determine whether there are back-end configuration errors.

Steps

1. Enter the following command: `storage array config show`

   The first step in installation verification (and troubleshooting) is to run the `storage array config show` command. If ONTAP detects an error in the back-end configuration, the following message is displayed at the bottom of the `storage array config show` output:

   ```
   Warning: Configuration errors were detected.  Use 'storage errors show'
   for detailed information.
   ```

2. Take the appropriate action, as follows:

If…	Then…
`storage array config show` instructs you to run `storage errors show`	Go to Step 3.

If…	Then…
`storage array config show` does NOT instruct you to run `storage errors show`	Review the `storage array config show` output to make sure that the output reflects the configuration you intended. See Verifying if the back-end configuration matches the expected output section. (You do not need to continue with the next steps in this procedure.) Verifying if the back-end configuration matches the expected output

3. Enter the following command: `storage errors show`

   The `storage errors show` command enables you to see details of the problem at the array LUN level.

4. Review the error message and fix any errors shown.

   You must fix any errors shown by `storage errors show`. See The `storage errors show` messages and their resolution section to learn about the cause of each problem detected by `storage errors show` and how to fix it. The storage errors show messages and their resolution

5. After fixing the problem, run `storage errors show` again to confirm that the error was fixed.

   If `storage errors show` continues to show the problem, review the documentation again for more information about what to do, or contact technical support.

6. After you resolve the back-end configuration error, run `storage array config show` again so that you can review the output to ensure that the configuration meets the expected output.

The storage errors show messages and their resolution

When `storage errors show` flags an error condition, you need to determine why the error occurred and how to fix it.

The following table lists the back-end configuration errors detected by `storage errors show` and refers you to detailed information about the causes of each error and its resolution.

`storage errors show` **message**	**For more information about this message see…**
`NAME (Serial #): All paths to this array LUN are connected to the same fault domain. This is a single point of failure`.	All paths to an array LUN are on the same storage array controller
`NAME (Serial #), port WWPN1: LUN 1 occurs more than once. LUNs cannot be reused on the same array target port.`	Duplicated LUN IDs on a target port

storage errors show **message**	**For more information about this message see…**
NAME (Serial #): This array LUN is an access control LUN. It is not supported and should be masked off or disabled`.	Access control LUN was presented
NAME (Serial #) This array LUN is configured with conflicting failover modes. Each path to this LUN must use the same mode.	Array LUNs are configured with conflicting failover modes
NAME (Serial #): This Array LUN is only available on one path. Proper configuration requires two paths.	Fewer than two paths to an array LUN
NAME (Serial #): This array LUN is too large and is not usable. The maximum array LUN size supported is xTB.	Array LUN is too small or too large
NAME (Serial #): This array LUN is too small and is not usable. The minimum array LUN size supported is 1GB.	Array LUN is too small or too large
NAME (Serial #): This Array LUN is using multiple LUN IDs. Only one LUN ID per serial number is supported.	LUN IDs for the same LDEV do not match Volume Set Addressing is inconsistent
NAME (Serial #): This array LUN is marked foreign and has a reservation.	Array LUN is marked foreign and has a reservation

Array LUN size is either smaller or larger than the supported values

When planning array LUN sizes, you must conform to ONTAP minimum and maximum array LUN size limits. These limits vary according to ONTAP release. The `storage errors show` output identifies array LUNs that do not meet size requirements.

You cannot assign array LUNs with size issues to an ONTAP system.

Storage errors show message

```
NAME (Serial #): This array LUN is too large and is not usable. The
maximum array LUN size supported is xTB
```

OR

```
NAME (Serial #): This array LUN is too small and is not usable. The
minimum array LUN size supported is xGB.
```

Explanation

This message is generated when the array LUN is smaller than the minimum array LUN size supported by ONTAP or exceeds the maximum supported size. Primary reasons for array LUN sizes to be larger or smaller than the supported values might be the following:

- The storage array administrator did not convert the ONTAP array LUN size limits into the equivalent limits according to the vendor's definition of units of measure.

  Some vendors calculate array LUN size limits differently from ONTAP to determine the minimum and maximum array LUN size limits.

  The *Hardware Universe* lists the values of the supported maximum and minimum array LUN size limits.

- The array LUNs are for another host whose size limits are different from ONTAP limits.

  In an open SAN, ONTAP is exposed to array LUNs intended for other hosts if those array LUNs have not been masked.

  ONTAP generates an error message about size issues for any array LUN exposed to it.

Troubleshooting and problem resolution

1. Review the `storage errors show` output so that you find out which array LUN has a size problem.
   - If the array LUN with the size problem is for ONTAP, the storage array administrator must resize the array LUN to meet ONTAP requirements, and then present it again to ONTAP.
   - If the array LUN with the size problem is for another host, the storage array administrator must mask the array LUN so that it is not exposed to ONTAP.
2. After the problem is fixed, run `storage array config show` again to confirm that the error does not persist.

Related information

[NetApp Hardware Universe](#)

LUN IDs for the same LDEV do not match

A logical device (LDEV) must be mapped to the same LUN ID on all storage array ports over which it must be visible to ONTAP systems. The `storage errors show` output identifies the LDEVs whose LUN IDs do not match.

ONTAP does not allow you to assign array LUNs to an ONTAP system if the LUN IDs do not match.

Storage errors show message

```
HIT-1.4 (4849544143484920443630303035323430303132): This Array LUN is
using multiple LUN IDs.  Only one LUN ID per serial number is supported.
```

Explanation

One of the following errors was made during storage array configuration:

- The LDEV is presented to the same FC initiator port of the ONTAP system from multiple target ports and the LUN IDs are not consistent.
- The LUN IDs of two LDEVs are swapped.

  In this case, an error is reported for each array LUN.

- Different LUN IDs for the same LDEV are used when mapping the LDEV to storage array ports that are presenting the LDEV to the ONTAP system.

  > (i) This error is more likely to occur on storage arrays on which each port is configured separately, for example, on Hitachi storage arrays. On some storage arrays, for example IBM storage arrays, ports are not configured separately.

- The Volume Set Addressing setting is inconsistent on the ports on which the LUN is mapped.

  On an EMC Symmetrix storage array, the problem would be that the Volume Set Addressing setting varies on the channel director ports.

Problem scenario

This scenario discusses the case of inconsistent LUN IDs as it applies to most storage arrays. See Volume Set Addressing is inconsistent section for a discussion of this same error message in the context of misconfigured Volume Set Addressing.

Volume Set Addressing is inconsistent

Assume that the storage array administrator creates a new LDEV Z. The LUN ID for LDEV Z is supposed to be LUN 3. However, the administrator presents LDEV Z as LUN 3 on storage array controller port 1A and as LUN 4 on storage array controller port 2A, as the following illustration shows:
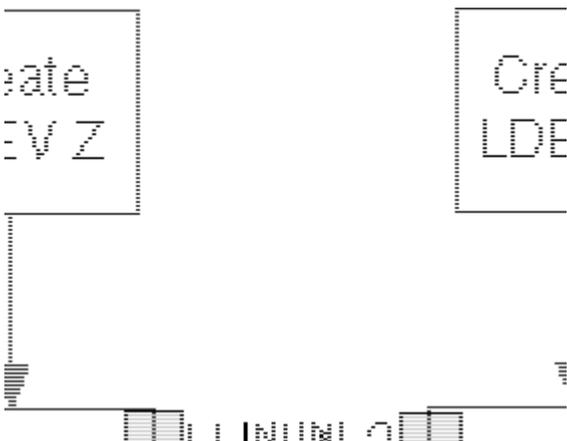
To fix this problem, the same LUN ID must be assigned to an LDEV on all ports to which the LDEV is mapped.

In this example, the LDEV should be presented as LUN ID 3 on both ports.

Troubleshooting and problem resolution

To fix the problem, the storage array administrator must remap the LUN, using the correct LUN ID. You can use ONTAP commands to obtain the details that you need to provide information about the problem to the storage administrator.

1. Review the `storage errors show` output to identify the array LUN whose LUN IDs do not match.

   When the LUN IDs for the same LDEV do not match, the output identifies the serial number of the LDEV with the problem. For example:

   ```
   mysystem1a::> storage errors show
   Disk: HIT-1.4
   UID: 48495441:43484920:44363030:30353234:30303132:00000000:...
   ----------

   HITACHI_DF600F_1
   ----------
   HIT-1.4 (48495441434849204436303030303535323430303132): This Array LUN is
   using multiple LUN IDs.  Only one LUN ID per serial number is supported.
   ```

   > (i) THE UID in this example is
   > 48495441:43484920:44363030:30353234:30303132:00000000:00000000:00000000:00000
   > 000:00000000. It is truncated in the example because of space.

2. Obtain details about which LUN IDs are being used for the same LDEV by entering the following command:
   `storage disk show arrayLUNname`

   The `storage disk show` output for this example shows the following:

```
mysystem1a::> storage disk show -disk HIT-1.4
               Disk: HIT-1.4
      Container Type: unassigned
         Owner/Home: -   / -
            DR Home: -
              Array: HITACHI_DF600F_1
             Vendor: HITACHI
              Model: DF600F
      Serial Number: D600020C000C
                UID:
48495441:43484920:44363030:30353234:30303132:00000000:...
                BPS: 512
      Physical Size: -
           Position: present
Checksum Compatibility: block
          Aggregate: -
               Plex: -
Paths:
                    LUN   Initiator Side  Target Side
Controller Initiator ID   Switch Port     Switch Port       Acc Use
Target Port     TPGN...
---------- --------- -------------------- ----------------- --- ---
-------------- ----
mysystem1a    0c         4  vgci9148s76:1-2  vgci9148s76:1-9  AO  INU
50060e80004291c1   1
mysystem1a    0a         3  vgbr300s89:1     vgbr300s89:9      S   RDY
50060e80004291c0   2
mysystem1b    0c         4  vgci9148s76:1-4  vgci9148s76:1-9  AO  INU
50060e80004291c1   1
mysystem1b    0a         3  vgbr300s89:3     vgbr300s89:10     S   RDY
50060e80004291c2   2

Errors:
HIT-1.4 (4849544143484920443630303035323430303132): This Array LUN is
using multiple LUN IDs.  Only one LUN ID per serial number is supported.
```

(i) THE UID in this example is
48495441:43484920:44363030:30353234:30303132:00000000:00000000:00000000:00000000:
00000000. It is truncated in the example because of space.

By looking at the LUN IDs in the Paths section of the storage disk show output, you can see that LUN IDs 3 and 4 are both being used for this LDEV.

1. Determine which LUN ID is not correct for the LDEV.

   LUN ID 4 is the incorrect LUN ID in this example.

2. In ONTAP, use the `storage path quiesce` command to quiesce the incorrect path for the array LUN.

   The following example shows the options to add to the `storage path quiesce` command for the path that is being quiesced—LUN ID 4 on initiator 0c.

   ```
   storage path quiesce -node mysystem1a -initiator 0c -target-wwpn
   50060e80004291c1 -lun-number 4
   ```

   The `storage path quiesce` command temporarily suspends I/O to a specific array LUN on a specific path. Some storage arrays require ceasing I/O for a period of time when an array LUN is to be removed or moved.

   After the path is quiesced, ONTAP can no longer see that LUN.

3. Wait one minute for the storage array's activity timer to expire.

   Although not all storage arrays require ceasing I/O for a period of time, it is good practice to do so.

4. On the storage array, remap the LUN to the target port by using the correct LUN ID, LUN ID 3 in this scenario.

   The next time the ONTAP discovery process runs, it discovers the new array LUN. Discovery runs every minute.

5. After ONTAP discovery is complete, run `storage array config show` in ONTAP again to confirm that there is no longer an error.

Volume Set Addressing is inconsistent

ONTAP can detect inconsistent LUN IDs across a path set for storage arrays. For storage arrays on which Volume Set Addressing is set, a mismatch of the settings on the ports to which the LUN is mapped is one problem that causes a mismatch of LUN IDs.

On EMC Symmetrix storage arrays, for example, inconsistent setting of the Volume Set Addressing parameter on the channel director ports to which a LUN is mapped triggers a LUN mismatch error.

Storage errors show message

```
EMC-1.128 (484954414348492044363030303035323430303132): This Array LUN is
using multiple LUN IDs.  Only one LUN ID per serial number is supported.
```

Explanation

There are a number of configuration errors that can cause the error message. This explanation is about the display of this message when Volume Set Addressing is set inconsistently.

ONTAP explicitly checks for inconsistent setting of the Volume Set Addressing parameter on ports to which a LUN is mapped. If the settings are different, ONTAP reports this as a LUN ID mismatch in `storage errors show` output and in EMS messages.

> ⓘ ONTAP does not alert you if Volume Set Addressing is not configured as expected; it alerts you only if the configuration is inconsistent across the channel director ports to which the LUN is mapped.

Troubleshooting and problem resolution

If the `storage errors show` command displays the particular error message and your storage array is an EMC Symmetrix, doing one of the following helps you identify whether the problem is due to a Volume Set Addressing inconsistency:

- In ONTAP, run `storage disk show -disk` for the identified array LUN.

  This command shows all the paths to the array LUN and the LUN ID assigned to each path.

- On the storage array, check the Volume Set Addressing settings for the channel director ports to which the identified LUN is mapped.

If you determine that the settings are inconsistent, fix the configuration problem on the storage array, making sure that you are setting the parameter on both channel director ports to the setting required by ONTAP.

Related information

[FlexArray virtualization implementation for third-party storage](#)

Duplicate LUN IDs on a target port

Each array LUN on the same storage array target port must have a unique LUN ID. The `storage errors show` output identifies the LUNs that are presented with the same LUN ID on the same target port.

Storage errors show message

```
NAME (UID), port WWPNx: LUN x occurs more than once.  LUNs cannot be
reused on the same array target port.
```

Explanation

The usual cause of duplicate LUN IDs on a target port is a zoning error. An administrator puts the FC initiators of ONTAP systems into different host groups to create multiple LUN groups on a storage array, but then makes a zoning mistake that allows the initiators in the different host groups to access the same target port.

When this type of zoning error is made, `storage array config show` output shows two LUN groups with the same target ports.

Problem scenario

The administrator wants to map four LDEVs (a, b, c, and d) for ONTAP use, two LDEVs in each of two LUN groups. For this scenario, assume that the storage array presents LDEVs to initiator ports without considering the target port by which the initiator accesses the storage arrays; that is, the host groups are *not* specific to a target port. Zoning must be used to create LUN groups by controlling which target ports are accessed by each initiator.

	For some storage arrays, such as HP EVA, host groups are the same for all target ports. For other storage arrays, such as Hitachi, host groups are specific to a target port.

The administrator correctly sets up two host groups, as follows, so that there are two LUN groups:

Host group	FC initiators in the host group	LDEVs and associated LUN IDs
1	0a 0c	LDEV a/LUN 1LDEV b/LUN 2
2	0b 0d	LDEV c/LUN 1LDEV d/LUN 2

The zoning should be set up as follows:

- The initiators in host group 1, 0a and 0c, should be zoned to the target port pair 1A and 2A.
- The initiators in host group 2, 0b and 0d, should be zoned to the target port pair 1B and 2B.

Notice in the preceding table that LDEV a and LDEV c both have the same LUN ID (L1). Likewise, LDEV b and LDEV d both have the same LUN ID (L2). If the zoning is set up correctly, this duplication of LUN IDs is not a problem because reuse of LUN IDs on different target ports is supported.

The problem in this scenario is that some initiators are placed in the wrong zone when the zoning is configured, as shown in the following table:

Zone	ONTAP system		Storage array	
Switch vnbr200es25				
z1	vs1	Port 0a	Controller 1	Port 1A
z2	vs1	Port 0b	Controller 1	Port 1A (instead of 1B)
Switch vnci9124s53				
z3	vs1	Port 0c	Controller 2	Port 2A
z4	vs1	Port 0d	Controller 2	Port 2A (instead of 2B)

The following illustration shows the result of the zoning error:
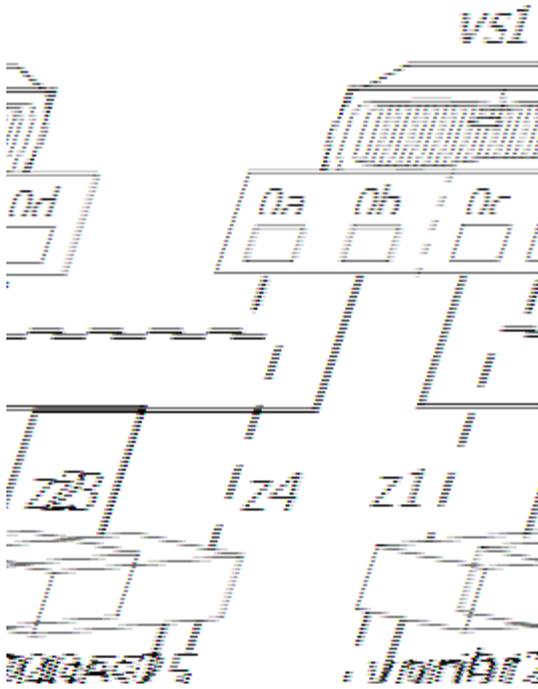
As you can see from the illustration, two LUN groups are created. However, because of the zoning error, LUN group 0 and LUN group 1 are on the same target port pair (1A and 2A), instead of one LUN group being on each target port pair.

The following `storage array config show` output for this example shows two LUN groups. The problem is that the two LUN groups have the same target ports.

```
vs1::> storage array config show

        LUN    LUN
Node  Group  Count  Array Name   Array Target Ports     Switch Port
Initiator
----- -----  ------- ----------- --------------------   ----------
---------

 vs1    0       2   DGC_RAID5_1  20:1A:00:a0:b8:0f:ee:04  vnbr200es25:5
0a
                                 20:2A:00:a0:b8:0f:ee:04  vnci9124s53:6
0c
        1       2   DGC_RAID5_1  20:1A:00:a0:b8:0f:ee:04  vnbr200es25:5
0b
                                 20:2A:00:a0:b8:0f:ee:04  vnci9124s53:6
0d

Warning: Configuration were errors detected.  Use 'storage errors show'
for detailed information.
```

The following `storage errors show` output for this example identifies the LUNs with the problem:

```
vs1::> storage errors show

Disk: EMC-1.1
UID: UID-a
----------
EMC-1.1 (UID-a), port WWPN1: LUN 1 occurs more than once.  LUNs cannot be
reused on the same array target port.


Disk: EMC-1.2
UID: UID-b
----------
EMC-1.2 (UID-b), port WWPN1: LUN 2 occurs more than once.  LUNs cannot be
reused on the same array target port.


Disk: EMC-1.3
UID: UID-c
----------
EMC-1.3 (UID-c), port WWPN2: LUN 1 occurs more than once.  LUNs cannot be
reused on the same array target port.


Disk: EMC-1.4
UID: UID-d
----------
EMC-1.4 (UID-d), port WWPN2: LUN 2 occurs more than once.  LUNs cannot be
reused on the same array target port.
```

From this `storage errors show` example you can see that the UIDs of all four LDEVs are shown, but there are only two unique LUN IDs, LUN 1 and LUN 2. instead of four.

Troubleshooting and problem resolution

The storage array administrator must fix the zoning so that the initiators in different host groups do not have access to the same target port.

1. In `storage array config` output, look for initiators that are talking to the same target port.

2. Enter the following command to view the details of the error: `storage errors show`

3. Determine the LDEV for which the LUN IDs are duplicated.

4. For each target port on controller 1 that has multiple initiators from the same ONTAP system mapped to it, change the zoning so that the two FC initiators are *not* talking to the same target port.

   You are performing this step because initiators in different host groups should not be in the same zone. You need to perform this step on one initiator at a time so that there is always a path to the array LUN.

5. Repeat the procedure on controller 2.

6. Enter `storage errors show` in ONTAP and confirm that the error has been fixed. ``

Fewer than two paths to an array LUN

Common reasons for fewer than two paths to an array LUN are a mapping error, a zoning error, or a cable dropping out. The `storage errors show` output identifies array LUNs with only a single path.

ONTAP requires redundant paths to an array LUN so that access to the LUN is maintained if a device fails. Two paths must exist to each array LUN.

Storage errors show message

```
NAME (UID):   This Array LUN is only available on one path.   Proper
configuration requires two paths.
```

Explanation

Reasons you see fewer than two paths to an array LUN include the following:

- The LDEV is mapped on only one storage array port.
- The second path to the array LUN is not zoned.
- There is a problem with the host group mapping.
- There is a problem with switch connections.
- The cable dropped out.
- SFPs failed on the adapter.

> ℹ️ If a path drops out on a running system, an EMS message is generated.

Problem scenario

For this example of a mapping error, assume that the storage administrator created a new LDEV Z. The administrator mapped LDEV Z as LUN ID 3 to target port 1A. However, the administrator did not map the LDEV to target port 2A, as the following illustration shows. The result is only one path to the array LUN.
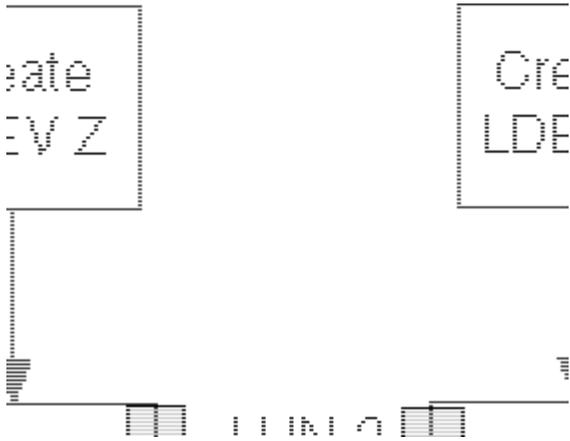
When this error is made, the `storage array config show` output shows only one path to the LUN, as the following example shows.

```
mysystem1::> storage array config show
            LUN      LUN
Node        Group    Count   Array Name    Array Target Ports     Switch
Port    Initiator
-------     -------  -----   ----------    -------------------
----------      ---------
mysystem1a     0        1      DGC_RAID5_1   20:1A:00:a0:b8:0f:ee:04
vnbr20es25:5    0a


Warning: Configuration errors were detected.  Use 'storage errors show'
for detailed information.
```

The `storage errors show` command provides the details you need to determine which LUN has fewer than two paths.

```
mysystem1a::> storage errors show
Disk: EMC-1.2
UID: 600508B4:000B6314:00008000:00200000:00000000:00000000:00000000:...
--------------------
EMC-1.2 (600508b4000b6314000800000200000): This array LUN is only
available on one path. Proper configuration requires two paths.
```

> (i) The UID for this example is
> 600508B4:000B6314:00008000:00200000:00000000:00000000:00000000:00000000:00000000
> :00000000. It is truncated because of space.

Troubleshooting and problem resolution

Looking at both the `storage array config show` output and the storage errors show output is helpful when troubleshooting fewer than two paths to an array LUN.

1. Review the `storage errors show` output to obtain the serial number of the array LUN that is available on only one path.

2. Review the `storage array config show` output to try to isolate the cause of the problem.

If the `storage array config show` output shows…	The cause is most likely…
Other array LUNs	A mapping error
No other array LUNs	A cabling error, zoning error, or hardware issue

3. If the cause is a mapping error, have the storage array administrator map the identified array LUN to two redundant storage array ports.

4. If the cause seems to be a problem other than mapping, check zoning, host group mapping, cabling, and connectivity.

5. After you fix the problem, run `storage array config show` again to confirm that the error is fixed.

An access control LUN is presented to ONTAP

ONTAP does not support access control array LUNs. The `storage errors show` output alerts you if an access control LUN is being presented.

Storage errors show message

```
NAME (UID): This array LUN is an access control LUN. It is not supported
and should be masked off or disabled.
```

Explanation

ONTAP supports only storage array LUNs. When an array LUN, for example, an E-Series access control LUN is presented to ONTAP, the `storage array config show` output looks normal; it shows the access control LUN in a LUN group, as the following example shows. The warning message at the bottom of the screen indicates the problem. You need to run `storage errors show` to find out that the problem is that an access control LUN was presented and which LUN it is.

```
mysystem1::> storage array config show

          LUN     LUN
Node      Group   Count  Array Name    Array Target Port      Initiator
------    ------  -----  ------------  ------------------     --------
mysystem1   0       1    NETAPP_INF_1  20:1A:00:a0:b8:0f:ee:04   0a
                                       20:2A:00:a0:b8:0f:ee:04   0c


Warning: Configuration errors were detected.  Use 'storage errors show'
for detailed information.
```

Troubleshooting and problem resolution

1. On the storage array, mask off the access control LUN.

2. In ONTAP, run `storage errors show` again to confirm that the access control LUN is no longer being presented to ONTAP.

All paths to an array LUN are on the same storage array controller

ONTAP does not support configuring all paths to the same storage array controller because doing so sets up a configuration with a single point of failure (SPOF). The `storage errors show` command identifies any array LUN whose paths are set up to go to the same storage array controller.

ONTAP does not allow you to assign array LUNs to an ONTAP system until after you fix this error.

Storage errors show message

```
NAME (UID): All paths to this array LUN are connected to the same fault
domain. This is a single point of failure
```

Explanation

This error occurs because the paths to an array LUN are set up to go to the same storage array controller or FRU.

> (i) Using four paths to an array LUN, a storage array with FRUs with multiple directors (such as an EMC Symmetrix or HDS USP), or a storage array with dual controllers (such as an EMC CX, or HP EVA) are good methods for achieving redundancy. However, if you set up the paths to go through a single storage array controller or FRU, you are setting up your configuration with a SPOF, even with such features. On an active-active storage array, the entire FRU is considered to be one fault domain. An EMC Symmetrix storage array, for example, has multiple channel directors on the same FEBE board. A FEBE board is considered to be one fault domain because if all paths go through the same FEBE board, you lose all paths if you must replace the board.

The following illustration shows correct and incorrect storage array port selection for setting up redundant paths to an array LUN so that you do not have a single fault domain. The path setup in the example on the left is correct because the paths to the array LUN are redundant—each connection is to a port on a different controller on the storage array. In the example on the right, both paths to the array LUN go to the same controller, which sets up a SPOF.
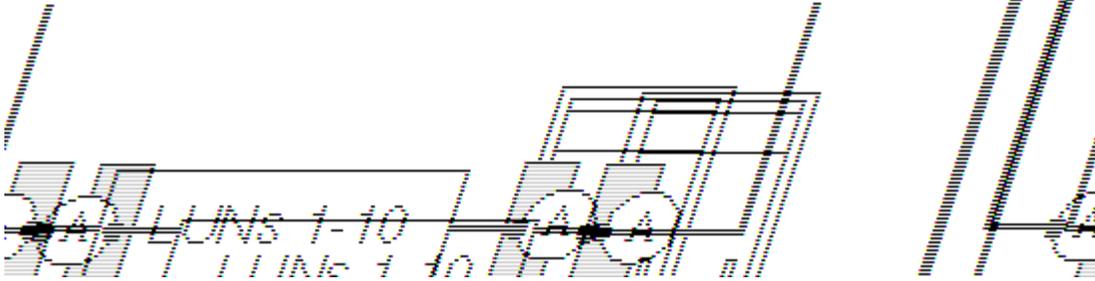
The `storage errors show` command shows the array LUN that is in the same fault domain. You can also see this problem in the `storage disk show` output if you look at the TPGN column (Target port group number). A different TPGN should be shown for each initiator in an initiator port pair. If the TPGN is the same for both initiators in the pair, both initiators are in the same fault domain.

The following `storage disk show` example shows TPGN 1 for LUN 30, which is accessed over initiators 0a and 0c. If the paths are redundant, each initiator shows a different TPGN.

```
mysystem1::> storage disk show mysystem1:vgbr300s70:9.126L30
                   Disk: HP-1.15
          Container Type: unassigned
              Owner/Home: -   / -
                DR Home: -
                  Array: HP_HSV450_1
                 Vendor: HP
                  Model: HSV450
          Serial Number: 600508B4000B63140000800001660000
                    UID: 600508B4:000B6314:00008000:01660000:00000000:...
                    BPS: 512
          Physical Size: -
               Position: present
Checksum Compatibility: block
              Aggregate: -
                  Plex: -
Paths:
                    LUN Initiator Side     Target Side
Controller Initiator ID  Switch Port        Switch Port      Acc Use  Target
Port       TPGN...
---------- --------- --- --------------- --------------- --- ---
--------------- -----
mysystem1    0c       30  vgci9148s75:1-12 vgci9148s75:1-9 AO  RDY
50014380025d1509   1
mysystem1    0a       30  vgbr300s70:12    vgbr300s70:9     AO  INU
50014380025d1508   1

Errors:
HP-1.15 (600508b4000b63140000800001660000): All paths to this array LUN
are connected to the same fault domain. This is a single point of failure.
```

ⓘ The full UID in this example is
600508B4:000B6314:00008000:01660000:00000000:00000000:00000000:00000000:00000000
:00000000. It is truncated in the example because of space.

Troubleshooting and problem resolution

The paths to the array LUN must be reconfigured so that they go to redundant storage array controllers or
FRUs.

1. Add a cable to the redundant target port on the other controller.

   You should maintain redundancy while fixing this problem by adding a cable to the alternate controller
   before you remove a cable from the controller with the SPOF. Redundancy is maintained in this case
   because you are increasing the number of paths to three paths temporarily instead of decreasing the
   number of paths to one while you are fixing the problem.

2. Remove one cable from the controller that was set up with the SPOF.

   You now have two redundant paths to the array LUN.

3. From the ONTAP command line, enter the following command again and confirm that the error has been fixed: `storage errors show`

Array LUNs are configured with conflicting failover modes

ONTAP requires that array LUNs that are visible to a particular ONTAP system be configured with the same failover mode. On some storage arrays, it is possible to configure inconsistent failover modes on different paths to an array LUN.

Storage errors show message

```
NAME(UID): This array LUN is configured with conflicting failover modes.
Each path to this LUN must use the same mode.
```

Explanation

On some storage arrays, for example EMC CLARiiON storage arrays, the failover mode can be set by FC initiator port. On such storage arrays, it is possible to set inconsistent failover modes for array LUNs visible to the FC initiators on the same ONTAP system. ONTAP does not support inconsistent failover modes for paths to an array LUN from a particular ONTAP system.

If your storage array allows setting the failover mode for an array LUN by FC initiator, part of your installation validation process should include checking to ensure that there are no problems with the failover mode settings for the array LUNs visible to the ONTAP system. The `storage errors show` command alerts you about inconsistent failover mode settings for array LUNs and generates an EMS message.

Although your system can operate with inconsistent array LUN failover mode settings, you need to fix this problem as soon as possible. Otherwise, if a path fails, the ONTAP system might not operate properly, failover might not occur, or the system might panic.

> ⓘ ONTAP supports different failover mode settings between nodes running ONTAP. For example, node A can use Active/Passive mode for the paths to an array LUN and node B can use ALUA for the paths to the same array LUN.

Troubleshooting and problem resolution

The failover mode of the first path that ONTAP discovers during LUN initialization is the failover mode that ONTAP expects for all paths to the LUN from a particular ONTAP system. If the failover mode of subsequent discovered paths does not match the failover mode of the first path, ONTAP issues an error message.

In the following `storage errors show` example, ONTAP tells you that the failover mode for the LUN EMC-1.128, which is visible over mysystem1 FC initiator 0a, is *Proprietary*, and that the failover mode is different from the failover mode that ONTAP discovered on the first path for that array LUN.

```
mysystem1::> storage errors show
EMC-1.128 (60060160e1b0220008071baf6046e211): hba 0a port 500601603ce014de
mode Proprietary: This array LUN is configured with conflicting failover
modes. Each path to this LUN must use the same mode.

Disk: EMC-1.128
UID: 60060160:E1B02200:1C65EB20:BFF7E111:00000000:00000000:00000000:...
```

You need to fix the failover mismatch problem on the storage array. However, the entire procedure for fixing the mismatch depends on whether the failover mode that ONTAP detected on the first path is the failover mode that you want to be used for all paths on that ONTAP system to the array LUN.

1. Enter `storage errors show` if you have not done so already as part of your installation verification process.

   > (i) The `storage array config` command tells you to run `storage error show` if there is a problem that you need to fix.

2. Review the `storage errors show` output to determine the failover mode setting for the array LUN that is not consistent with the failover mode that ONTAP is expecting.

If the failover mode that the system detected on the first path is…	Example	You need to…
What you want	You want a failover mode of ALUA and ALUA is the failover mode that ONTAP detected for the first path.	Change, on the storage array, the failover mode for the initiator that ONTAP identified in the error message. Go to Step 3.
Not what you want	You want a failover mode of Active/Passive but ALUA is the failover mode that ONTAP detected for the first path.	Remove the array LUN from the view of the ONTAP system. Go to Step 4.

3. If you need to change the failover mode for the initiator, proceed as follows to fix the mismatch.

   You would use this step if the failover mode that the system detected on the first path *is* what you want.

   a. In ONTAP, take the second path offline.

   b. On the storage array, change the failover mode for the initiator that ONTAP identified in the error message.

   c. In ONTAP, bring the second path back online.

4. If you need to remove the array LUN from the view of the ONTAP system to fix the mismatch, select one of the following methods, depending on whether the array LUNs are spares or in an aggregate.

   You would use one of these methods if the failover mode that the system detected on the first path *is not* what you want.

Method 1: Affected array LUNs are spares (not part of an aggregate)	Method 2: Affected LUNs are in an aggregate
With this method, the ONTAP system does not have to be rebooted. a. In ONTAP, run the following command for each affected spare LUN: `disk remove_ownership LUNfullname` b. On the storage array, mask each affected array LUN on all paths to the ONTAP system. c. Wait for about a minute, then confirm that the array LUNs are no longer visible to the ONTAP system. d. Set the same failover mode for each of the FC initiators on the ONTAP system. e. Present all the affected array LUNs to the ONTAP system again. ONTAP should discover the LUNs when it next runs LUN discovery f. Run `storage errors show` to confirm that there is no longer a failover mode error.	With this method, the ONTAP system must be rebooted. a. Reboot the ONTAP system and hold it at the LOADER prompt. b. On the storage array, review the failover mode settings on the FC initiators for this system and update them as necessary to the failover mode you want. c. Reboot the ONTAP system. d. Run `storage errors show` to confirm that there is no longer a failover mode error.

Array LUN is marked foreign and has a reservation

You can import data hosted on array LUNs in their native format to ONTAP. The process of importing the contents of such an array LUN that is marked **foreign** might be impacted if the array LUN has external host reservations during import.

Storage errors show message

```
EMC-1.3 (600000e00d1000000010000e00030000): This array LUN is marked
foreign and has a reservation.
```

Explanation

This error condition occurs when the reservations created by external host applications on the LUN are not cleared before the ONTAP administrator initiates the import process. The import operation fails and the message is displayed as the output of the `storage errors show` command.

The reservations must be cleared for the import operation to succeed.

Troubleshooting and problem resolution

To fix the problem, the storage array administrator must remove the persistent reservation from the array LUN.

You can remove the persistent reservation either from the external host that accesses the array LUN data in its native format or by using ONTAP commands. You can use the following ONTAP commands to remove the reservation:

1. Review the `storage errors show` output to identify the array LUN with reservations, as shown in the following example:

```
system1a::> storage errors show
EMC_SYMMETRIX_1
---------------------------------------
EMC-1.3 (600000e00d1000000010000e00030000): This array LUN is marked
foreign and has a reservation.
```

2. Run the `set -privilege advanced` command to switch to the *advanced* mode, because you cannot import the array LUN contents in the *admin* mode.

3. Use the `storage disk -remove-reservation` command to remove the persistent reservation from the identified array LUN.

```
system1a::>* storage disk remove-reservation -disk EMC-1.3
```

4. Use the `lun import start` command to initiate the import process of the array LUN contents to ONTAP.

Verifying that the back-end configuration matches the intended configuration

After resolving the back-end configuration errors detected by `storage errors show`, you must check whether the existing back-end configuration matches the configuration you intended, and fix issues arising out of any mismatch.

Steps

1. Enter the following command: `storage array config show`

   The `storage array config show` output groups information about LUN groups, LUN counts, and paths by storage array, as the following example for an HA pair shows:

```
mysystem1::> storage array config show
            LUN   LUN
Node        Group Count Array Name       Array Target Port      Initiator
----------- ----- ----- ---------------  --------------------   ---------
mysystem1a   0    10    DGC_RAID5_1        5005076303030124        1a
                                          5005076303088124        1b
                                          5005076303130124        1c
                                          5005076303188124        1d
mysystem1b   0    10    DGC_RAID5_1        5005076303030124        1a
                                          5005076303088124        1b
                                          5005076303130124        1c
                                          5005076303188124        1d
8 entries were displayed.
```

2. Check the `storage array config show` output for each problem statement in the following table, and refer to the appropriate information for solution.

If you find this problem…	See this information…
Empty LUN groups	Reasons for no LUNs in the array LUN group
Missing expected storage arrays	Reasons you might not see all storage arrays you expected
More array LUN groups than expected	Reasons for more array LUN groups than expected
Fewer array LUN groups than expected	Reasons for fewer array LUN groups than expected
Array LUN groups do not show the number of LUNs expected	Reasons for the incorrect number of LUNs in array LUN groups
Fewer paths than expected	Fewer than two paths to an array LUN
More paths than expected	Reasons for more paths to an array LUN than expected

Reasons for no LUNs in the array LUN group

When validating the back-end configuration, you should check the `storage array config show` output to determine whether LUNs are shown in the LUN groups. When the `storage array config show` output shows no LUNs in an array LUN group, ONTAP can see the target port on the fabric but the target port is not presenting array LUNs to ONTAP.

There are a variety of reasons why a target port might not present array LUNs to ONTAP (an *open target port*).

The reasons for an open target port can differ between different storage arrays. In addition, the ways to handle the open target port issues differ with storage arrays. For all storage arrays, troubleshooting the cause of an open target port should include checking the storage array configuration, including the host group configuration.

For example, the cause could be an *empty host group*, which presents itself to ONTAP as an open target port. With an empty host group, the host group defines the FC initiator and target ports, but it does not list any array LUNs (that is, the host group is empty).

> (i) The operation of the ONTAP systems is not impacted by an empty host group.

The following illustration represents an open port target port situation and an empty host group situation. (A stand-alone ONTAP system is used in the illustration for simplicity.)

The open target port is caused by missing LUN IDs in the host group definition for storage controller 1A. In the host group definition for storage controller 1A, the FC initiator 0b is zoned into the target port and there is a host group defined for FC initiator port 0b, but there are no LUN IDs in the host group. As the illustration shows, the host group definition for storage controller 2A includes both initiators and LUNs.

The empty host group is caused by array LUNs not getting listed in the host group definition for storage controllers 1B and 2B. The FC initiators 0a and 0d are zoned into the target ports but no LUNs are shown.
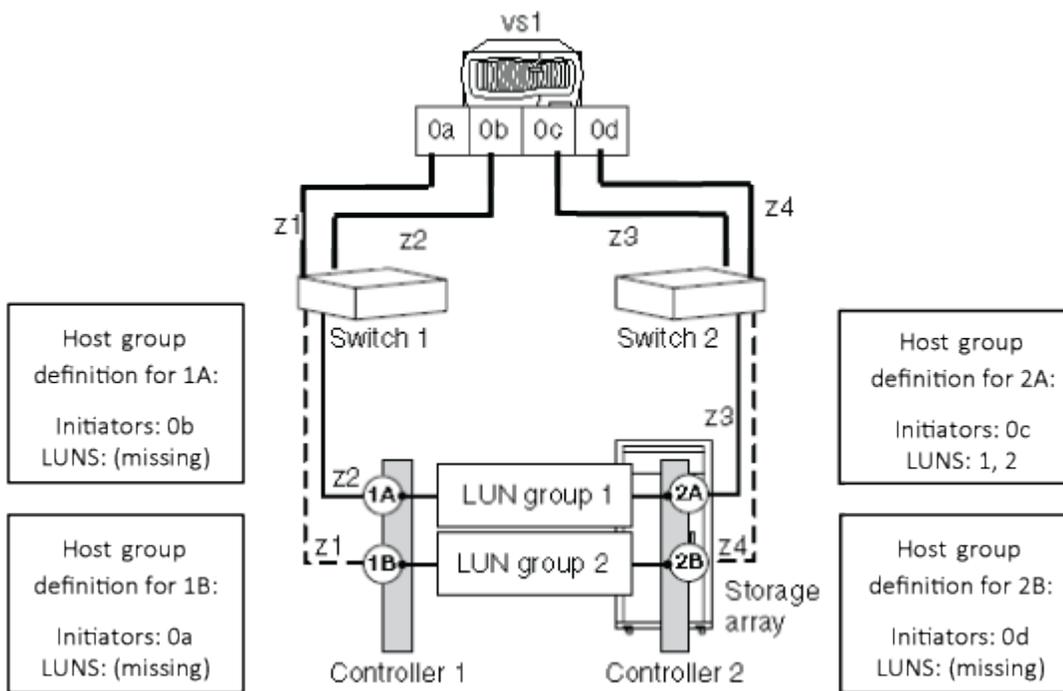
The following example shows the `storage array config show` output for the illustrated situations where the ONTAP system is zoned to the storage array but there are no LUNs in the host group definitions for the storage controller 1A, resulting in an open target port. The controllers 1B and 2B do not have LUNs in their respective host group definitions, resulting in an empty host group.

In the output for the illustrated situations, the FC initiators 0a, 0b, and 0d show no LUNs in the LUN count field. For the FC initiator 0c, two LUNs are shown in LUN group1.

```
cluster-1::> storage array config show
          LUN   LUN
Node      Group Count  Array Name      Array Target Port   Initiator
--------- ----- -----  ------------    -------------------- ---------
vs1
          0     2      EMC_SYMMETRIX_1 50060480000001b0        0c

          1     0      EMC_SYMMETRIX_1 50060480000001a0        0b

          2     0      EMC_SYMMETRIX_1 50060480000001b1        0a

          0      EMC_SYMMETRIX_1 50060480000001a1        0d

4 entries were displayed.
```

(i) From the output you can determine that the problem is not due to missing FC initiators in the host group. If the FC initiators were missing from the host group, ONTAP would not be able to see the LUN groups having no LUNs.

Reasons for fewer array LUN groups than expected

When validating the back-end configuration, you need to check the `storage array config show` output to determine whether the number of array LUN groups in the output is what you intended.

Explanation

The most likely cause for fewer LUN groups than expected is that the LDEV-to-LUN mapping is the same for both FC initiator port pairs on the ONTAP system. If the LDEV-to-LUN mapping is the same for both FC initiator port pairs, the `storage array config show` output shows one less LUN group than expected.

The following `storage array config show` output shows only one array LUN group due to both FC initiator port pairs being mapped to the same target port pair:

```
mysystem1::> storage array config show

          LUN    LUN
Node      Group Count Array Name  Array Target Ports       Switch Port
Initiator
------    ----- ----- ---------- ------------------       -----------
---------

mysystem1  0      2    DGC_RAID5_1  20:1A:00:a0:b8:0f:ee:04  vnbr200es25:5
0a
                                    20:2A:00:a0:b8:0f:ee:04  vnci9124s53:6
0c
                                    20:1A:00:a0:b8:0f:ee:04  vnbr200es25:5
0b
                                    20:2A:00:a0:b8:0f:ee:04  vnci9124s53:6
0d
```

By looking at the Array Target Ports column, you can see the same target port more than once within the LUN group, and each occurrence has a different initiator.

- Initiators 0a and 0b both have access to storage array port 1A.
- Initiators 0c and 0d both have access to storage array port 2A.

Resolving the issue

ONTAP does not flag this as an error because an ONTAP system can operate when the LDEV-to-LUN mapping is the same for both FC initiator port pairs. However, multiple FC initiators to the same target port is not supported. You should fix the mapping so that your ONTAP system follows a supported configuration, and so that you have the number of LUN groups that you intended.

If you want to fix this issue, do the following:

1. On the storage array, fix the mapping so that the FC initiator port pair mapping is no longer the same for both FC initiator port pairs on the ONTAP system.

2. On the ONTAP system, run `storage array config show` again and confirm that the number of LUN groups that you expected are shown and that FC initiator port pairs are not accessing the same target ports.

Reasons for more array LUN groups than expected

When validating your configuration, you should check the `storage array config show` output to ensure that the number of LUN groups is what you intended. The most common reason for extra array LUN groups is that the LDEV is spanning target port pairs.

Explanation

Common reasons why you would see more LUN groups than expected are as follows:

- An LDEV is not mapped to a redundant target port pair.

  The most common cause of an extra LUN group is that the LDEV is spanning path pairs. An LDEV is said to be *spanning path pairs* if matching LUN IDs for the LDEV are not presented to a redundant target port pair on the storage array.

  > ⓘ On many storage arrays, it is not possible to present an LDEV to target ports that are not redundant if you follow the conventional process for creating and mapping LDEVs.

- ONTAP is trying to balance the load over the target ports during migration of array LUNs from one LUN group to another.

  In this case, the LDEV spanning path pairs is a transitional state.

- Too many connections are set up.

ONTAP can run with a single array LUN group or multiple array LUN groups. Therefore, ONTAP does not consider any number of LUN groups to be a misconfiguration. However, multiple LUN groups are not supported for all storage arrays in all ONTAP releases. During configuration planning, you should check the information in the Interoperability Matrix to verify whether multiple array LUN groups are supported for the storage arrays used in your ONTAP configuration.

Problem scenario

Assume that there are two existing LUN groups, LUN group 0 and LUN group 1. LUN group 0 has two array LUNs and LUN group 1 has three array LUNs. The administrator created a new LDEV Z, intending to add LUN 3 to LUN group 0. The administrator mapped LDEV Z as LUN 3 on two storage array ports. However, the ports to which LUN 3 are mapped, storage array ports 1A and 2B, are not a redundant target port pair, as the following illustration shows.
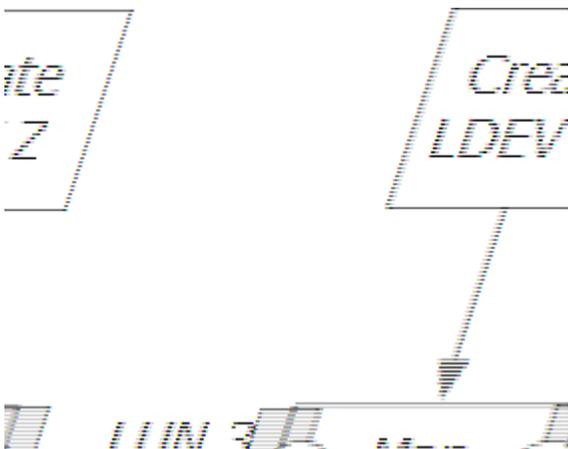
The result of this error is that a third, unintended LUN group is created (Group 2), as the following example shows:

```
mysystem1::> storage array config show

          LUN   LUN
Node      Group Count  Array Name   Array Target Ports        Switch Port
Initiator
-------   ----- ------ -----------  -------------------       -----------
---------

mysystem1  0     3     DGC_RAID5_1  20:1A:00:a0:b8:0f:ee:04   vnbr20es25:5
0a
                                    20:2A:00:a0:b8:0f:ee:04   vnci9124s53:6
0c
           1     3     DGC_RAID5_1  20:1B:00:a0:b8:0f:ee:04   vnbr20es25:7
0b
                                    20:2B:00:a0:b8:0f:ee:04   vnci9124s53:8
0d
           2     1     DGC_RAID5_1  20:1A:00:a0:b8:0f:ee:04   vnbr20es25:5
0a
                                    20:2B:00:a0:b8:0f:ee:04   vnci9124s53:8
0d
```

You can infer from the information in the Array Target Ports column for Groups 0 and 1 that the paths to the array target ports are redundant. Group 0 goes to target ports 1A and 2A, a target port pair. Group 1 goes to 1B and 2B, a different target port pair.

However, the information in the Array Target Ports column for Group 2 suggests that the paths are not redundant. One path goes to target port 1A and the other goes to target port 2B. This is not a redundant target port pair; the array LUN is spanning LUN groups. The array LUN should have been mapped to either 1A and 2A or 1B and 2B.

Because the ONTAP system can run with an LDEV spanning path pairs, the message instructing you to run `storage errors show` does not appear after you run the `storage array config show` command. However, this is not a best practice configuration.

Resolving the issue

1. Wait for one minute, then run `storage array config show` again to see whether the extra LUN group is still shown in the `storage array config show` output.

   ◦ If the extra LUN group is no longer in the output, you can conclude that the issue was transitional.

   ◦ If the extra LUN group still appears in the output, the storage array administrator must remap the LDEV, as documented in the next steps.

   You need to maintain redundancy while fixing this problem. This procedure instructs you to map the LDEV to the correct target port *before* removing the mapping to the incorrect target port. Redundancy is maintained in this case because you are increasing the number of paths to three, temporarily, instead of decreasing the number of paths to one while you are fixing the problem.

2. Decide which of the inconsistent target ports should be remapped.

3. On the storage array, map the LDEV to the new (correct) target port.

4. In ONTAP, run `storage array config show` to confirm that three paths are shown.

5. Remove the incorrect mapping.

6. Wait for one minute while ONTAP discovers the LUN.

7. In ONTAP, run `storage array config show` again to make sure that the extra LUN group is gone.

Related information

NetApp Interoperability Matrix Tool

Reasons for more paths to an array LUN than expected

The primary reasons for an unexpected additional path to an array LUN are zoning issues and too many cables. Three paths to an array LUN is not best practice, but you are not required to fix this issue.

Example of storage array config show output

The FC initiator port pair on the ONTAP system is 0a and 0c. The following example shows an extra path, 0b, in the `storage array config show` output:

```
mysystem1::> storage array config show
            LUN   LUN
Node        Group Count   Array Name        Array Target Port   Initiator
----------  ----- -----   ----------------  ------------------- ----------
mysystem1a    1     3     HITACHI_DF600F_1  50060e80004291c0    0a
                                            50060e80004291c1    0b
                                                                0c

3 entries were displayed.
```

> (i) If an initiator in the `storage array config show` output is not preceded by an array target port, the initiator is connecting to the same array target port as the initiator above it.

Explanation

Three paths within a LUN group indicates that there is an extra path. For ONTAP configurations, the best practice is two or four paths.

Reasons there could be more paths than expected include the following:

- More cables were connected than are needed.
- A zoning configuration error caused an extra path.

Resolving the issue

Having an extra path is not a best practice, but it is not incorrect from the system perspective. You do not have

to fix this issue. If you want to fix the issue to align with your intended configuration, complete the following steps:

1. Check your cabling and the zoning configuration for the cause, and then fix the issue that is causing the extra path.

2. After the issue is fixed, run `storage array config show` again to confirm that the extra path is gone.

Reasons for the incorrect number of LUNs in array LUN groups

When validating your configuration, you should check the `storage array config show` output to ensure that the number of LUNs in each LUN group is what you intended. The most likely cause for the incorrect number of LUNs in a LUN group is that the array LUN is not mapped to an ONTAP system.

Example of storage array config show output

The number of array LUNs in each LUN group appears in the `storage array config show` output, as the following example shows:

```
mysystem1::> storage array config show

                LUN      LUN
Node            Group    Count Array Name      Array Target Port     Initiator
------          ------   ----- --------------  --------------------  ----------
mysystem1         0        50   DGC_RAID5_1      201A00a0b80fee04        0a
                                                 202A00a0b80fee04        0c
```

Explanation

The most likely reasons that an array LUN you expected to be in a LUN group is missing are as follows:

• The array LUN is not mapped to the ONTAP system.

• A mapping error is made that resulted in the array LUN being in the wrong LUN group.

  For example, the host group configuration might be incorrect.

• The storage array is still in the process of initializing and making the array LUNs available (transitional state).

• The ONTAP LUN scanner has not yet discovered the LUNs (transitional state).

Resolving the issue

1. If the array LUN has not been mapped to the ONTAP system, the storage array administrator has to map it.

   The process for mapping array LUNs to hosts varies among storage arrays.

2. If the array LUN has been mapped to the ONTAP system, check zoning and the host group configuration.

3. After the issue is fixed, run `storage array config show` again to confirm that the issue is fixed.

Reasons storage arrays are missing from command output

A storage array that is not connected to the ONTAP system does not appear in the `storage array config show` output. Problems with cabling, zoning, and host group configuration can prevent a connection between the two devices.

Resolving the issue

1. Check cabling, host group configuration, and zoning as follows:
   - Check that cables are connected.
   - Check that the WWPNs for the FC initiators on the ONTAP systems are in the host group.
   - Check that both the storage array and the FC initiator are in the same zone.

2. After the problem is fixed, run `storage array config show` in ONTAP to confirm that the issue was fixed.