FLI offline migration

ONTAP FLI

NetApp
January 07, 2026

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ONTAP FLI offline migration workflow summary

A Foreign LUN Import (FLI) data migration is a process that involves several key steps to ensure a successful migration of data from third-party storage arrays to NetApp storage systems. FLI supports offline and online migrations. In an FLI offline migration, the client system is taken offline during data migration from the third party foreign storage array to the NetApp storage system.

Before you begin

- You should complete the discovery, analysis, and planning phases of the migration process.
- You should configure your FC adapters for initiator mode.
- You should zone your foreign array target ports with the ONTAP storage initiator ports.

The FLI offline workflow includes preparing the hosts and foreign LUNs for import, creating the LUN import relationship, and importing the data.

Prepare your host.

Before you perform an FLI offline migration, you should reboot your hosts and verify your host multipathing configuration.

Prepare your foreign LUNs.

In the FLI offline migration process, you must take manual steps from your foreign array to present the foreign source LUN to the ONTAP storage system; then you must take additional manual steps to discover the foreign source LUN on the ONTAP storage system.

Create the LUN import relationship.

Creating the LUN import relationship for FLI offline migrations includes identifying the source array LUNs as foreign in ONTAP, creating and configuring the destination volume to contain the foreign LUNs, creating destination target LUNs, and finally establishing the import relationship.

Import LUN data from the foreign array.

Use FLI to import LUN data from the foreign array.

Verify the migration results.

Perform a block-by-block comparison of the source and destination LUNs to verify that the migration is complete and accurate.

Remove the LUN import relationship.

After the FLI offline migration is completed, the LUN import relationship can be safely removed.

7 **Perform post-migration tasks.**

Review logs for errors, verify your host multipathing configuration, and perform application testing to verify that your migration completed successfully.

Prepare hosts for ONTAP FLI offline migration

Before you begin a Foreign LUN Import (FLI) offline migration, you should perform any steps identified in the analysis phase as necessary for host remediation such as installing host attach kits or DSMs. You should also reboot your hosts and verify that host multipathing is configured correctly.

Steps

1. Perform any necessary host remediation steps identified in the analysis phase.
2. Shut down all your open applications.
3. Reboot the host.
4. Review the logs for errors.
5. Verify your host multipathing configuration.
   - For Windows hosts: See Using Windows Server 2022 with ONTAP for steps to verify your multipath configuration.
   - For Linux hosts: Run the `multipath-ll` command and review the output. All paths should display as active and ready.

     Sample output of multipath-ll command

     ```
     mpath2 (360060e801046b96004f2bf4600000012) dm-6 HITACHI,DF600F

     \_ round-robin 0 [prio=1][active] \_ 0:0:1:2 sdg 8:96 [active][ready] \_ 1:0:1:2 sdo 8:224
     [active][ready] \_ round-robin 0 [prio=0][enabled] \_ 0:0:0:2 sdc 8:32 [active][ready] \_ 1:0:0:2 sdk
     8:160 [active][ready] mpath1 (360060e801046b96004f2bf4600000011) dm-5 HITACHI,DF600F

     \_ round-robin 0 [prio=1][active] \_ 0:0:0:1 sdb 8:16 [active][ready] \_ 1:0:0:1 sdj 8:144
     [active][ready] \_ round-robin 0 [prio=0][enabled] \_ 0:0:1:1 sdf 8:80 [active][ready] \_ 1:0:1:1 sdn
     8:208 [active][ready] mpath0 (360060e801046b96004f2bf4600000010) dm-0 HITACHI,DF600F

     \_ round-robin 0 [prio=1][active] \_ 0:0:1:0 sde 8:64 [active][ready] \_ 1:0:1:0 sdm 8:192
     [active][ready] \_ round-robin 0 [prio=0][enabled] \_ 0:0:0:0 sda 8:0 [active][ready] \_ 1:0:0:0 sdi
     8:128 [active][ready] mpath3 (360060e801046b96004f2bf4600000013) dm-7 HITACHI,DF600F

     \_ round-robin 0 [prio=1][active] \_ 0:0:0:3 sdd 8:48 [active][ready] \_ 1:0:0:3 sdl 8:176
     [active][ready] \_ round-robin 0 [prio=0][enabled] \_ 0:0:1:3 sdh 8:112 [active][ready] \_ 1:0:1:3 sdp
     8:240 [active][ready] [root@dm-rx200s6-22 ~]#
     ```

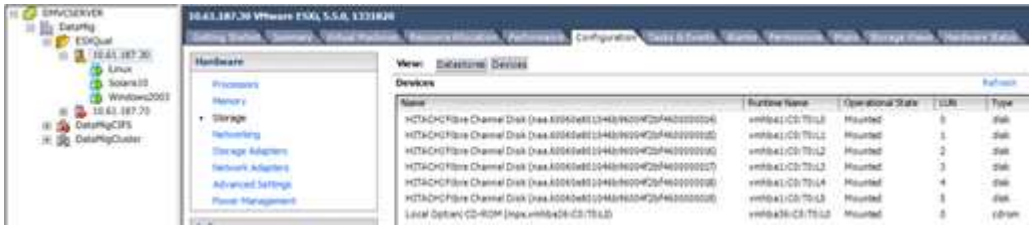
Multipath verification for ESXi hosts

As part of the Foreign LUN Import (FLI) process, you should verify that multipath is configured and functioning correctly on your ESXi hosts.

Steps

1. Determine ESXi and virtual machine using VMware vSphere Client.

2. Determine SAN LUNs to be migrated using vSphere Client.



3. Determine VMFS and RDM (vfat) volumes to be migrated: `esxcli storage filesystem list`

```
Mount Point                                          Volume Name
UUID                                 Mounted  Type           Size
Free
-----------------------------------------------  ----------------
---------------------------------  -------  ------  -----------
-----------
/vmfs/volumes/538400f6-3486df59-52e5-00262d04d700  BootLun_datastore
538400f6-3486df59-52e5-00262d04d700     true  VMFS-5  13421772800
12486443008
/vmfs/volumes/53843dea-5449e4f7-88e0-00262d04d700  VM_datastore
53843dea-5449e4f7-88e0-00262d04d700     true  VMFS-5  42681237504
6208618496
/vmfs/volumes/538400f6-781de9f7-c321-00262d04d700
538400f6-781de9f7-c321-00262d04d700     true  vfat     4293591040
4269670400
/vmfs/volumes/c49aad7f-afbab687-b54e-065116d72e55
c49aad7f-afbab687-b54e-065116d72e55     true  vfat      261853184
77844480
/vmfs/volumes/270b9371-8fbedc2b-1f3b-47293e2ce0da
270b9371-8fbedc2b-1f3b-47293e2ce0da     true  vfat      261853184
261844992
/vmfs/volumes/538400ef-647023fa-edef-00262d04d700
538400ef-647023fa-edef-00262d04d700     true  vfat      299712512
99147776
~ #
```

In case of VMFS with extends \(spanned VMFS\), all LUNs that are part of the span should be migrated. To show all the extends in the GUI, go to Configuration \> Hardware \> Storage and click datastore to select the Properties link.

Post-migration, while adding them back to storage, you will see multiple LUN entries with the same VMFS label. In this scenario you should ask the customer to select only the entry marked as head.

4. Determine the LUN and size to be migrated: `esxcfg-scsidevs -c`

```
Device UID                            Device Type      Console Device
Size      Multipath PluginDisplay Name
mpx.vmhba36:C0:T0:L0                  CD-ROM
/vmfs/devices/cdrom/mpx.vmhba36:C0:T0:L0                  0MB       NMP
Local Optiarc CD-ROM (mpx.vmhba36:C0:T0:L0)
naa.60060e801046b96004f2bf4600000014  Direct-Access
/vmfs/devices/disks/naa.60060e801046b96004f2bf4600000014  20480MB   NMP
HITACHI Fibre Channel Disk (naa.60060e801046b96004f2bf4600000014)
naa.60060e801046b96004f2bf4600000015  Direct-Access
/vmfs/devices/disks/naa.60060e801046b96004f2bf4600000015  40960MB   NMP
HITACHI Fibre Channel Disk (naa.60060e801046b96004f2bf4600000015)
~~~~~~ Output truncated ~~~~~~~
~ #
```

5. Identify raw device mapping (RDM) LUNs to be migrated.
6. Find RDM devices: `find /vmfs/volumes -name **-rdm**`

```
/vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_1-rdmp.vmdk
/vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_2-rdm.vmdk
/vmfs/volumes/53843dea-5449e4f7-88e0-00262d04d700/Linux/Linux_1-rdm.vmdk
/vmfs/volumes/53843dea-5449e4f7-88e0-00262d04d700/Solaris10/Solaris10_1-
rdmp.vmdk
```

7. Remove -rdmp and -rdm from preceding output and run the vmkfstools command to find vml mapping and RDM type.

```
# vmkfstools -q /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_1.vmdk
vmkfstools -q /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_1.vmdk
Disk /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_1.vmdk is a Passthrough Raw Device
Mapping
Maps to: vml.020002000060060e801046b96004f2bf460000016444636303046
~ # vmkfstools -q /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_2.vmdk
Disk /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003_2.vmdk is a Non-passthrough Raw
Device Mapping
Maps to: vml.020003000060060e801046b96004f2bf460000017444636303046
~ # vmkfstools -q /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Linux/Linux_1.vmdk
Disk /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Linux/Linux_1.vmdk is a Non-passthrough Raw Device Mapping
Maps to: vml.020005000060060e801046b96004f2bf460000019444636303046
~ # vmkfstools -q /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Solaris10/Solaris10_1.vmdk
Disk /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Solaris10/Solaris10_1.vmdk is a Passthrough Raw Device
Mapping
Maps to: vml.020004000060060e801046b96004f2bf460000018444636303046
~ #
```

Passthrough is RDM with physical \(RDMP\), and nonpassthrough is RDM with virtual \(RDMV\). VMs with virtual RDMs and VM Snapshot copies will break after migration due to VM Snapshot delta vmdk pointing to an RDM that has a stale naa ID. So before migration, ask the customer to remove all Snapshot copies in such VMs. Right-click VM and click the Snapshot --\> Snapshot Manager Delete All button. Refer to NetApp KB 3013935 for details about hardware-accelerated locking for VMware on NetApp storage.

8. Identify LUN naa to RDM device mapping.

```
~ # esxcfg-scsidevs -u | grep
vml.020002000060060e801046b96004f2bf46000000164446363030 46
naa.60060e801046b96004f2bf4600000016
vml.020002000060060e801046b96004f2bf46000000164446363030 46
~ # esxcfg-scsidevs -u | grep
vml.020003000060060e801046b96004f2bf46000000174446363030 46
naa.60060e801046b96004f2bf4600000017
vml.020003000060060e801046b96004f2bf46000000174446363030 46
~ # esxcfg-scsidevs -u | grep
vml.020005000060060e801046b96004f2bf46000000194446363030 46
naa.60060e801046b96004f2bf4600000019
vml.020005000060060e801046b96004f2bf46000000194446363030 46
~ # esxcfg-scsidevs -u | grep
vml.020004000060060e801046b96004f2bf46000000184446363030 46
naa.60060e801046b96004f2bf4600000018
vml.020004000060060e801046b96004f2bf46000000184446363030 46
~ #
```

9. Determine virtual machine configuration: `esxcli storage filesystem list | grep VMFS`

```
/vmfs/volumes/538400f6-3486df59-52e5-00262d04d700  BootLun_datastore
538400f6-3486df59-52e5-00262d04d700     true  VMFS-5  13421772800
12486443008
/vmfs/volumes/53843dea-5449e4f7-88e0-00262d04d700  VM_datastore
53843dea-5449e4f7-88e0-00262d04d700     true  VMFS-5  42681237504
6208618496
~ #
```

10. Record the UUID of the datastore.
11. Make a copy of `/etc/vmware/hostd/vmInventory.xml` and note the contents of file and vmx config path.

```
~ # cp /etc/vmware/hostd/vmInventory.xml
/etc/vmware/hostd/vmInventory.xml.bef_mig
~ # cat /etc/vmware/hostd/vmInventory.xml
<ConfigRoot>
  <ConfigEntry id="0001">
    <objID>2</objID>
    <vmxCfgPath>/vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003.vmx</vmxCfgPath>
  </ConfigEntry>
  <ConfigEntry id="0004">
    <objID>5</objID>
    <vmxCfgPath>/vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Linux/Linux.vmx</vmxCfgPath>
  </ConfigEntry>
  <ConfigEntry id="0005">
    <objID>6</objID>
    <vmxCfgPath>/vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Solaris10/Solaris10.vmx</vmxCfgPath>
  </ConfigEntry>
</ConfigRoot>
```

12. Identify the virtual machine hard disks.

    This information is required post-migration to add the removed RDM devices in order.

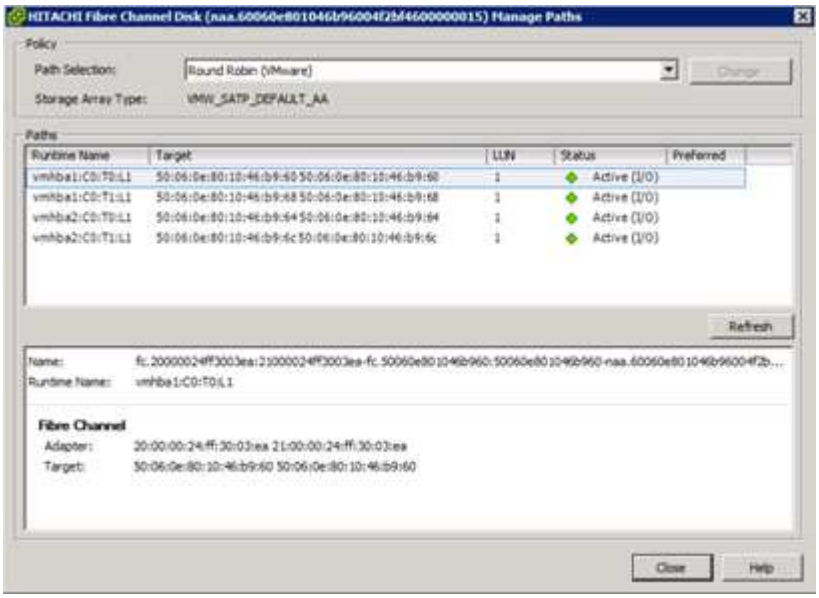
```
~ # grep fileName /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Windows2003/Windows2003.vmx
scsi0:0.fileName = "Windows2003.vmdk"
scsi0:1.fileName = "Windows2003_1.vmdk"
scsi0:2.fileName = "Windows2003_2.vmdk"
~ # grep fileName /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Linux/Linux.vmx
scsi0:0.fileName = "Linux.vmdk"
scsi0:1.fileName = "Linux_1.vmdk"
~ # grep fileName /vmfs/volumes/53843dea-5449e4f7-88e0-
00262d04d700/Solaris10/Solaris10.vmx
scsi0:0.fileName = "Solaris10.vmdk"
scsi0:1.fileName = "Solaris10_1.vmdk"
~ #
```

13. Determine RDM device, virtual machine mapping, and compatibility mode.
14. Using the preceding information, note the RDM mapping to device, virtual machine, compatibility mode, and order.

    You will need this information later, when adding RDM devices to the VM.

```
Virtual Machine -> Hardware -> NAA -> Compatibility mode
Windows2003 VM -> scsi0:1.fileName = "Windows2003_1.vmdk" ->
naa.60060e801046b96004f2bf4600000016
-> RDM Physical
Windows2003 VM -> scsi0:2.fileName = "Windows2003_2.vmdk" ->
naa.60060e801046b96004f2bf4600000017
-> RDM Virtual
Linux VM -> scsi0:1.fileName = “Linux_1.vmdk” ->
naa.60060e801046b96004f2bf4600000019 -> RDM Virtual
Solaris10 VM -> scsi0:1.fileName = “Solaris10_1.vmdk” ->
naa.60060e801046b96004f2bf4600000018 -> RDM Physical
```

15. Determine multipath configuration.
16. Obtain multipath settings for your storage in the vSphere Client:
    a. Select an ESX or ESXi host in the vSphere Client and click the Configuration tab.
    b. Click **Storage**.
    c. Select a datastore or mapped LUN.
    d. Click **Properties**.
    e. In the Properties dialog box, select the desired extent, if necessary.
    f. Click **Extent Device** > **Manage Paths** and obtain the paths in the Manage Path dialog box.



17. Obtain LUN multipathing information from the ESXi host command line:
    a. Log in to the ESXi host console.
    b. Run `esxcli storage nmp device list` to get multipath information.

```
# esxcli storage nmp device list
naa.60060e801046b96004f2bf4600000014
```

```
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000014)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=3:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L0, vmhba2:C0:T0:L0, vmhba1:C0:T1:L0,
vmhba1:C0:T0:L0
   Is Local SAS Device: false
   Is Boot USB Device: false

naa.60060e801046b96004f2bf4600000015
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000015)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L1, vmhba2:C0:T0:L1, vmhba1:C0:T1:L1,
vmhba1:C0:T0:L1
   Is Local SAS Device: false
   Is Boot USB Device: false

naa.60060e801046b96004f2bf4600000016
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000016)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=1:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L2, vmhba2:C0:T0:L2, vmhba1:C0:T1:L2,
vmhba1:C0:T0:L2
   Is Local SAS Device: false
   Is Boot USB Device: false
```

```
naa.60060e801046b96004f2bf4600000017
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000017)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=1:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L3, vmhba2:C0:T0:L3, vmhba1:C0:T1:L3,
vmhba1:C0:T0:L3
   Is Local SAS Device: false
   Is Boot USB Device: false

naa.60060e801046b96004f2bf4600000018
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000018)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=1:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L4, vmhba2:C0:T0:L4, vmhba1:C0:T1:L4,
vmhba1:C0:T0:L4
   Is Local SAS Device: false
   Is Boot USB Device: false

naa.60060e801046b96004f2bf4600000019
   Device Display Name: HITACHI Fibre Channel Disk
(naa.60060e801046b96004f2bf4600000019)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: SATP VMW_SATP_DEFAULT_AA does
not support device configuration.
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config:
{policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=1:
NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T1:L5, vmhba2:C0:T0:L5, vmhba1:C0:T1:L5,
vmhba1:C0:T0:L5
```

```
    Is Local SAS Device: false
    Is Boot USB Device: false
```

What's next?

Prepare the foreign storage array LUNs for FLI offline migration.

Prepare foreign storage array LUNs for an ONTAP FLI offline migration

In a Foreign LUN Import (FLI) offline migration, you must take manual steps from your foreign storage array to present the foreign source LUN to your ONTAP storage system; then you must take steps from your ONTAP storage system to discover the foreign LUN.

Step 1: Present foreign array source LUNs to ONTAP storage

Before you can begin importing data from a foreign storage array LUN using an FLI offline migration, you must present the source LUNs on your foreign storage array to your ONTAP storage system.

Steps

1. Log in to the source array.
2. Add the NetApp initiators to the host group created during the plan phase.
3. Select the host LUNs that need to be migrated from available logical LUNs.

   Use LUN names for each host mentioned in the source LUNs section of your Site Survey and Planning worksheet.

Step 2: Discover foreign array source LUNs in ONTAP

After you have presented your foreign array source LUNs to your ONTAP storage system, the LUNs must be discovered in ONTAP before you can create the LUN import relationship.

Steps

1. Verify the source LUNs and mapping from the source storage to the destination storage.
2. Log in to the ONTAP storage system through SSH using admin user.
3. Change the mode to advanced.

   ```
   set -privilege advanced
   ```

4. Enter `y` when asked if you want to continue.
5. Discover the source array on ONTAP. Wait for a few minutes and retry to detect the source array.

   ```
   storage array show
   ```

   The following example shows the discovery of a Hitachi DF600F array.

```
DataMig-ontap::*> storage array show
Prefix                          Name   Vendor            Model Options
-------- ---------------------------- -------- ----------------
----------
HIT-1                HITACHI_DF600F_1  HITACHI           DF600F
```

When the storage array is discovered for the first time, ONTAP might not show the array by discovering automatically. Use the following instructions to reset the switch port where ONTAP initiator ports are connected.

6. Verify the source array is discovered through all the initiator ports.

```
storage array config show -array-name <array_name>
```

The following example shows the Hitachi DF600F array discovered through all the initiator ports.

```
DataMig-ontap::*> storage array config show -array-name HITACHI_DF600F_1
             LUN   LUN
Node         Group Count     Array Name       Array Target Port
Initiator
------------ ----- ----- ----------------------------
----------------------
DataMig-ontap-01 0     1    HITACHI_DF600F_1     50060e801046b960
0a
                                                 50060e801046b964
0b
                                                 50060e801046b968
0a
                                                 50060e801046b96c
0b
DataMig-ontap-02 0     1    HITACHI_DF600F_1     50060e801046b960
0a
                                                 50060e801046b964
0b
                                                 50060e801046b968
0a
                                                 50060e801046b96c
0b
```

What's next?

Create the LUN import relationship.

Create the LUN import relationship for an ONTAP FLI offline migration

Before you can migrate a LUN from a foreign array to an ONTAP storage system, you must create a LUN import relationship. A LUN import relationship is a persistent pairing between the source and destination storage for the purpose of data import. The source and destination endpoints are LUNs.

Creating the LUN import relationship for Foreign LUN Import (FLI) offline migrations includes identifying the source array LUNs as foreign in ONTAP, creating and configuring the destination volume to contain the foreign LUNs, creating destination target LUNs, and finally establishing the import relationship.

Before you begin

You should have completed the steps to prepare your foreign LUNs for FLI offline migration.

Step 1: Identify the source array LUNs as foreign in ONTAP

You'll need to identify the source array LUNs as foreign LUNs in ONTAP before you begin your FLI offline migration.

Steps

1. List the source LUNs mapped from the foreign array; then verify the disk properties and paths.

   ```
   storage disk show -array-name <array_name> -fields disk, serial-number,
   container-type, owner, path-lun-in-use-count, import-in-progress, is-
   foreign
   ```

   You should see the number of paths expected based on your cabling (at least two paths for each source controller). You should also check the event log after masking the array LUNs.

   The following example shows the source LUNs from the Hitachi DF600F array.

```
DataMig-ontap::*> storage disk show -array-name HITACHI_DF600F_1 -fields
disk, serial-number, container-type, owner, path-lun-in-use-count,
import-in-progress, is-foreign

disk     owner is-foreign container-type import-in-progress path-lun-in-
use-count serial-number
-------- ----- ---------- -------------- ------------------
---------------------- -------------
HIT-1.2  -     false      unassigned     false        0,0,0,0,0,0,0,0
83017542001E
HIT-1.3  -     false      unassigned     false        0,0,0,0,0,0,0,0
83017542000E
HIT-1.14 -     false      unassigned     false        0,0,0,0,0,0,0,0
830175420019
3 entries were displayed.
```

2. Use the serial number to mark the source LUN as foreign in ONTAP:

```
storage disk set-foreign-lun -serial-number <lun_serial_number> -is
-foreign true
```

The following example marks the source LUNs from the Hitachi DF600F array as foreign.

```
DataMig-ontap::*> storage disk set-foreign-lun { -serial-number
83017542001E }
                   -is-foreign true
DataMig-ontap::*> storage disk set-foreign-lun { -serial-number
83017542000E }
                   -is-foreign true
DataMig-ontap::*> storage disk set-foreign-lun { -serial-number
83017542000F }
                   -is-foreign true
```

3. Verify the source LUN is marked as foreign.

```
storage disk show -array-name <array_name> -fields disk, serial-number,
container-type, owner,import-in-progress, is-foreign
```

The following example shows the source LUNs from the Hitachi DF600F array marked as foreign.

```
DataMig-ontap::*> storage disk show -array-name HITACHI_DF600F_1 -fields
disk, serial-number, container-type, owner,import-in-progress, is-
foreign

disk     owner is-foreign container-type import-in-progress serial-
number
-------- ----- ---------- -------------- ------------------
-------------
HIT-1.2  -     true       foreign        false              83017542001E
HIT-1.3  -     true       foreign        false              83017542000E
HIT-1.4  -     true       foreign        false              83017542000F
3 entries were displayed.
```

Step 2: Create and configure a destination volume

Before you create the LUN import relationship for an FLI offline migration, you must create a volume on your ONTAP storage system to contain the LUNs you will import from your foreign array.

About this task

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI offline migration is supported with ASA r2 systems. ASA r2 systems vary from other ONTAP systems (ASA, AFF, and FAS) in the implementation of its storage layer. In ASA r2 systems, volumes are automatically created when a storage unit (LUN or namespace) is created. Therefore, you do not need to create a volume before creating the LUN import relationship. You can skip this step if you are using an ASA r2 system.

Learn more about ASA r2 systems.

Steps

1. Create a destination volume.

```
volume create -vserver <SVM_name> -volume <volume_name> -aggregate
<aggregate> -size <volume_size> -snapshot-policy default
```

   The following example creates a volume named `winvol` on the `aggr1` aggregate with a size of 100 GB.

```
DataMig-ontap::*> vol create -vserver datamig winvol aggr1 -size 100g
```

2. Disable the default Snapshot policy on each volume.

```
volume modify -vserver <SVM_name> -volume <volume_name> -snapshot-policy
none
```

   If default Snapshot copies exist prior to FLI migration, the volume needs additional space to store changed data.

The following example disables the default Snapshot policy on the `winvol` volume.

```
DataMig-ontap::> volume modify -vserver datamig -volume winvol -snapshot
-policy none

Warning: You are changing the Snapshot policy on volume winvol to none.
Any Snapshot copies on this volume from the previous policy will not be
deleted by
         this new Snapshot policy.
Do you want to continue? {y|n}: y
Volume modify successful on volume winvol of Vserver datamig.
```

3. Set `fraction_reserveoption` for each volume to `0` and set the Snapshot policy to `none`.

```
vol modify -vserver <SVM_name> -volume * -fractional-reserve 0
-snapshot-policy none
```

The following example sets the `fractional-reserve` option to `0` and the Snapshot policy to `none` for all the volumes in the datamig SVM.

```
DataMig-ontap::> vol modify -vserver datamig -volume * -fractional
-reserve 0 -snapshot-policy none
Volume modify successful on volume winvol of Vserver datamig.
```

4. Verify your volume settings.

```
volume show -vserver <SVM_name> -volume * -fields fractional-
reserve,snapshot-policy
```

The factional-reserve and snapshot-policy settings should be `0` and `none`, respectively.

5. Delete any existing Snapshot copies.

```
set advanced; snap delete -vserver <SVM_name> -volume <volume_name>
-snapshot * -force true
```

FLI migration modifies every block of the target LUN. If default or other Snapshot copies exist on a volume prior to FLI migration, the volume gets filled up. Changing the policy and removing any existing Snapshot copies before FLI migration are required. Snapshot policy can be set again post-migration.

Step 3: Create the destination LUNs and LUN import relationship

For FLI offline migration, the destination LUNs on your ONTAP storage system, must be created and mapped to an igroup; then they must be offlined before creating the LUN import relationship.

About this task

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI offline migration is supported with ASA r2 systems. ASA r2 systems vary from other ONTAP systems (ASA, AFF, and FAS) in the implementation of its storage layer. In ASA r2 systems, volumes are automatically created when a storage unit (LUN or namespace) is created. Each volume contains only one storage unit. Therefore, for ASA r2 systems, you do not need to include the volume name in the `-path` option when creating the LUN; you should include the storage unit path instead.

Steps

1. Create destination LUNs.

```
lun create -vserver <SVM_name> -path <volume_path|storage_unit_path>
-ostype <os_type> -foreign-disk <serial_number>
```

The following example creates LUNs on the `datamig` SVM with the specified paths and foreign disk serial numbers. The `-ostype` option specifies the operating system type of the LUN.

```
DataMig-ontap::*> lun create -vserver datamig -path /vol/winvol/bootlun
-ostype windows_2008 -foreign-disk 83017542001E

Created a LUN of size 40g (42949672960)

Created a LUN of size 20g (21474836480)
DataMig-ontap::*> lun create -vserver datamig -path
/vol/linuxvol/lvmlun1 -ostype linux -foreign-disk 830175420011

Created a LUN of size 2g (2147483648)
DataMig-ontap::*> lun create -vserver datamig -path /vol/esxvol/bootlun
-ostype vmware -foreign-disk 830175420014

Created a LUN of size 20g (21474836480)
```

> The `lun create` command detects the LUN size and alignment based on partition offset and creates the LUN accordingly with foreign-disk option. Some I/O will always appear be partial writes and will therefore look misaligned. Examples of this would be database logs.

2. Verify the size and source LUN of the newly created LUNs.

```
lun show -vserver <SVM_name> -fields vserver, path, state, mapped, type,
size
```

The following example shows the LUNs created in the `datamig` SVM with their paths, states, mapped status, types, and sizes.

```
DataMig-ontap::*> lun show -vserver datamig

Vserver   Path                            State   Mapped   Type
Size
--------- ------------------------------- ------- -------- --------
--------
datamig   /vol/esxvol/bootlun             online  unmapped vmware
20GB
datamig   /vol/esxvol/linuxrdmvlun        online  unmapped linux
2GB
datamig   /vol/esxvol/solrdmplun          online  unmapped solaris
2GB
datamig   /vol/winvol/gdrive              online  unmapped windows_2008
3GB
4 entries were displayed.
```

3. If you are running ONTAP 9.15.1 or later, disable space allocation for the newly created LUNs.

   Space allocation is enabled by default for newly created LUNs in ONTAP 9.15.1 and later.

```
lun modify -vserver <vserver_name> -volume <volume_name> -lun <lun_name>
-space-allocation disabled
```

4. Verify that space allocation is disabled.

```
lun show -vserver <vserver_name> -volume <volume_name> -lun <lun_name>
-fields space-allocation
```

5. Create a host igroup of protocol FCP and add host initiators.

```
lun igroup create -ostype <os_type> -protocol fcp -vserver <SVM_name>
-igroup <igroup_name> -initiator <initiator_wwpn1>,<initiator_wwpn2>
```

   Find initiator WWPNs from storage groups section of your Site Survey planning worksheet.

   The following example creates igroups for the destination LUNs with the specified operating system types and initiators.

```
DataMig-ontap::*> lun igroup create -ostype windows -protocol fcp
-vserver datamig -igroup dm-rx200s6-21 -initiator
21:00:00:24:ff:30:14:c4,21:00:00:24:ff:30:14:c5

DataMig-ontap::*> lun igroup create -ostype linux -protocol fcp -vserver
datamig  -igroup dm-rx200s6-22 -initiator
21:00:00:24:ff:30:04:85,21:00:00:24:ff:30:04:84

DataMig-ontap::*> lun igroup create -ostype vmware -protocol fcp
-vserver datamig -igroup dm-rx200s6-20 -initiator
21:00:00:24:ff:30:03:ea,21:00:00:24:ff:30:03:eb
```

Use the same LUN ID as source. Refer to source LUNS section of your Site Survey planning worksheet.

6. Map the destination LUNs to an igroup.

```
lun map -vserver <SVM_name> -path <volume_path|storage_unit_path>
-igroup <igroup_name> -lun-id <lun_id>
```

The following example maps the destination LUNs to their respective igroups with the specified paths and LUN IDs.

```
DataMig-ontap::*> lun map -vserver datamig -path /vol/winvol/bootlun
-igroup dm-rx200s6-21 -lun-id 0
DataMig-ontap::*> lun map -vserver datamig -path /vol/linuxvol/bootlun
-igroup dm-rx200s6-22 -lun-id 0
DataMig-ontap::*> lun map -vserver datamig -path /vol/esxvol/bootlun
-igroup dm-rx200s6-20 -lun-id 0
```

7. Offline the destination LUNs.

```
lun offline -vserver <SVM_name> -path <volume_path|storage_unit_path>
```

The following example offlines the destination LUNs in the `datamig` SVM.

```
DataMig-ontap::*> lun offline -vserver datamig -path /vol/esxvol/bootlun
DataMig-ontap::*> lun offline -vserver datamig -path
/vol/esxvol/linuxrdmvlun
DataMig-ontap::*> lun offline -vserver datamig -path
/vol/esxvol/solrdmplun
```

8. Create the LUN import relationship between the destination and source LUNs.

```
lun import create -vserver <SVM_name> -path
<volume_path|storage_unit_path> -foreign-disk <serial_number>
```

The following example creates the LUN import relationship for the destination LUNs in the `datamig` SVM with their respective paths and foreign disk serial numbers.

```
DataMig-ontap::*> lun import create -vserver datamig -path
/vol/winvol/bootlun -foreign-disk 83017542001E
DataMig-ontap::*> lun import create -vserver datamig -path
/vol/linuxvol/ext3lun -foreign-disk 830175420013
DataMig-ontap::*> lun import create -vserver datamig -path
/vol/esxvol/linuxrdmvlun -foreign-disk 830175420018
DataMig-ontap::*> lun import create -vserver datamig -path
/vol/esxvol/solrdmplun -foreign-disk 830175420019
```

9. Verify the LUN import relationship is created.

```
lun import show -vserver <SVM_name> -fields vserver, foreign-disk, path,
operation, admin-state, operational-state, percent-complete
```

The following example shows the LUN import relationship created for the destination LUNs in the `datamig` SVM with their respective foreign disks and paths.

```
DataMig-ontap::*> lun import show -vserver datamig
vserver foreign-disk   path                operation admin operational
percent
                                         in progress state state
complete
--------------------------------------------------------------------------
-------
datamig 83017542000E   /vol/winvol/fdrive  import    stopped
                                                       stopped
0
datamig 83017542000F   /vol/winvol/gdrive  import    stopped
                                                       stopped
0
datamig 830175420010   /vol/linuxvol/bootlun
                                           import    stopped
                                                       stopped
0
3 entries were displayed.
```

What's next?

Import the data from the foreign LUNs to the ONTAP LUNs.

Related information

- Learn more about unaligned I/O.
- Learn more about enabling space allocation for SAN protocols.

Import data from a foreign array using ONTAP FLI offline migration

After you have created the LUN import relationship between the source and destination LUNs for an FLI offline migration, you can import the data from the foreign array to the ONTAP storage system.

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI offline migration is supported with ASA r2 systems. ASA r2 systems vary from other ONTAP systems (ASA, AFF, and FAS) in the implementation of its storage layer. In ASA r2 systems, volumes are automatically created when a storage unit (LUN or namespace) is created. Each volume contains only one storage unit. Therefore, for ASA r2 systems, you do not need to include the volume name in the `-path` option when creating the LUN; you should include the storage unit path instead.

Learn more about ASA r2 systems.

Steps

1. Start the data import from the foreign LUNs to the ONTAP LUNs.

```
lun import start –vserver <SVM_name> –path
<volume_path|storage_unit_path>
```

This example shows the command to start the data import for LUNs named **bootlun**, **fdrive** and **gdrive** in the **winvol** volume and the **datamig** SVM.

```
DataMig-ontap::*> lun import start –vserver datamig –path
/vol/winvol/bootlun

DataMig-ontap::*> lun import start –vserver datamig –path
/vol/winvol/fdrive

DataMig-ontap::*> lun import start –vserver datamig –path
/vol/winvol/gdrive
```

2. Monitor the import progress.

```
lun import show –vserver <SVM_name> –fields vserver, foreign-disk, path,
admin-state, operational-state, percent-complete, imported-blocks,
total-blocks, estimated-remaining-duration
```

You can compare the progress you are seeing here with the migration performance estimates that you developed after performing your test migrations.

This example shows the command to monitor the import progress for the **datamig** SVM.

```
DataMig-ontap::*> lun import show -vserver datamig -fields vserver,
foreign-disk, path, admin-state, operational-state, percent-complete,
imported-blocks, total-blocks, , estimated-remaining-duration

vserver foreign-disk path               admin-state operational-state
percent-complete imported-blocks total-blocks estimated-remaining-
duration
------- ------------ ------------------ ----------- -----------------
---------------- --------------- ------------
----------------------------
datamig 83017542000E /vol/winvol/fdrive started     completed
100              4194304         4194304      -
datamig 83017542000F /vol/winvol/gdrive started     completed
100              6291456         6291456      -
datamig 830175420010 /vol/linuxvol/bootlun
                                        started     in_progress       83
35107077        41943040     00:00:48
3 entries were displayed.
```

3. Verify that the data import is completed successfully.

```
lun import show -vserver <SVM_name> -fields vserver, foreign-disk, path,
admin-state, operational-state, percent-complete, imported-blocks,
total-blocks, , estimated-remaining-duration
```

This example shows the command to verify the import status for the **datamig** SVM.

```
DataMig-ontap::*> lun import show -vserver datamig -fields vserver,
foreign-disk, path, admin-state, operational-state, percent-complete,
imported-blocks, total-blocks, , estimated-remaining-duration
```

The **operational status** shows as **completed** when the import job is completed successfully.

What's next?

Verify the migration results.

Verify ONTAP FLI offline migration results

After a LUN is migrated from the foreign array to your ONTAP storage system, FLI can perform a block-by-block comparison of the source and destination LUNs to verify that the migration is complete and accurate. A migration verification takes approximately the same amount of time as (or slightly more than) the migration.

A migration verification is not required, but is highly recommended.

About this task

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI offline migration is supported with ASA r2 systems. ASA r2 systems vary from other ONTAP systems (ASA, AFF, and FAS) in the implementation of its storage layer. In ASA r2 systems, volumes are automatically created when a storage unit (LUN or namespace) is created. Each volume contains only one storage unit. Therefore, for ASA r2 systems, you do not need to include the volume name in the `-path` option when creating the LUN; you should include the storage unit path instead.

Steps

1. Start the LUN migration verification.

```
lun import verify start -vserver <SVM_name> -path
<volume_path|storage_unit_path>
```

This example shows the command to start the LUN migration verification for LUNs named **bootlun**, **fdrive** and **gdrive** in the **winvol** volume and the **datamig** SVM.

```
DataMig-ontap::*> lun import verify start -vserver datamig -path
/vol/winvol/bootlun

DataMig-ontap::*> lun import verify start -vserver datamig -path
/vol/winvol/fdrive

DataMig-ontap::*> lun import verify start -vserver datamig -path
/vol/winvol/gdrive
```

2. Monitor the verification status.

```
lun import show -vserver <SVM_name> -fields vserver, foreign-disk, path,
admin-state, operational-state, percent-complete, imported-blocks,
total-blocks, estimated-remaining-duration
```

This example shows the command to monitor the verification status for the **datamig** SVM.

```
DataMig-ontap::*> lun import show -vserver datamig -fields vserver,
foreign-disk, path, admin-state, operational-state, percent-complete,
imported-blocks, total-blocks, , estimated-remaining-duration

vserver foreign-disk path               admin-state operational-state
percent-complete imported-blocks total-blocks estimated-remaining-
duration
------- ------------ ------------------ ----------- -----------------
--------------- -------------- ------------
----------------------------
datamig 83017542000E /vol/winvol/fdrive started     in_progress       57
-               4194304      00:01:19
datamig 83017542000F /vol/winvol/gdrive started     in_progress       40
-               6291456      00:02:44
datamig 830175420010 /vol/linuxvol/bootlun
                                        started     in_progress       8
-               41943040     00:20:29
3 entries were displayed.
```

You can execute the same command to track the progress of the verification. The **operational-state** displays a status of **completed** when the verification job is completed successfully.

3. Stop the LUN verification.

```
lun import verify stop -vserver <SVM_name> -path
<volume_path|storage_unit_path>
```

This example shows the command to stop the LUN verification for the **datamig** SVM.

```
DataMig-ontap::*> lun import verify stop -vserver datamig -path
/vol/esxvol/winrdmplun
```

The LUN import verification must be explicitly stopped before bringing the LUN back online. Otherwise, the `lun online` command fails. This step must be performed manually even if the status shows that the verification is completed.

What's next?

Remove the LUN import relationship.

Remove the LUN import relationship after an ONTAP FLI offline migration

After the Foreign LUN Import (FLI) offline migration is completed, the LUN import

relationship can be safely removed. The host is now accessing the new NetApp array for all I/O to the new ONTAP LUN and the source LUN is no longer in use so the import relationship is no longer needed.

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI offline migration is supported with ASA r2 systems. ASA r2 systems vary from other ONTAP systems (ASA, AFF, and FAS) in the implementation of its storage layer. In ASA r2 systems, volumes are automatically created when a storage unit (LUN or namespace) is created. Each volume contains only one storage unit. Therefore, for ASA r2 systems, you do not need to include the volume name in the `-path` option when creating the LUN; you should include the storage unit path instead.

Steps

1. Delete the import relationship to remove the data import jobs.

```
lun import delete -vserver <SVM_name> -path
<volume_path|storage_unit_path>
```

This example shows the command to delete the import relationship for LUNs named **bootlun**, **fdrive** and **gdrive** in the **winvol** volume and the **datamig** SVM.

```
DataMig-ontap::*> lun import delete -vserver datamig -path
/vol/winvol/bootlun

DataMig-ontap::*> lun import delete -vserver datamig -path
/vol/winvol/fdrive

DataMig-ontap::*> lun import delete -vserver datamig -path
/vol/winvol/gdrive
```

2. Verify that the import jobs are deleted.

```
lun import show -vserver <SVM_name>
```

This example shows the command to verify that the import jobs are deleted for the **datamig** SVM.

```
DataMig-ontap::*> lun import show -vserver datamig
There are no entries matching your query.
```

3. Mark the foreign LUN attribute to `false`.

```
storage disk modify -serial-number <serial_number> -is-foreign false
```

This example shows the command to mark the foreign LUN attribute to `false` for the LUNs named

bootlun, **fdrive** and **gdrive** in the **winvol** volume and the **datamig** SVM.

```
DataMig-ontap::*> storage disk modify { -serial-number 83017542001E }
-is-foreign false

DataMig-ontap::*> storage disk modify { -serial-number 83017542000E }
-is-foreign false

DataMig-ontap::*> storage disk modify { -serial-number 83017542000F }
-is-foreign false
```

4. Verify the foreign LUNs are marked as `false`.

```
storage disk show -array-name <array_name> -fields disk, serial-number,
container-type, owner, import-in-progress, is-foreign
```

This example shows the command to verify the foreign LUNs are marked as `false` on the **HITACHI_DF600F_1** array.

```
DataMig-ontap::*> storage disk show -array-name HITACHI_DF600F_1 -fields
disk, serial-number, container-type, owner,import-in-progress, is-
foreign

disk     owner is-foreign container-type import-in-progress serial-
number
-------- ----- ---------- -------------- ------------------
-------------
HIT-1.2  -     false      unassigned     false              83017542001E
HIT-1.3  -     false      unassigned     false              83017542000E
HIT-1.4  -     false      unassigned     false              83017542000F
3 entries were displayed.
```

5. Bring the destination LUNs online.

```
lun online -vserver <SVM_name> -path <volume_path|storage_unit_path>
```

This example shows the command to bring the destination LUNs online for LUNs named **bootlun**, **fdrive** and **gdrive** in the **winvol** volume and the **datamig** SVM.

```
DataMig-ontap::*> lun online -vserver datamig -path /vol/winvol/bootlun

DataMig-ontap::*> lun online -vserver datamig -path /vol/winvol/fdrive

DataMig-ontap::*> lun online -vserver datamig -path /vol/winvol/gdrive
```

6. Verify the LUNs are online.

```
lun show -vserver <SVM_name>
```

This example shows the command to verify the LUNs are online for the **datamig** SVM.

```
DataMig-ontap::*> lun show -vserver datamig
Vserver   Path                            State   Mapped   Type
Size
--------- ------------------------------- ------- -------- --------
--------
datamig   /vol/esxvol/bootlun             online  mapped   vmware
20GB
datamig   /vol/esxvol/linuxrdmvlun        online  mapped   linux
2GB
datamig   /vol/esxvol/solrdmplun          online  mapped   solaris
2GB
3 entries were displayed.
```

7. Optionally, view the event log to verify the migration results.

```
event log show –event fli*
```

This example shows sample output of the command to view the event log for FLI migration results.

```
DataMig-ontap::*> event log  show -event fli*

7/7/2014 18:37:21   DataMig-ontap-01 INFORMATIONAL
fli.lun.verify.complete: Import verify of foreign LUN 83017542001E of
size 42949672960 bytes from array model DF600F belonging to vendor
HITACHI  with NetApp LUN QvChd+EUXoiS is successfully completed.
7/7/2014 18:37:15   DataMig-ontap-01 INFORMATIONAL
fli.lun.verify.complete: Import verify of foreign LUN 830175420015 of
size 42949672960 bytes from array model DF600F belonging to vendor
HITACHI  with NetApp LUN QvChd+EUXoiX is successfully completed.
7/7/2014 18:02:21   DataMig-ontap-01 INFORMATIONAL
fli.lun.import.complete: Import of foreign LUN 83017542000F of size
3221225472 bytes from array model DF600F belonging to vendor HITACHI  is
successfully completed. Destination NetApp LUN is QvChd+EUXoiU.
```

What's next?

Perform post-migration tasks for an FLI offline migration.

Perform ONTAP FLI offline post-migration tasks

Any outstanding server remediation not performed earlier is performed during post-migration.

The third-party software is removed, NetApp software is installed and configured, and then the host is brought up accessing the LUNs on NetApp. See the topic *Host remediation* for examples of post-migration remediation for specific host types.

Review logs for errors, check pathing, and perform any application testing to verify that your migration completed cleanly and successfully.

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