FLI online migration

ONTAP FLI

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FLI online migration

ONTAP FLI online 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 a Foreign LUN Import (FLI) online migration, the client system stays online 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 verify that online migration is supported for your host type and for your NetApp destination storage array configuration.

  Online migrations are not supported by MetroCluster configurations. If a site failover occurred during an active online import, write pass-throughs to the source array could fail which would lead to a verification failure and potential data loss. If your NetApp destination controller is in a MetroCluster configuration, you should use the FLI offline migration process.

  Online migrations are supported by the following versions of Windows, Linux, or ESXi host operating system. For other host operating systems, you should use the FLI offline migration process.

  - Microsoft (all versions of the servers listed are supported):
    - Windows Server 2008 R2 and later (includes Windows Server failover cluster)
    - Microsoft Hyper-V Server 2008 and later
    - Windows Server 2012 and later (includes Windows Server 2012 cluster)
    - Microsoft Hyper-V Server 2012 and later
  - VMware ESXi 5.x and later
  - Red Had Enterprise Linux (RHEL) 5.x and later
- You should verify that host multipathing is correctly configured and working properly. All available paths to LUNs should be active.
- You should configure your FC adapters for initiator mode.
- You should zone your foreign array target ports with the ONTAP storage initiator ports.

About this task

To perform an FLI online migration, you should prepare your host, create a LUN import relationship, map the foreign LUN to your ONTAP storage system, import data from the foreign LUN, verify migration results, remove the LUN import relationship, and finally perform post-migration tasks.

1. **Prepare your host.**

Perform any necessary host remediation steps and reboot your hosts.

2 **Create a LUN import relationship.**

Creating the LUN import relationship includes identifying the foreign LUN to be imported from source array, creating a destination volume to contain the foreign LUN, creating the destination target LUN on your ONTAP storage system, and finally establishing the import relationship.

3 **Map the foreign LUNs to your ONTAP storage system.**

On the foreign array, unmap the LUN to be migrated and remap it to your ONTAP storage system. This process is disruptive.

4 **Import data from your foreign LUNs.**

Import the data from the foreign array source LUN to the ONTAP destination LUN.

5 **Verify the migration results.**

Use FLI to perform a block-by-block comparison of the source and destination LUNs to verify that the migration is complete and accurate

6 **Remove the LUN import relationship.**

After the FLI online migration is complete, 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 online migration

Before you begin a Foreign LUN Import (FLI) online migration, you should perform any steps identified in the analysis phase necessary for host remediation such as installing host attach kits or DSMs. After you have performed any necessary remediation steps, it is recommended that you reboot your hosts.

Before you begin

As a precaution, take a Snapshot copy of your host data to facilitate a revert if needed later.

Steps

1. Perform any necessary host remediation steps.
2. Shut down all your open applications.
3. Reboot the host.
4. Review the logs for errors.

What's next?

Create the LUN import relationship.

Create the LUN import relationship for an ONTAP FLI online migration

Before you can migrate a LUN from a foreign array to ONTAP storage, 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) online migrations includes identifying the foreign LUN to be imported from source array, creating and configuring a destination volume to contain the foreign LUN, creating destination target LUN and finally establishing the import relationship.

Step 1: Identify the source array LUN as a foreign LUN in ONTAP

You'll need to identify the source array LUN as a foreign LUN before you begin your FLI online migration.

Steps

1. In ONTAP, change the privilege level to advanced.

```
set -privilege advanced
```

2. Enter `y` when asked if you want to continue.
3. Verify that the source array can be seen on the destination controller.

```
storage array show
```

The following example shows the discovery of a DGC LUNZ array.

```
cluster::*> storage array show
Prefix                          Name    Vendor             Model Options
-------- ---------------------------- -------- ----------------
----------
DGC-1                       DGC_LUNZ_1      DGC              LUNZ
1 entries were displayed.
```

4. Display source LUN details.

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

The following example shows the DGC LUNZ array details.

```
cluster::*> storage array config show -array-name DGC_LUNZ_1 -instance

           Controller Name: ontaptme-fc-cluster-01
                 LUN Group: 0
        Array Target Ports: 500601643ea067da
                 Initiator: 0c
                Array Name: DGC_LUNZ_1
   Target Side Switch Port: stme-5010-3:2-1
Initiator Side Switch Port: stme-5010-3:2-3
      Number of array LUNs: 1

           Controller Name: ontaptme-fc-cluster-01
                 LUN Group: 0
        Array Target Ports: 500601653ea067da
                 Initiator: 0d
                Array Name: DGC_LUNZ_1
   Target Side Switch Port: stme-5010-4:2-1
Initiator Side Switch Port: stme-5010-4:2-3
      Number of array LUNs: 1
~~~~~~~~~~~ output truncated for readability ~~~~~~~~~~~~~~~~~
8 entries were displayed.
```

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

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

The following example shows the DGC LUNZ array discovered through all the initiator ports.

```
cluster::*> storage array config show -array-name DGC_LUNZ_1
             LUN   LUN
Node         Group Count                   Array Name       Array Target
Port Initiator
------------ ----- ----- ----------------------------
---------------------- ---------
ontaptme-fc-cluster-01
                  0     1                   DGC_LUNZ_1
500601643ea067da        0c

500601653ea067da        0d

5006016c3ea067da        0c

5006016d3ea067da        0d
ontaptme-fc-cluster-02
                  0     1                   DGC_LUNZ_1
500601643ea067da        0c

500601653ea067da        0d

5006016c3ea067da        0c

5006016d3ea067da        0d
8 entries were displayed.
```

6. List the LUNs mapped from the source storage; then verify the disk properties and paths.

```
storage disk show -array-name <array_name> -container-type lun
```

The following example shows the LUNs mapped from the source storage.

```
cluster::*> storage disk show -array-name DGC_LUNZ_1 -instance
                  Disk: DGC-1.9
        Container Type: unassigned
            Owner/Home: -  / -
               DR Home: -
    Stack ID/Shelf/Bay: -  / -  / -
                   LUN: 0
                 Array: DGC_LUNZ_1
                Vendor: DGC
                 Model: VRAID
         Serial Number: 600601603F103100662E70861000E511
                   UID:
60060160:3F103100:662E7086:1000E511:00000000:00000000:00000000:00000000:
00000000:00000000
                   BPS: 512
         Physical Size: -
              Position: present
Checksum Compatibility: block
             Aggregate: -
                  Plex: -
Paths:
                               LUN  Initiator Side        Target Side
Link
Controller         Initiator     ID  Switch Port           Switch Port
Acc Use  Target Port                TPGN    Speed      I/O KB/s
IOPS
------------------ ---------  -----  --------------------
--------------------  --- ---  ----------------------  ------  -------
------------  ------------
ontaptme-fc-cluster-02
                   0c             0  stme-5010-3:2-4       stme-5010-
3:2-2       AO  INU  5006016c3ea067da              2   4 Gb/S
0             0
ontaptme-fc-cluster-02
                   0d             0  stme-5010-4:2-4       stme-5010-
4:2-2       AO  INU  5006016d3ea067da              2   4 Gb/S
0             0
ontaptme-fc-cluster-02
                   0d             0  stme-5010-4:2-4       stme-5010-
4:2-1       ANO RDY  500601653ea067da              1   4 Gb/S
0             0

Errors:
-
```

7. View the source LUN.

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

   The following example shows the source LUN.

```
cluster::*> storage disk show -array-name DGC_LUNZ_1
                     Usable           Disk    Container   Container
Disk                   Size Shelf Bay Type    Type        Name
Owner
---------------- ---------- ----- --- ------- ----------- ---------
--------
DGC-1.9                   -     -   - LUN     unassigned  -         -
```

8. Mark the source LUN as foreign.

```
storage disk set-foreign-lun -is-foreign true -disk <disk_name>
```

   The following example shows the command to mark the source LUN as foreign.

```
cluster::*> storage disk set-foreign-lun -is-foreign true -disk DGC-1.9
```

9. Verify the source LUN is marked as foreign.

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

   The following example shows the source LUN marked as foreign.

```
cluster::*> storage disk show -array-name DGC_LUNZ_1
                     Usable           Disk    Container   Container
Disk                   Size Shelf Bay Type    Type        Name
Owner
---------------- ---------- ----- --- ------- ----------- ---------
--------
DGC-1.9
```

10. List all foreign LUNs and their serial numbers.

```
storage disk show -container-type foreign -fields serial-number
```

Serial numbers are used in FLI LUN import commands.

The following example shows the foreign LUN and its serial number.

```
disk    serial-number
------- --------------------------------
DGC-1.9 600601603F103100662E70861000E511
```

Step 2: Create and configure a destination volume

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

About this task

Beginning with ONTAP 9.17.1, data migration of foreign LUNs using FLI online 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_name> -size <size>
```

2. Verify the volume is created.

```
volume show -vserver <SVM_name>
```

The following example shows the **fli_vol** volume created in the **fli** SVM.

```
cluster::*> vol show -vserver fli
Vserver   Volume       Aggregate    State      Type       Size
Available Used%
--------- ------------ ------------ ---------- ---- ----------
---------- -----
fli       fli_root     aggr1        online     RW          1GB
972.6MB    5%
fli       fli_vol      aggr1        online     RW          2TB
1.90TB    5%
2 entries were displayed.
```

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

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

4. Verify the volume settings.

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

The following example shows the **fractional-reserve** set to `0` and the **snapshot-policy** set to `none` for the **fli_vol** volume in the **fli** SVM.

```
cluster::*> vol show -vserver datamig -volume * -fields fractional-
reserve,snapshot-policy
vservervolumesnapshot-policyfractional-reserve
-----------------------------------------------
datamigdatamig_rootnone0%
datamigwinvolnone0%
Volume modify successful on volume winvol of Vserver datamig.
```

5. Delete any existing Snapshot copies.

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

FLI migration modifies every block of the target LUNs. 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 is required. Snapshot policy can be set again post-migration.

Step 3: Create the destination LUN and LUN import relationship

To prepare for your foreign LUN import, create the destination LUN and igroup, map the LUN to the igroup and create the LUN import relationship.

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 the destination LUN.

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

> 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 that new LUN is created.

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

The following example shows the new LUN created in the **fli** SVM.

```
cluster::*> lun show -vserver fli
Vserver   Path                            State   Mapped   Type
Size
--------- ------------------------------- ------- -------- --------
--------
fli       /vol/fli_vol/OnlineFLI_LUN      online  unmapped windows_2008
1TB
```

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 an igroup of protocol FCP with host initiators.

```
igroup create -vserver <SVM_name> -igroup <igroup_name> -protocol fcp
-ostype <os_type> -initiator <initiator_name>
```

6. Verify that the host can access all paths to the new igroup.

```
igroup show -vserver <SVM_name> -igroup <igroup_name>
```

The following example shows the **FLI** igroup in the **fli** SVM with two initiators logged in.

```
cluster::*> igroup show –vserver fli –igroup FLI
   Vserver name: fli
    Igroup name: FLI
       Protocol: fcp
     OS Type: Windows
Portset Binding Igroup: -
   Igroup UUID: 5c664f48-0017-11e5-877f-00a0981cc318
          ALUA: true
    Initiators: 10:00:00:00:c9:e6:e2:77 (logged in)
10:00:00:00:c9:e6:e2:79 (logged in)
```

7. Offline the destination LUN.

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

The following example shows the command to take the new LUN offline in the **fli** SVM.

```
cluster::*> lun offline -vserver fli -path /vol/fli_vol/OnlineFLI_LUN

Warning: This command will take LUN "/vol/fli_vol/OnlineFLI_LUN" in
Vserver "fli" offline.
Do you want to continue? {y|n}: y
```

8. Map the destination LUN to the igroup.

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

9. Create import relationship between new LUN and foreign LUN.

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

What's next?

Map the source LUN to the ONTAP destination LUN.

Related information

Learn more about unaligned I/O.

Map the source LUN to the ONTAP array for an FLI online migration

To import data from a foreign array LUN, the LUN must first be unmapped on the foreign array and remapped to your ONTAP storage system. The commands to unmap a LUN on a foreign array vary based upon the array vendor. You should follow the steps provided for the overall process and see the documentation for your foreign array for specifics commands.

Before you begin

Removing the host (initiator) from an igroup affects all LUNs that are mapped to the igroup. To prevent disruption to other LUNs on your foreign array, the LUN you are migrating must be the only LUN that is mapped to its igroup. If there are other LUNs sharing the igroup, remap them to a different igroup, or create a new igroup specifically for the LUN to be migrated. See the vendor documentation for the appropriate commands.

Steps

1. On the foreign array, display the storage group to which the source LUN is mapped.

   See the vendor documentation for the appropriate commands.

2. If the LUNs that are being imported are for an ESXi host, review and follow the instructions for ESXi CAW/ATS remediation.
3. Unmap the source LUN from the hosts.

   The disruption begins immediately after the `unmap` command is executed. Generally, the disruption window can be measured in minutes. The disruption window is the time taken to repoint the host at the new NetApp target and to scan for LUNs.

4. Verify that the host initiators are no longer present.
5. On the ONTAP cluster, bring the destination LUN online, and verify that it is mapped.

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

6. Verify that the LUN is online.

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

7. Rescan the disks on the host, find the LUN on the ONTAP target, and then verify that the DSM has claimed the LUN.

   The disruption window ends here.

8. Verify that you can see all expected paths, and check your event logs to verify that no errors exist.

Result

The disruptive part of this migration is complete, unless there are outstanding host remediation tasks (identified during your analysis and planning phases) that are disruptive.

The LUNs are online and mapped, and the hosts are now mounting the new ONTAP-hosted LUN. Reads are passed through the ONTAP array to the source LUN, and writes are written to both the new ONTAP-hosted LUN and the original source LUN. The source LUN and destination LUN will stay synchronized until the migration is complete and the LUN relationship has been broken.

What's next?

Import data from your foreign LUNs.

Import data from a foreign array using ONTAP FLI online migration

After the LUN import relationship has been established and the host connection has been moved from the foreign array to the ONTAP array, you can import the data from the foreign source LUN to the ONTAP destination LUN.

Steps

1. Set the privilege level to advanced.

```
set -privilege advanced
```

2. Enter `y` when asked if you want to continue.
3. Start the migration import.

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

4. Display FLI status.

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

What's next?

Verify the migration results.

Verify ONTAP FLI online migration results

After your LUN is migrated from the foreign array to the ONTAP array, Foreign LUN Import (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.
- A migration verification is disruptive. The LUNs being verified need to be offline for the duration of the verification.

Steps

1. Offline the LUNs to be verified.

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

   This example shows the command to offline the LUN named **72Clun1** in the **flivol** volume and the **fli_72C** SVM.

   ```
   cluster::*> lun offline -vserver fli_72C -path /vol/flivol/72Clun1
   Warning: This command will take LUN "/vol/flivol/72Clun1" in Vserver
   "fli_72C" offline.
   Do you want to continue? {y|n}: y
   ```

   The disruption window begins here.

2. Start the LUN migration verification.

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

3. Monitor the verification status.

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

   This example shows the command to monitor the verification status for the LUN named **72Clun1** in the **flivol** volume and the **fli_72C** SVM.

```
ontaptme-fc-cluster::*> lun import show -vserver fli_72C -path
/vol/flivol/72Clun1
vserver foreign-disk   path                operation admin operational
percent
                                         in progress state state
complete
--------------------------------------------------------------------------
-------
fli_72C D0i1E+G8Wg6m   /vol/flivol/72Clun1 verify    started

9
```

4. Stop the LUN verification.

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

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

5. Online the LUN.

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

The disruption window ends here.

What's next?

Remove the LUN import relationship.

Remove the LUN import relationship after an ONTAP FLI online migration

After the Foreign LUN Import (FLI) online 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.

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 LUN import relationship.

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

2. Verify that the import relationship is deleted.

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

3. 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.

Perform ONTAP FLI online post-migration tasks

Any server remediation not performed pre-migration, is performed during post-migration.

Any third-party software is removed. NetApp software is installed and configured. See 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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