



SAN migration using FLI

ONTAP FLI

NetApp
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SAN migration using FLI

Data migration program overview

Data migration program overview

The data migration program creates data migration solutions that make it easier for customers to migrate to NetApp storage and to migrate LUNs from NetApp 7-Mode to ONTAP. Foreign LUN Import (FLI) is a part of the data migration portfolio.

The program enhances productivity by providing the necessary tools, products, and service collateral required for successful data migration. By providing the proper skills and knowledge to perform data migrations, this program aims to accelerate the adoption of NetApp technologies.

Intended audience

You can use this content to help you migrate data from a foreign array to ONTAP or to transition LUNs from NetApp 7-Mode arrays to ONTAP.

You should be familiar with common SAN concepts and processes including zoning, LUN masking, the host operating systems whose LUNs need to be migrated, ONTAP, and the source third-party array.

Migration types supported by Foreign LUN Import

FLI supports four main types of migration workflows: online, offline, transition, and automated. Your choice of which workflow to use depends on your configuration and other factors.

- In an online migration, FLI from third-party arrays allows the client system to stay online during migration (requires a Windows, Linux, or ESXi host operating system).
- In an offline migration, FLI from third-party arrays takes the client system offline and copies the data to the new LUN before bringing it back online.
- In a transition migration, FLI transitions ONTAP operating in 7-Mode to ONTAP. This is functionally the same process except that the source array is ONTAP. The transition workflow is available in either online or offline mode.
- In an automated migration, FLI uses workflow automation (WFA) software to automate parts of the migration process. FLI with WFA is available in either online or offline mode.

Architecturally the three migrations and the transition workflow are fairly similar. All four rely on NetApp's FlexArray technology to allow your ONTAP controller to act as an initiator in front of a source array and to use that position to copy LUNs block for block from the source to a LUN on the destination ONTAP array.

The differences between the workflows have to do with when cutovers occur, length of the disruption window, use of automation, or if the source array is a NetApp array running ONTAP 7-Mode or a third-party array.

Foreign LUN Import concepts

Understanding of basic FLI concepts helps in proper operation and decreases the initial configuration effort.

- **Foreign array**

A foreign array is a storage device that does not run ONTAP. This is also referred to as a third-party array or source array. In the case of a 7-Mode to ONTAP transition, the foreign array would be an array produced by NetApp running ONTAP 7-Mode.

- **Foreign LUN**

A foreign LUN is a LUN containing user data hosted on a third-party array using that array's native disk format.

- **FLI LUN relationship**

A FLI LUN relationship is a persistent pairing between source and destination storage for the purpose of data import. The source and destination endpoints are LUNs.

- **LUN import**

LUN import is a process of transferring the data in a foreign LUN from its third-party format into a native NetApp format LUN.

Data migration challenges

Some of the challenges posed by data migration are extended downtime, potential risk, scarce resources, and inadequate expertise.

Data availability requirements have become increasingly demanding and downtime unacceptable, such that business operations drive the data migration process. Risk factors such as performance impacts on production systems, potential data corruption, and loss are a concern in any data migration process.

Professional services for SAN migration solutions

Professional services for SAN migration solutions

NetApp and partner professional services use a time-tested methodology to guide SAN migrations through all major phases.

NetApp FLI technology, along with third-party data migration software, have created proficiencies in data migration that allow professional services to execute SAN data migration projects successfully worldwide. By utilizing NetApp and partner professional services, customers free up internal resources, minimize downtime, and abate risk.

With ONTAP, a professional-services-run migration is no longer mandatory. However, NetApp still strongly recommends a professional services or partner professional services engagement to scope and plan the migration as well as to train customer personnel in how to perform data migrations using FLI.

Data Migration Service for heterogeneous SAN environments

The Data Migration Service for heterogeneous SAN environments is a comprehensive data migration solution using FLI technology. The SAN data migration service provides software and services that reduce error, increase productivity, and promote consistent delivery of data migrations for NetApp and partner professional services.

Data migration methodology

The data migration process consists of phases that provide a tested methodology. You can use the data migration methodology to scope, plan, and document your migration choices and tasks.

1. Discovery phase

Collect information about hosts, storage, and fabrics in the environment.

2. Analysis phase

Examine the collected data, and determine the appropriate migration approach for each host or storage array.

3. Planning phase

Create and test migration plans, provision destination storage, and configure migration tools.

4. Execution phase

Migrate the data and perform host remediations.

5. Verification phase

Validate the new system configurations and provide documentation.

Data migration options

In choosing a data migration option, things to consider are the use of a Data Transfer Appliance or an application-based migration.

While FLI might be the best choice for most migrations, other options may be performed non-disruptively and therefore might be preferable to performing a migration using FLI. You should consider your options and choose the right tool for each migration. All of these tools can be used for parts of your migrations for which they are best suited.

- Use of a Data Transfer Appliance (DTA)

A DTA is a NetApp-branded appliance that is connected to the SAN fabric, is licensed on per-TB data migrated and supports both offline and online migrations.

- Host operating system or application-based migrations

There are various host operating systems or application-based data migration options including:

- VMware Storage vMotion
- Logical volume manager (LVM) based solutions
- Utilities such as DD (Linux) and Robocopy (Windows)

Regardless of the procedures and tools chosen, you can and should use the data migration methodology to scope, plan, and document your migration choices and tasks.

Recommended tools for data migration

Recommended tools for data migration

Service tools provide a standardized method for performing useful functions such as remote data collection, configuration, and storage management tasks.

The following service tools are used to gather and parse data:

- **OneCollect**

NetApp Active IQ OneCollect, available with a web-based UI or the CLI, helps you collect data from storage, hosts, fabrics, and switches in both SAN and NAS environments. The collected data is used for troubleshooting, solution validation, data migration, and upgrade assessments. The diagnostic content related to your environment can be either sent to NetApp for further analysis or analyzed on-premises.

- **NetApp Data Migration Solaris Relabeler**

Solaris Relabeler is a command-line utility that provides the ability to update the ASCII label on volume table of contents (VTOC) disks after migration.

During the initial VTOC disk initialization routines, the Solaris format command performs a SCSI inquiry against the disk and writes vendor-specific information (manufacturer, product, and revision) to the disk label. All further inquiries are directed to the disk label and not to the actual device. Block-level migration copies this disk label to the new disk, and old SCSI inquiry data is still visible in the system tools and logs. The relabeler updates the disks post-migration with new inquiry data.

These tools and utilities are also useful in FLI migration projects:

- **Interoperability Matrix**

The Interoperability Matrix tool (IMT) is a NetApp web-based utility that is used for interoperability checks for NetApp, FlexArray, and third-party software components.

- **ONTAP System Manager**

ONTAP System Manager provides remote storage management of NetApp FAS systems using a graphical interface.

- **OnCommand Workflow Automation**

WFA is a software solution that enables you to create storage workflows and automate storage management tasks such as provisioning, migrating, decommissioning, and cloning storage.

Related information

[NetApp Tools](#)

[NetApp Tools: Data Center Planner](#)

[NetApp Interoperability Matrix Tool](#)

[NetApp Documentation: OnCommand System Manager \(current releases\)](#)

Benchmarks for estimating migration durations

For planning purposes certain assumptions can be used to estimate the level of effort and duration of data migrations.

To get an accurate estimate of your actual performance, you should run a number of test migrations of different sizes in order to get accurate performance numbers for your specific environments.



The following benchmarks are strictly for planning purposes and are unlikely to be particularly accurate for specific environments.

Assumptions: Five hours per host migration based on a host with 8 LUNs with a total of 2 TB of data. These parameters provide a planning number of approximately 400 GB per hour.

Foreign LUN Import

Foreign LUN Import overview

Foreign LUN Import (FLI) is a feature built into ONTAP that allows users to import data from foreign array LUNs to NetApp LUNs in a simple and efficient manner.

All FLI migrations operate at the LUN level. FLI is a strictly block-based tool; file, record, NFS, and CIFS-based migrations are not supported. For a discussion of other migration methodologies for file-level protocols, such as NFS and CIFS/SMB, review the [Data Migration Tools Quick Reference](#).

FLI leverages NetApp FlexArray® technology to discover the foreign RAID array LUNs and pull data from them. FlexArray allows a NetApp ONTAP controller to act as an initiator in front of one or more third-party arrays. FlexArray can mount LUNs from those arrays as back-end storage and then present the space from those LUNs as NetApp unified storage (allowing FCP, FCoE, iSCSI, NFS, and CIFS/SMB protocol access) to hosts in your SAN or NAS environment.

FLI doesn't require a FlexArray license. FLI leverages FlexArray technology to copy the foreign LUN to a NetApp ONTAP array and then allow the hosts and applications consuming that LUN to be pointed at the NetApp array that is now hosting the LUN in question. Although ONTAP no longer requires a professional-services-run migration, NetApp does strongly recommend professional services involvement in scoping, planning, and training for all but the simplest migrations.

FLI was developed to migrate SAN LUNs to ONTAP. FLI supports a range of migration requirements, including, but not limited to, the following:

- Migrating data between heterogeneous storage arrays from EMC, Hitachi, HP, and other vendors to NetApp as supported by FlexArray configuration.
- Simplifying and accelerating block data migrations during data center relocation, consolidation, and array replacements.
- Consolidating migration and LUN realignments into a single workflow.

In addition, the 7-Mode to ONTAP transition procedure is able to convert from 32-bit to 64-bit aggregates, fix alignment problems, and migrate LUNS as a single operation.

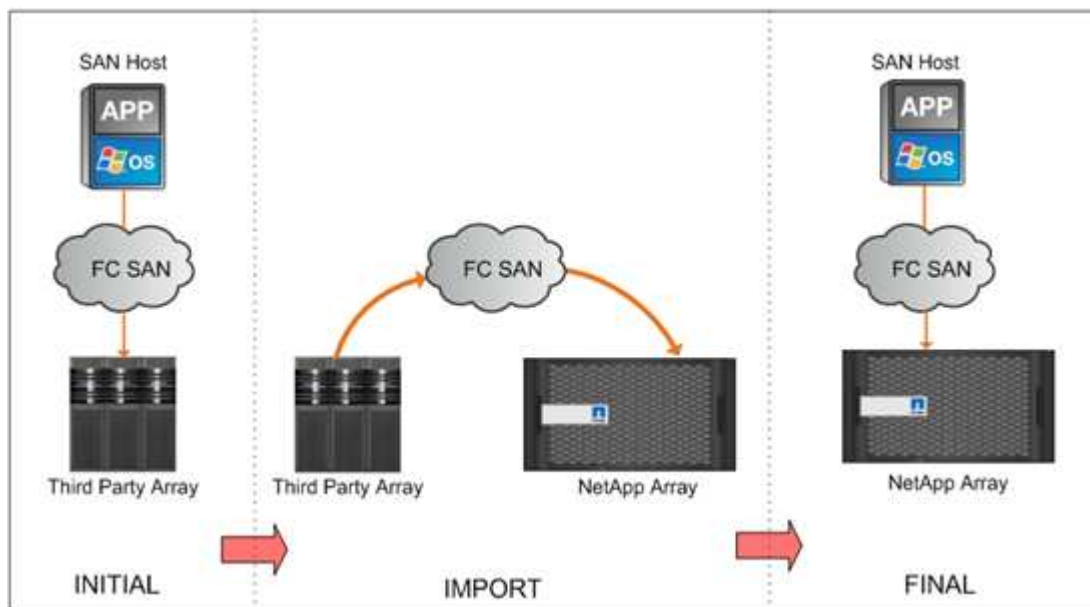
FLI enables the NetApp storage to discover the LUNs to be imported for data migration. The foreign LUNs are

shown as disks on the NetApp storage and have no ownership assigned to them automatically so that the user data is not overwritten by mistake. The disks that contain foreign array LUNs must be marked as foreign. The rules for configuring foreign array LUNs must be strictly adhered to in order to use FLI for NetApp storage. See the topic, [LUN requirements and limitations](#).

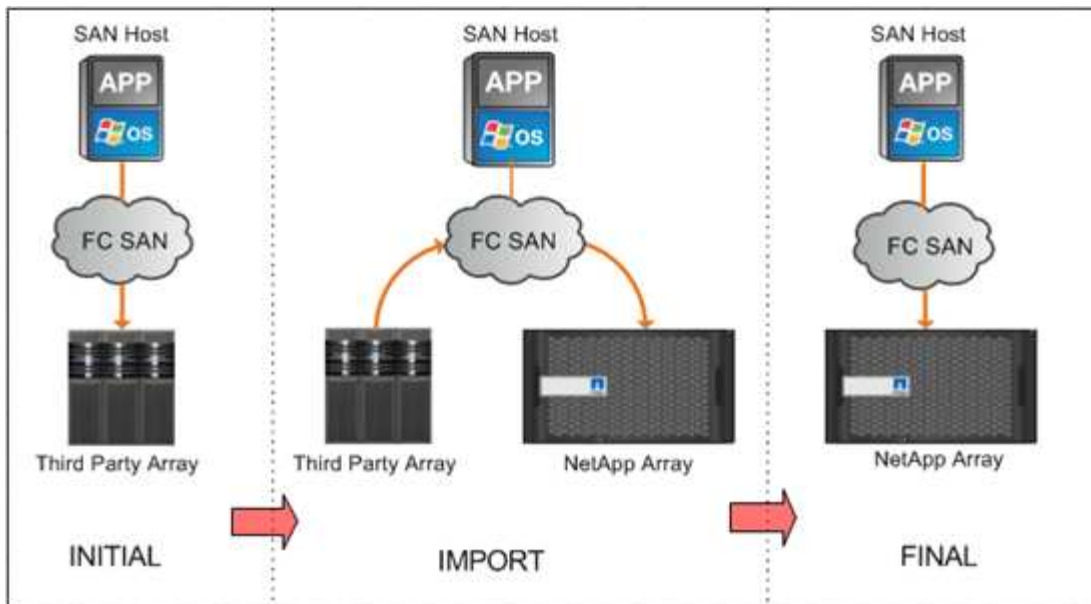
FLI requires at least one physical FC port on each controller and to have LUNs migrate directly in Initiator mode. Two ports, one to each fabric, are preferred, but a single port can be used. These ports are used to connect to the source array and need to be zoned and masked in order to be able to see and mount the source LUNs. If you need to change a port from target to initiator, see [FlexArray virtualization installation requirements and reference](#) for a review of the process of converting an FC port from target to initiator.

FLI migrations can be performed either offline, which disrupts operations for the duration of the import, or online, which is mainly non-disruptive.

This figure shows an FLI offline data migration, where the host is taken offline for the migration. The NetApp array copies the data directly from the third-party array.



This figure shows an FLI online data migration. The host is connected to the NetApp controller where the new LUN is now hosted. Host operation can then resume and continue during the import.



Foreign LUN Import features

FLI features allow you to migrate data from third-party SAN storage to ONTAP systems. FLI migration features support a variety of processes and systems.

- Support for online and offline migrations.
- Operating system independence: block-level data migration does not rely on volume managers or operating system utilities.
- Fibre Channel fabric independence: FLI is fully compatible with Brocade and Cisco FC fabrics.
- Support for most Fibre Channel storage arrays. See the Interoperability Matrix for a list of supported arrays.
- Support for native multipath and load balancing.
- CLI-based management.

Related information

[NetApp Interoperability Matrix Tool](#)

Benefits of an FLI-based solution

The FLI solution is designed to give NetApp customers exceptional value with these benefits.

- FLI is built into ONTAP and requires no additional licensing.
- FLI utilizes FlexArray technology, but does not require a FlexArray license.
- FLI does not require an additional hardware appliance for data migration.
- FLI-based solutions support a variety of migration types and configurations of third-party storage platforms.
- FLI automatically aligns LUNs and can migrate a LUN hosted in a 32-bit aggregate to a 64-bit aggregate hosted on an ONTAP array. This makes FLI for 7-Mode to ONTAP an excellent choice for transitioning 7-Mode-hosted LUNs that are hosted on 32-bit aggregates and/or are misaligned.

LUN requirements and limitations

Your LUNs should meet the following requirements before beginning an FLI migration.

- FLI requires at least one FC port on each controller and to have LUNs migrate directly in Initiator mode.
- Foreign LUN must be marked foreign on the destination array to prevent assignments from ONTAP.
- Foreign LUN must be in an import relationship before starting import.
- The LUN must be the same size as the foreign LUN and must have the same disk block size. Both of these requirements are taken care of during the LUN creation steps.
- The LUN must not be expanding or contracting.
- The LUN must be mapped to at least one igroup.
- NetApp LUN should be brought offline before creating a relationship. However, after the LUN relationship is created, it can be brought back online in case of online FLI.

Limitations

- All migrations are at the LUN level.
- FLI supports Fibre Channel (FC) connections only.
- FLI does not support iSCSI connections directly. In order for iSCSI LUNs to be migrated using FLI, the LUN type must be changed to FC. After the migration is complete, the LUN type is changed back to iSCSI.

FLI supported configurations

The FLI environment must be deployed in a supported manner to ensure proper operation and support. As engineering qualifies new configurations, the list of supported configurations will change. Refer to the NetApp Interoperability Matrix to verify support for specific configurations.

ONTAP 8.3 and later are the only supported destination storage. Migrations to third-party storage are not supported.

For a list of supported source storage arrays, switches, and firmware, see the Interoperability Matrix. The data migration program will provide support for the configurations in the NetApp Interoperability Matrix.

Once the import is complete and all LUNs have been migrated to NetApp controllers, ensure that all configurations are supported.

Related information

[NetApp Interoperability Matrix Tool](#)

Implementation basics for data migration

Implementation basics for data migration

A Foreign LUN Import (FLI) implementation includes the steps for physical wiring, zoning, and initiator record creation. The initial configuration of the NetApp storage initiator ports and source storage prepares the environment for migration.

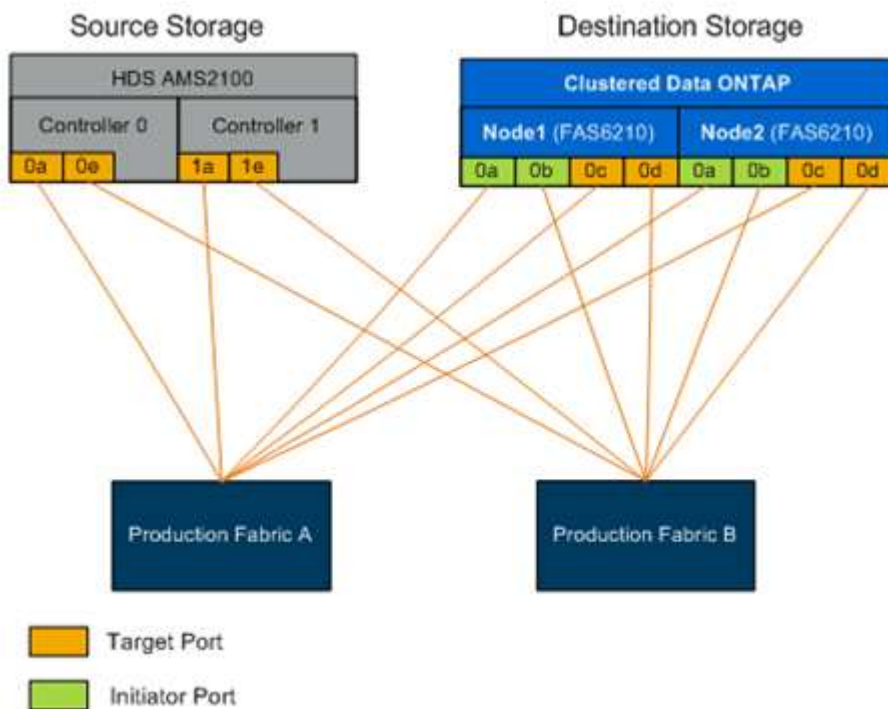
The examples in this section use a Hitachi Data Systems (HDS) AMS array, and therefore the foreign array commands will differ depending on the third-party array from which you are migrating.

Physical wiring requirements for FLI

FLI has the same wiring requirements as NetApp FlexArray. NetApp storage initiator ports are connected to the fabric where source storage target ports are connected. Follow FlexArray best practices while connecting source storage to NetApp storage.

The storage arrays used during migration must have a primary path from each controller (in use) present in both fabrics. This means that the source array and the destination array nodes being migrated to must be in a common zone on both fabrics. It is not necessary to add other controllers in the NetApp cluster, only those actually importing/migrating LUNs. While you could use indirect paths for the migration, the best practice is to use active/optimized paths between the source and destination arrays. The following figure shows both the HDS AMS2100 and NetApp ONTAP storage having a primary (active) path present in both fabrics.

This figure is an example of storage wiring for dual fabrics.



Follow these wiring best practices:

- Use the NetApp FlexArray best practices for wiring source and destination storage as discussed in [FlexArray virtualization installation requirements and reference](#).
- ONTAP storage requires free initiator ports to connect to fabric. Configure initiator ports if free ports do not exist.

Target and initiator port zoning

FLI migration requires source storage LUNs to be accessed by NetApp storage. This is achieved by zoning target ports of source storage with initiator ports of destination

storage.

The existing source storage-to-host zones are not modified and are deactivated post-migration. Host-to-destination storage zones are created to enable access of migrated LUNs from destination storage by the host.

A standard migration scenario using FLI requires four distinct zones:

- Zone 1: Source storage to destination storage (production fabric A)
- Zone 2: Source storage to destination storage (production fabric B)
- Zone 3: Host to destination storage (production fabric A)
- Zone 4: Host to destination storage (production fabric B)

Follow these zoning best practices:

- Do not mix source storage target ports and destination storage target ports in the same zone.
- Do not mix destination storage initiator ports and host ports in the same zone.
- Do not mix destination storage target and initiator ports in the same zone.
- Zone with at least two ports from each controller for redundancy.
- NetApp recommends single initiator and single target zoning.



After zoning the source storage target ports with the destination storage initiator ports, source storage will be visible in destination storage using the storage array show command. When the storage array is discovered for the first time, the NetApp controllers might not show the array automatically. Fix this by resetting the switch port where ONTAP initiator ports are connected.

FLI zoning requirements

A standard migration scenario using FLI requires four distinct zones. You should include specific ports in each zone.

- Zone 1: Source storage to destination storage (production fabric A)

Zone 1 should contain all destination storage initiators on all the nodes and all the source storage target ports in fabric A. Zone members include:

- ONTAP — Node1 — 0a
- ONTAP — Node2 — 0a
- AMS2100 — Ctrl0 — 0a
- AMS2100 — Ctrl1 — 1a

- Zone 2: Source storage to destination storage (production fabric B)

Zone 2 should contain all destination storage initiator ports on all the nodes and all the source storage target ports in fabric B. Zone 2 members include:

- ONTAP — Node1 — 0b
- ONTAP — Node2 — 0b
- AMS2100 — Ctrl0 — 0e

- AMS2100 — Ctrl1 — 1e
- Zone 3: Host to destination storage (production fabric A)

Zone 3 should contain the host bus adapter (HBA) port 1 and the destination controller ports in production Fabric A. Zone 3 members include:

- ONTAP — lif1
- ONTAP — lif3
- Host — HBA0
- Zone 4: Host to destination storage (production fabric B)

Zone 4 should contain the HBA port 2 and the destination controller ports in production fabric B. Zone 4 members include:

- ONTAP — lif2
- ONTAP — lif4
- Host — HBA1

Initiator group configuration

Proper LUN masking configuration is critical for correct operation. All initiator ports (on both nodes) in ONTAP storage must reside in the same igroup.

FLI migration requires source storage LUNs to be accessed by NetApp storage. To enable access apart from zoning, creating initiator groups on the source storage using the worldwide port name (WWPN) of the initiator ports of the destination storage is required.



The examples in this section use a Hitachi Data Systems (HDS) AMS array, and therefore the foreign array commands will differ depending on the third-party array from which you are migrating.

Always enable Asymmetric Logical Unit Access (ALUA) on initiator groups for NetApp arrays.

Initiator groups go by different names depending upon the vendor and product. For example:

- Hitachi Data Systems (HDS) uses “host group.”
- NetApp E-Series uses “host entry.”
- EMC uses “initiator record” or “storage group.”
- NetApp uses “igroup.”

Regardless of nomenclature, the purpose of an initiator group is to identify initiators by WWPNs that share the same LUN mappings.

To define initiator groups, review your array documentation for how to set up LUN masking (igroups/host groups/storage groups, and so on). You can also review [FlexArray virtualization implementation for third-party storage](#) for third-party storage configuration requirements.

Reasons to perform test migrations

NetApp recommends that all configurations be tested in a customer test environment before migration of production data.

You should perform a series of test migrations of different sizes before you perform your production migration. Performing test migrations before production migrations allows you to:

- Verify proper storage and fabric configuration.
- Estimate the duration and performance of the migration.

Using test migration results, you can estimate how long your production migration may take and the throughput that can be expected. Otherwise, the number of variables that can factor into how long migrations will take will make it difficult to accurately estimate.

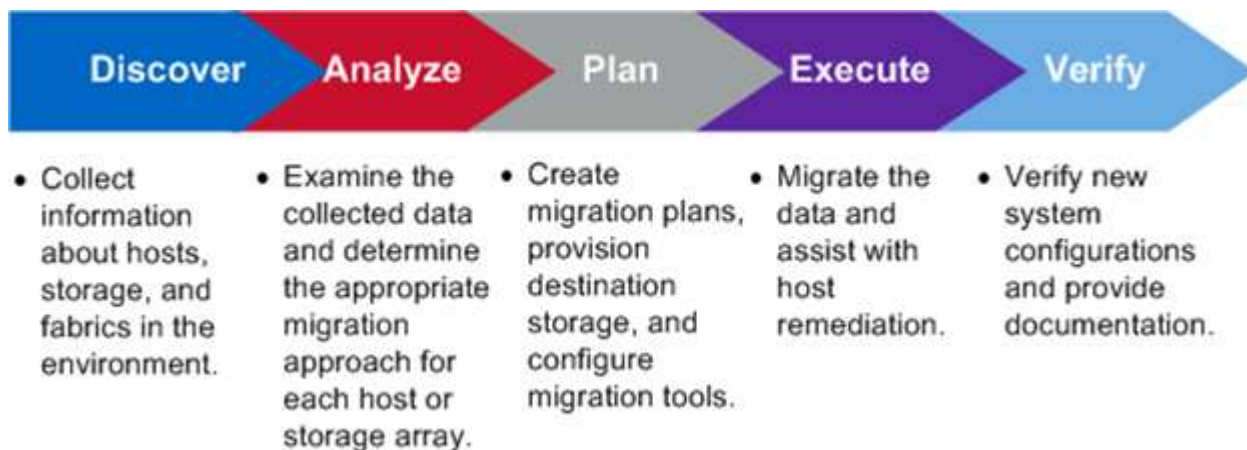


The test migration should be performed a minimum of one week prior to beginning the production data migrations. This will allow enough time to resolve possible issues such as access, storage connectivity, and licensing.

Migration process overview

Migration process overview

The FLI migration process is a five-phase methodology that applies to any data migration: discover, analyze, plan, execute, and verify.

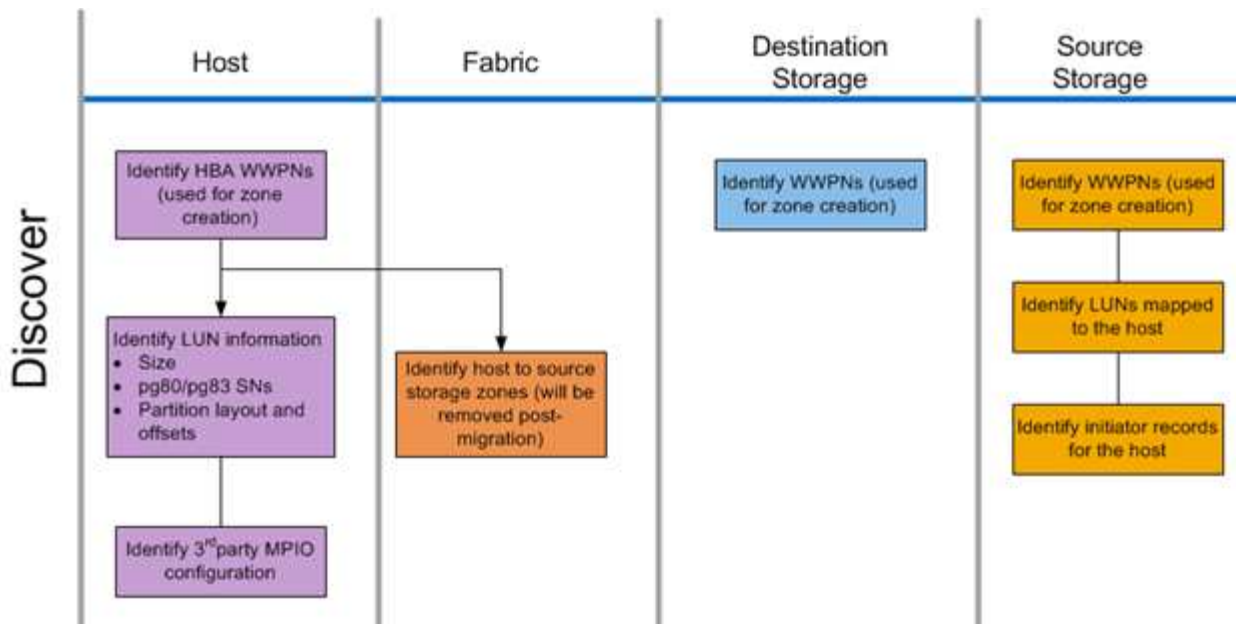


These phases provide a general framework to help identify where common tasks are performed throughout the migration process. The charts in this section show the tasks that can be performed in parallel in each of the four major components: host, fabric, destination storage, and source storage.

Discover phase workflow

The discover phase of the migration process focuses on collecting information used for host remediation and creating migration plans in the later steps. The collection of most information is automated using a data collection tool, such as OneCollect.

The following figure shows the discover phase workflow.



The discover phase tasks are listed in the following table.

Component	Tasks
Host	<ol style="list-style-type: none"> 1. Identify HBA WWPNs (used for zone creation). 2. Identify LUN information (size, serial numbers, partition layouts, and offsets). 3. Identify third-party MPIO configuration, host operating system, HBA/CNA models and firmware, and so on.
Fabric	Identify host to source storage zones. (These are removed post-migration).
Destination storage	Identify the WWPNs for the ports that will be used for initiator/target usage.
Source storage	<ol style="list-style-type: none"> 1. Identify WWPNs (used for zone creation). 2. Identify LUNs mapped to the host. 3. Identify initiator records for the host.

Analyze phase workflow

The analyze phase focuses on items that must be addressed before migration planning. Host configuration specifics that fall outside of the Interoperability Matrix must be identified.

For each host, a target configuration (post-migration) is identified, and a gap analysis is performed to identify specific components that are not supported. The host analysis should be reviewed immediately upon completion. Required updates might break compatibility with applications running on each host.

Usually, required host changes are not made until the actual migration event. This is due to the common need to schedule maintenance windows, but it is often less risky to do host changes in advance where possible, such as system patching and host bus adapter (HBA) updates. In addition, system updates are frequently done in coordination with application updates utilizing the same maintenance events. Typically, any changes made to the multipath I/O (MPIO) configuration before migration will affect the support of the current storage as well. For example, removing PowerPath from a host and reconfiguring it to use native MPIO and Asymmetric Logical Unit Access (ALUA) on Linux might not be supported by the current storage configuration.

Delaying MPIO reconfiguration until after the migration simplifies the process for rollback if required.

The planning phase tasks are listed in the following table.

Component	Tasks
Host	<ol style="list-style-type: none">1. Perform a gap analysis for each host. Identify required hot fixes/patches, OS updates, HBA driver, and firmware upgrades required to match the selected target configuration on the NetApp IMT. In addition, requirements for other NetApp software to be installed on this host (SnapDrive®, SnapManager®) should be taken into consideration.2. Determine a target configuration (post-migration) for each host (OS configuration, MPIO, HBA details, Host Utility Kit version).3. Determine additional NetApp product requirements (SnapDrive, SnapManager).

Related information

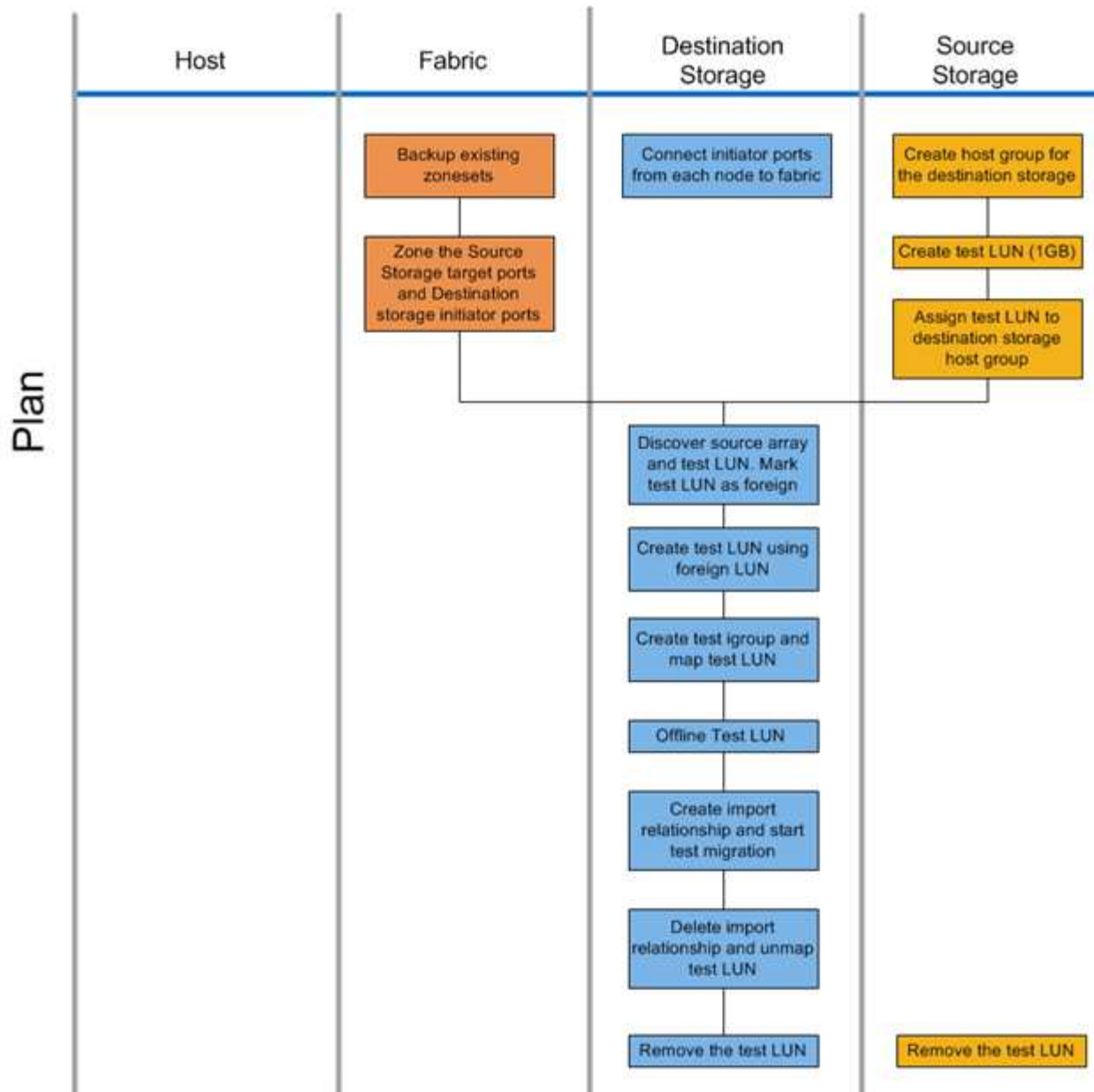
[NetApp Interoperability](#)

Plan phase workflow

The planning phase of the data migration process focuses on tasks required to create detailed migration plans and to make sure that everything is ready for the actual migration. The majority of migration work is the planning performed during this phase.

The planning phase is where you develop a remediation plan using the host gap analysis information gathered in the analysis phase. Use the host remediation information while planning. After end-to-end connectivity is verified, a test migration is performed to make sure everything is properly configured before beginning the production migration.

The following figure shows the plan workflow.



The planning phase tasks are listed in the following table.

Component	Tasks
Fabric	<ol style="list-style-type: none"> 1. Back up the existing zonesets. 2. Zone the source storage to destination storage.

Component	Tasks
Destination storage	<ol style="list-style-type: none"> 1. Connect initiator ports to fabric. 2. Discover source storage and test LUN. Mark the source LUN as foreign. 3. Create test LUN using foreign LUN. 4. Create test igroup and map test LUN. 5. Offline test LUN. 6. Create import relationship and start test migration. 7. Delete import relationship and unmap test LUN. 8. Remove the test LUN.
Source storage	<ol style="list-style-type: none"> 1. Create host group for destination storage using initiator port WWPNs. 2. Create test LUN (1GB). 3. Assign (map/mask) test LUN to destination storage host group. 4. Remove the test LUN.

FLI supported configurations

The FLI environment must be deployed in a supported manner to ensure proper operation and support. As engineering qualifies new configurations, the list of supported configurations will change. Refer to the NetApp Interoperability Matrix to verify support for specific configurations.

ONTAP 8.3 and later are the only supported destination storage. Migrations to third-party storage are not supported.

For a list of supported source storage arrays, switches, and firmware, see the Interoperability Matrix. The data migration program will provide support for the configurations in the NetApp Interoperability Matrix.

Once the import is complete and all LUNs have been migrated to NetApp controllers, ensure that all configurations are supported.

Related information

[NetApp Interoperability Matrix Tool](#)

Execute phase workflows

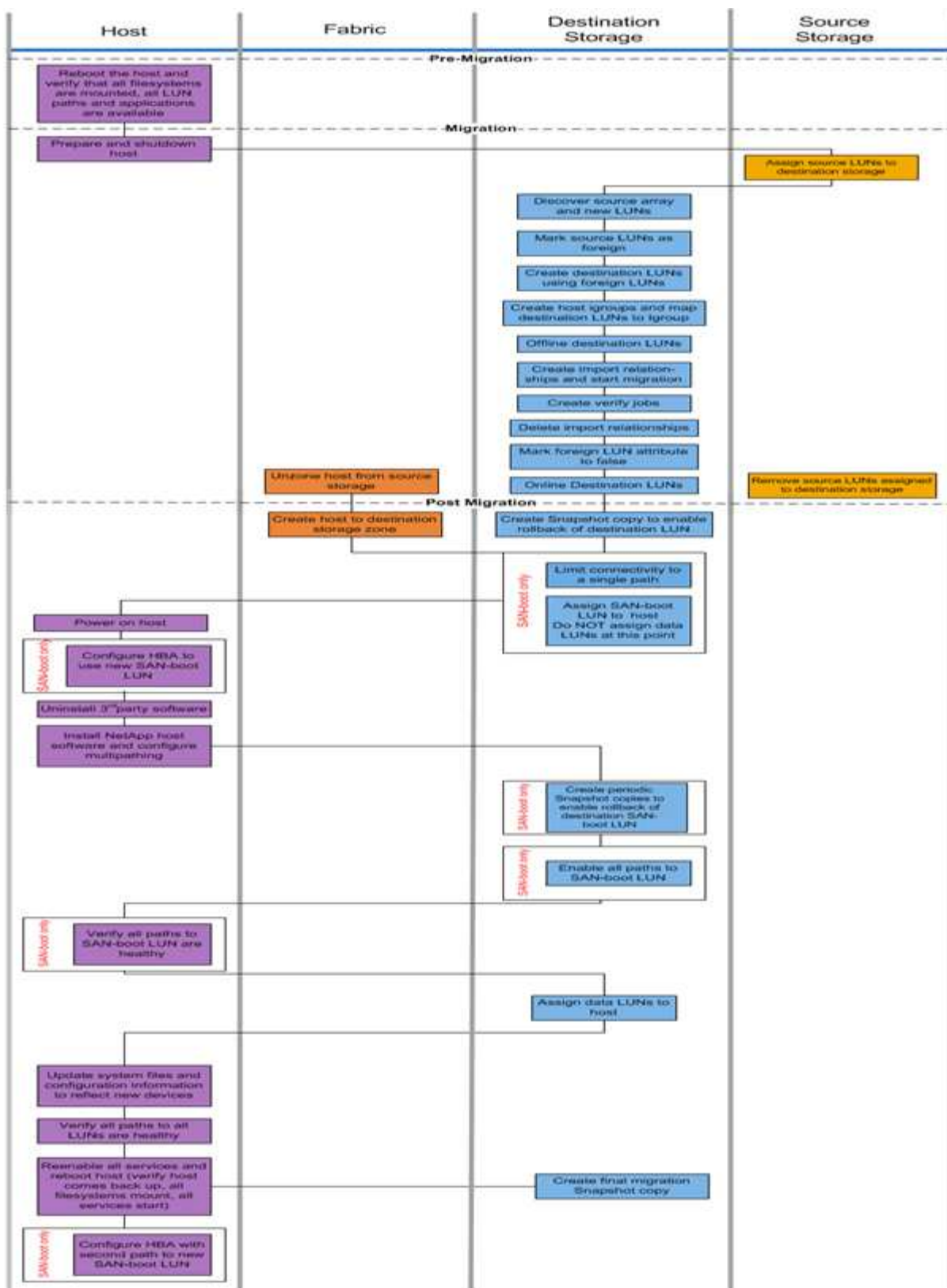
The execute phase focuses on the LUN migration tasks for performing an FLI offline or online migration.

The host event logs are reviewed in order to find and correct any problems and reduce risk. The hosts are rebooted to make sure that there are no underlying issues with the hosts before major reconfiguration occurs.

After the source LUNs are visible on the destination storage, migration jobs can be created and executed. After migrations are complete (FLI offline) or the FLI LUN relationship is established (FLI online), the host is zoned to the destination storage. New LUNs are mapped, and host remediation can begin for drivers, multipath software, and any other updates that have been identified in the analyze phase.

Offline migration workflow

The offline migration workflow is performed at the execute phase of the migration process. The offline workflow diagram shows the tasks that are performed on the host, the fabric, the destination storage and the source storage.



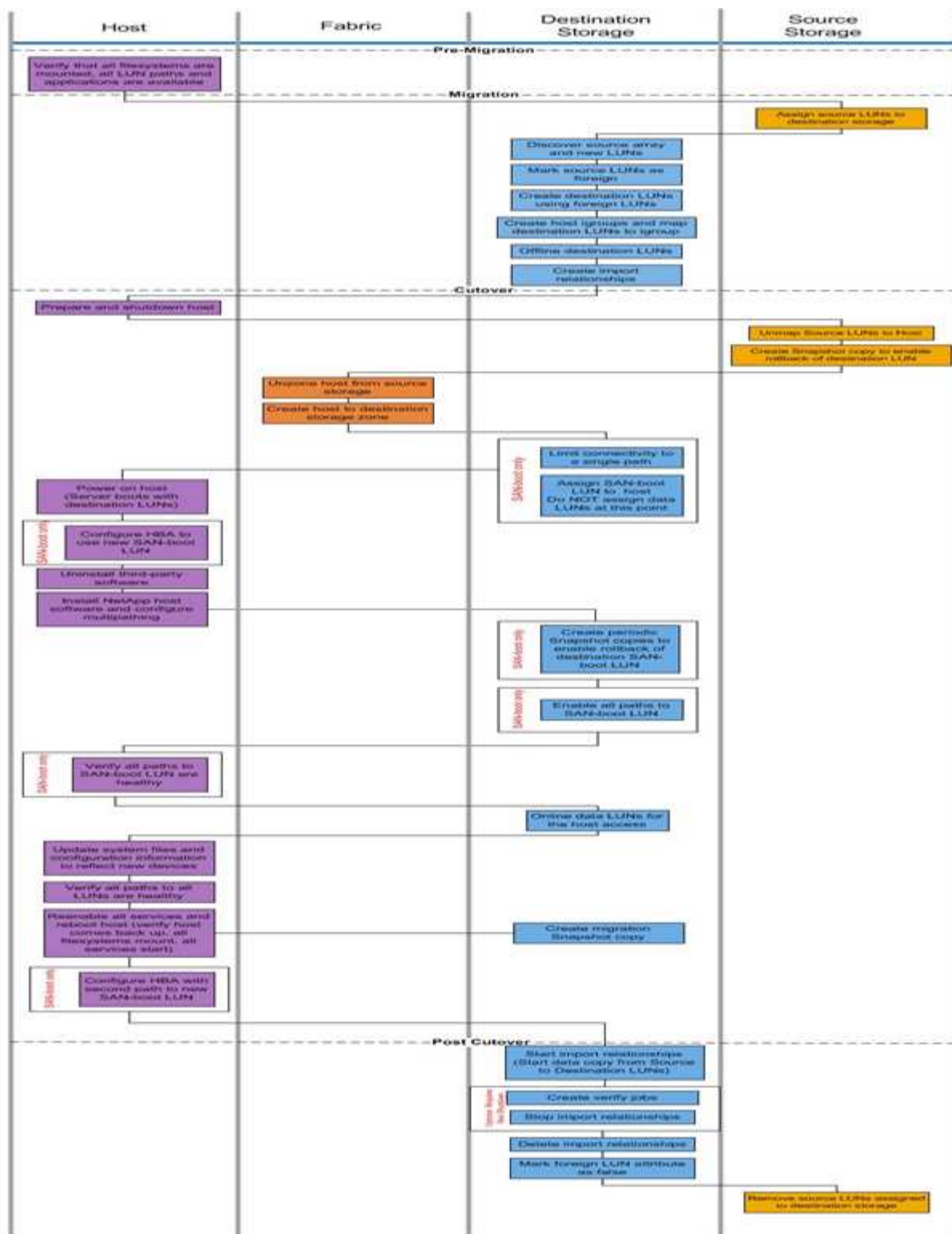
The offline workflow tasks are listed in the following table.

Component	Tasks
Host	<ol style="list-style-type: none"> 1. Reboot the host and verify that all file systems mount, all LUN paths are available, and services start. 2. Prepare and shut down the host. 3. After the migration completes, power on the host. 4. Configure the HBA to use new SAN boot LUN (SAN boot only). 5. Uninstall third-party MPIO. 6. Install NetApp host software and configure multipathing. 7. Verify all paths to SAN boot LUN are healthy (SAN boot only). 8. Update system files and configuration to reflect new devices. 9. Verify all paths to all LUNs are healthy. 10. Reenable all services and reboot host (verify host comes back up, all file systems mount, all services start). 11. Configure the HBA with the second path to new SAN boot LUN (SAN boot only).
Fabric	<ol style="list-style-type: none"> 1. Unzone the host from the source storage. 2. Create host to destination storage zone.

Component	Tasks
Destination storage	<ol style="list-style-type: none"> 1. Discover source array and new LUNs. 2. Mark source LUNs as foreign. 3. Create destination LUNs using foreign LUNs. 4. Create host initiator igroups and map destination LUNs to igroup.migration Snapshot copy. 5. Offline destination LUNs. 6. Create import relationships and start import jobs. 7. Create verify jobs (optional). 8. Delete import relationships. 9. Mark foreign LUN attribute to false. 10. Online destination LUNs. 11. Create a Snapshot® copy to enable rollback of destination LUN. 12. Limit connectivity to a single path (SAN boot only). 13. Assign SAN boot LUN to host; do not assign data LUNs at this point (SAN boot only). 14. Verify all host ports are logged in. 15. Create periodic Snapshot copies to enable rollback of destination SAN boot LUN (SAN boot only). 16. Enable all paths to SAN boot LUN (SAN boot only). 17. Assign data LUNs to host. 18. Create a final Snapshot copy.
Source storage	<ol style="list-style-type: none"> 1. Assign source LUNs to destination storage. 2. Remove the source LUNs assigned to destination storage.

Online migration workflow

The online migration workflow is performed at the execute phase of the migration process. The online workflow diagram shows the tasks that are performed on the host, the fabric, the destination storage and the source storage.



The online workflow tasks are listed in the following table.

Component	Tasks
Host	<ol style="list-style-type: none"> 1. Verify that all file systems are mounted and all LUN paths and applications are available. 2. Optional: If the LUNs being imported are for ESX, review and follow the instructions in Appendix A: ESX CAW/ATS Remediation. 3. Prepare and shut down the hosts. 4. Power on the hosts with destination LUNs. 5. Configure the HBA to use new SAN boot LUN (SAN boot only). 6. Uninstall third-party MPIO. 7. Install NetApp host software and configure multipathing. 8. Verify all paths to SAN boot LUN are healthy (SAN boot only). 9. Update system files and configuration to reflect new devices. 10. Verify all paths to all LUNs are healthy. 11. Reenable all services and reboot host (verify host comes back up, all file systems mount, all services start). 12. Configure the HBA with the second path to new SAN boot LUN (SAN boot only).
Fabric	<ol style="list-style-type: none"> 1. Unzone the host from the source storage. 2. Create host to destination storage zone.

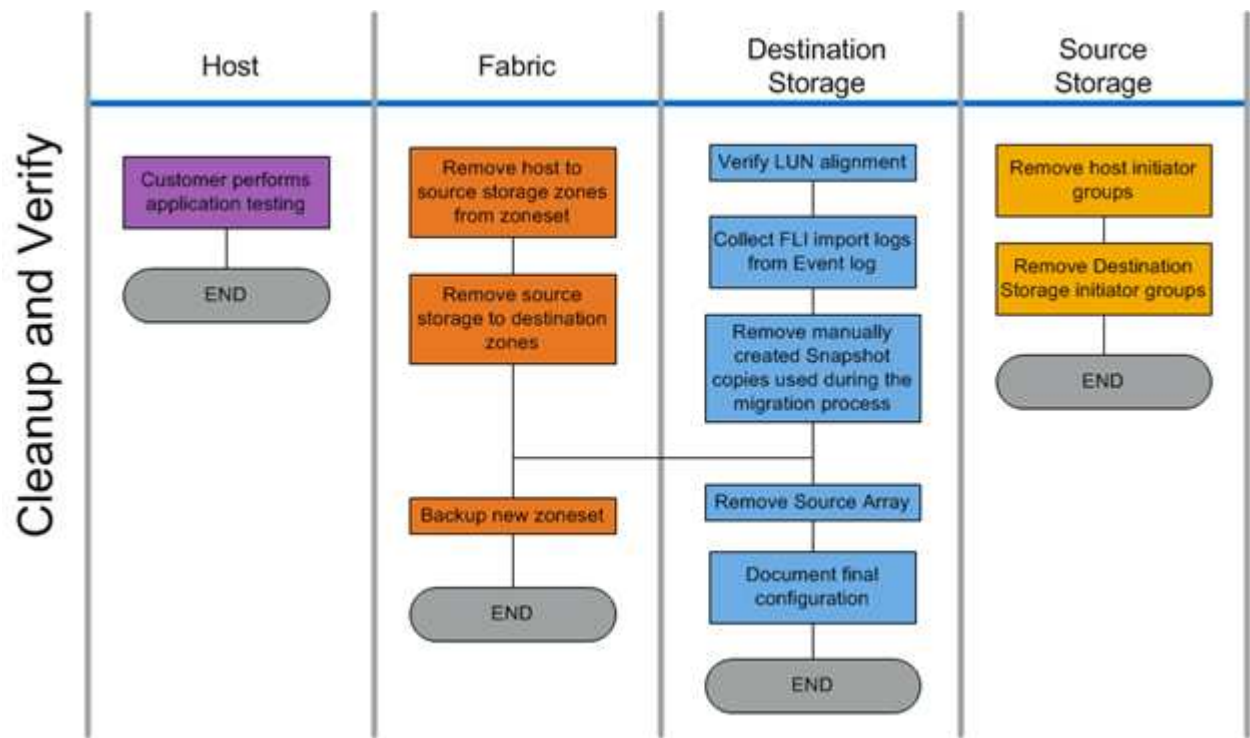
Component	Tasks
Destination storage	<ol style="list-style-type: none"> 1. Discover source array and new LUNs. 2. Mark source LUNs as foreign. 3. Create destination LUNs using foreign LUNs. 4. Create host initiator igroups and map destination LUNs to igroup. 5. Offline the destination LUNs. 6. Remove hosts from source array LUN masking (igroups). 7. Create import relationships and start import jobs. 8. Perform host step 4 earlier (remap hosts to new LUN locations). 9. Limit connectivity to a single path (SAN boot only). 10. Assign SAN boot LUN to host; do not assign data LUNs at this point (SAN boot only). 11. Create periodic Snapshot copies to enable rollback of destination SAN boot LUN (SAN boot only). 12. Enable all paths to SAN boot LUN (SAN boot only). 13. Online destination LUNs. 14. Create a Snapshot copy to enable rollback of destination LUN. 15. Start import relationships (start data copy from source to destination LUNs). 16. Create verify jobs and stop import relationships (optional). 17. Delete import relationships. 18. Mark foreign LUN attribute to false.
Source storage	<ol style="list-style-type: none"> 1. Assign source LUNs to destination storage. 2. Unmap source LUNs to host. 3. Create Snapshot copy to enable rollback of destination LUN. 4. Remove the source LUNs assigned to destination storage.

Verify phase workflow

The verify phase of the migration process focuses on the post-migration cleanup and confirming the accuracy of the execution of the migration plan. Initiator records on the

source storage and the zone between the source and destination zone are removed.

The following figure shows the verify phase workflow.



The verify phase tasks are listed in the following table.

Component	Tasks
Host	Customer performs application testing.
Fabric	<ol style="list-style-type: none">1. Remove host to source storage zones from the zoneset.2. Remove source storage to destination zones.3. Backup the new zoneset.
Destination storage	<ol style="list-style-type: none">1. Verify LUN alignment.2. Collect FLI import logs from the Event log.3. Remove manually created Snapshot copies used during the migration process.4. Remove source array.5. Document final configuration.
Source storage	<ol style="list-style-type: none">1. Remove host storage initiator groups.2. Remove destination storage initiator groups.

Discover phase data collection procedures

The discover phase collects customer environment information necessary for successful migration planning and execution.

Use Active IQ OneCollect in the data collection phase. For complete details, see the [Active IQ OneCollect documentation](#).

Analyze phase IMT best practices

Analyze phase IMT best practices

The analyze phase focuses on items that must be addressed before proceeding with the migration activities. The host configuration information must be compared to supported configurations documented in the NetApp Interoperability Matrix (IMT).

The IMT is a web-based utility that enables searching for information about configurations for NetApp products that work with third-party products and components qualified by NetApp. The IMT contains both supported and certified NetApp configurations. Supported configurations are those qualified by NetApp. Certified configurations are those qualified by a third-party company to work with NetApp components.

IMT best practices

- Enter the NetApp IMT recommendations for required software and upgrades into the Switches and Hosts section of your planning worksheet.
- Start by entering static information, such as ONTAP OS, protocol, and CF mode, into the IMT. Then, using the site survey as a filter guide, enter host OS, volume manager, and HBA information.
- Do not be so specific as to have no results returned; it is better to view multiple returned results and choose the best fit.
- Host HBAs are sometimes reported on the OEM part number and will need to be cross-referenced before they are entered into the IMT.
- Check each host against the IMT for supportability.

Related information

[NetApp Interoperability](#)

FLI interoperability and support criteria

The FLI Interoperability Matrix (IMT) is very similar to the FlexArray IMT, but was added as a distinctly different interoperability tool in order to better support the NetApp-qualified source arrays that work with FLI.

Prior to performing a Foreign LUN Import, two areas of interoperability need to be checked:

- Check that FLI is supported. You can do this by reviewing the FLI IMT.
- Check that the complete end-to-end configuration, after the import(s) are complete, is a supported configuration. This is done from the FAS/AFF IMT.

In addition, check these three criteria against the target ONTAP version:

- The source storage platform model and microcode version.
- The SAN switch model and microcode version.
- The NetApp controller, the customer environment (switches, HBAs, firmware, server hardware, etc.) and SAN-attached clients that mount the LUNs after migration.

If any of these three components are not supported, some remediation might be necessary to ensure full success and support during and after the migration process.

Related information

[NetApp Interoperability](#)

Checking supported configurations for FLI using the IMT

You should use the Interoperability Matrix Tool (IMT) to find information about configurations for NetApp products that work with third-party products and components qualified by NetApp.



Beginning in ONTAP 9.9.1, if your array is not listed as supported in the IMT, you can use the SAN LUN Migrate App on the NetApp Support Site to determine if your array might be supported.

Steps

1. Go to the Interoperability Matrix Tool.
2. Search for the array model.
3. Select the solution **Foreign LUN Import (FLI) Back-end Interoperability**.
4. Select the **FAS model** and **ONTAP version** to determine the supported configurations.
5. For front-end supported host configurations, click **build end to end view with ONTAP SAN host**.
6. For switch-supported configurations, click **build end to end view for SAN-Switch** from the **ONTAP SAN host** tab.

Related information

[NetApp Interoperability](#)

Checking supported configurations for FLI using the SAN LUN Migrate App

Beginning in ONTAP 9.9.1, you can use the SAN LUN Migrate App to qualify a foreign source array for FLI. The SAN LUN Migrate App can be used when the desired foreign array is not listed in the FLI IMT.

Steps

1. Go to the NetApp Support Site.
2. Under **Filter by category**, select **Migration**.
3. Under **SAN LUN Migration**, click **Download App**.
4. Run the app from a FC or iSCSI Linux host that has block access to the source array.

If the foreign source array can be qualified, a green check mark is displayed. If the foreign source array

cannot be qualified, a red X is displayed.

Enablement for non-supported LUNs

Enablement for non-supported LUNs

It is important to verify that the host OS, HBA, switch, and ONTAP array for your source array and your final configuration are all listed as supported in the Interoperability Matrix.

The following sections provide information for these use cases:

- Importing iSCSI LUNs as FC LUNs
- Moving migrated LUNs to AFF platforms

Related information

[NetApp Interoperability Matrix Tool](#)

Importing non-FC LUNs

Because Foreign LUN Import (FLI) leverages FlexArray technology to mount foreign LUNs, it can only connect to source arrays using FCP. Only FC LUNs are supported by FLI. However, there is a workaround that allows you to import iSCSI LUNs. Because you will be importing the iSCSI LUNs as FC LUNs, unlike other FLI online 7-Mode to ONTAP workflows, the disruption window would span this entire workflow:

Because you will be importing the iSCSI LUNs as FC LUNs, unlike other FLI online 7-Mode to ONTAP workflows, the disruption window would span this entire workflow.

Steps

1. On the source array, you will need to unmap the desired iSCSI LUN from its iSCSI igroup.
2. On the source array, map the LUN to a FC igroup, making sure that the destination array WWPNs have been added to the igroup.
3. Import the LUN.
4. After the LUN has been imported, you can create a new iSCSI igroup and add the hosts to the igroup.
5. On the hosts, rescan for LUNs.

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

Related information

[NetApp Interoperability Matrix Tool](#)

Using Foreign LUN Import to import LUNs into AFF

AFF does not support FlexArray in all releases of ONTAP software. In those releases,

you must stage Foreign LUN Imports (FLI) to a non-AFF high availability (HA) pair on the same cluster with the AFF.

Beginning with ONTAP 9.1, AFF supports FLI. You can use FKU to import LUNs from other arrays directly into ONTAP clusters.

As of ONTAP 8.3.2, AFF can support FLI with an approved Process Variance Request (PVR). Contact your NetApp account team to get the PVR submitted for approval. On approval, the submitter, usually a NetApp System Engineer, will receive an approval letter with instruction for enabling FLI functionality.

For versions of ONTAP software previous to 8.3.2, AFF does not currently support FlexArray due to some of the write optimizations that have been made. You will need to stage FLI imports to a non-AFF HA pair on the same cluster with the AFF. After the migration has been completed, you can then use non-disruptive operations (NDO) such as vol or LUN move to move the migrated LUNs to AFF. If your AFF cluster doesn't have any non-AFF nodes, talk to your account team about the possibility of borrowing swing gear to facilitate this.

Gap analysis report

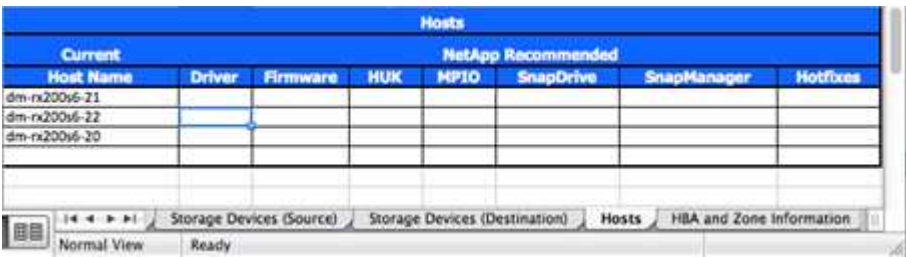
The gap analysis is a report of the customer's current and NetApp-recommended environment. It presents all recommended upgrades to the customer's environment that will need to take place post-migration.

The target configuration (post-migration) includes details for each host (OS configuration, MPIO, HBA details, Host Utility Kit version, and so on). Information about additional NetApp-required products, such as SnapDrive and SnapManager, is also available.

The changes required are typically not made until the actual migration event, because of the usual need to schedule maintenance windows. Typically, any changes made to the MPIO configuration before migration will affect the support of the current storage as well.

The completed NetApp Recommended section in the Hosts section of your Site Survey and Planning worksheet will serve as the gap analysis report. The gap analysis must be completed for every host included in the migration project. The completed gap analysis report must be reviewed with the customer.

The following is an example Gap analysis report.



The screenshot shows a table titled "Hosts" with two main sections: "Current" and "NetApp Recommended". The "Current" section has columns for Host Name, Driver, Firmware, HUK, MPIO, SnapDrive, SnapManager, and Hotfixes. The "NetApp Recommended" section has columns for MPIO, SnapDrive, SnapManager, and Hotfixes. The table lists three hosts: dm-nx200s6-21, dm-nx200s6-22, and dm-nx200s6-20. The bottom of the screenshot shows a navigation bar with tabs for Storage Devices (Source), Storage Devices (Destination), Hosts, and HBA and Zone Information. The Hosts tab is currently selected.

Hosts							
Current				NetApp Recommended			
Host Name	Driver	Firmware	HUK	MPIO	SnapDrive	SnapManager	Hotfixes
dm-nx200s6-21							
dm-nx200s6-22							
dm-nx200s6-20							

Plan and prepare phase procedures

Plan and prepare phase procedures

The FLI planning phase focuses on the tasks required to create detailed migration plans and prepare the customer environment for the actual migration. One or more test migrations are performed during this phase to verify the installation and setup of the

foreign LUN import.

The following are tasks to complete during the plan phase:

- Create a mapping of source and destination LUNs by entering the storage mapping information for each storage array in the LUN Details section of your Site Survey and Planning worksheet.
- Wire the source storage into the fabric based on the planning information.
- Configure the switch zones.
- Perform one or more test migrations to verify the installation and setup.

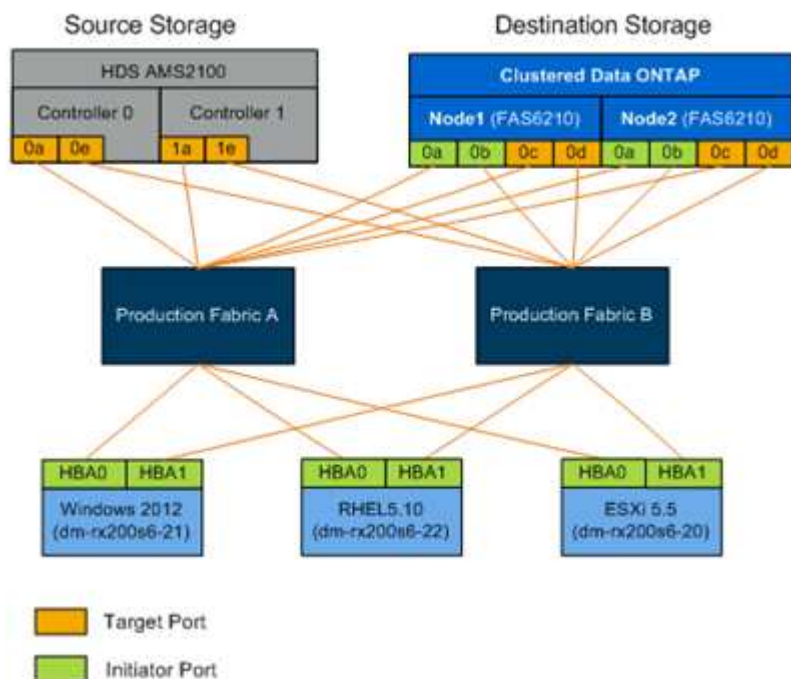
Wiring best practices for FLI migration

To configure ONTAP storage for FLI migration, you should wire the source storage into the fabric based on your planning information and recommended best practices.

The following wiring best practices are recommended when configuring ONTAP storage for FLI migration.

- Use dual fabrics for redundancy.
- Use at least two initiators and two target ports from each destination storage for FLI migration.
- Do not zone destination storage initiator ports with the host. Initiator ports of ONTAP are used to zone with target ports of source storage.

The following is an example of wiring for source storage and destination storage in a production fabric.

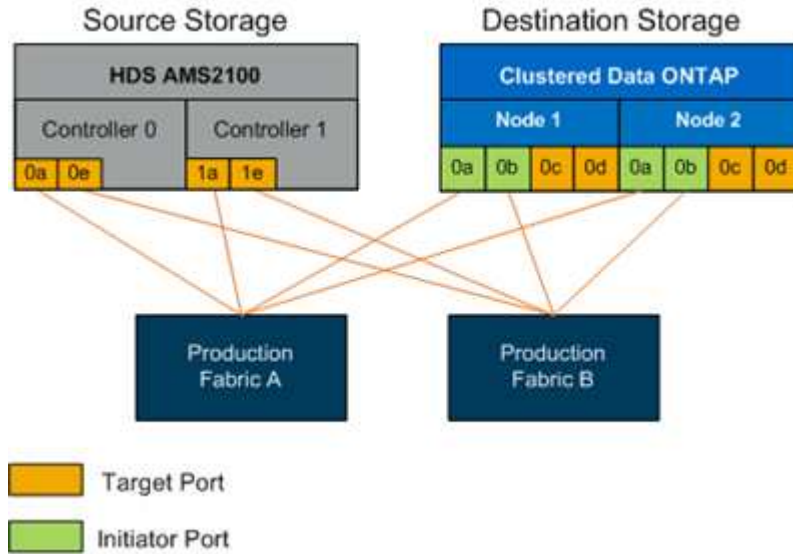


Configuring switch zones

You must create required zones on the SAN switches for connecting the source storage to the destination storage.

Steps

1. Back up the existing zonesets on each switch in the production and migration fabric.
2. Zone the source storage and destination storage as shown below.



3. Create the zone and add it to the zoneset in production fabric A.

The following is an example of the production zone, production fabric A for zone ZONE_AMS2100_cDOT_Initiator_fabA.

WWPN	Zone Members
50:06:0e:80:10:46:b9:60	AMS2100 Ctrl 0 Port 0a
50:06:0e:80:10:46:b9:68	AMS2100 Ctrl 1 Port 1a
50:0a:09:80:00:d3:51:59	ONTAP Node 1 Port 0a
50:0a:09:80:00:e7:81:04	ONTAP Node 2 Port 0a

4. Activate the zoneset in fabric A.
5. Create the zone and add it to the zoneset in production fabric B.

The following is an example of the production zone, production fabric A for zone ZONE_AMS2100_cDOT_Initiator_fabB.

WWPN	Zone Members
50:06:0e:80:10:46:b9:64	AMS2100 Ctrl 0 Port 0e
50:06:0e:80:10:46:b9:6c	AMS2100 Ctrl 1 Port 1e
50:0a:09:80:00:d3:51:59	ONTAP Node 1 Port 0b
50:0a:09:80:00:e7:81:04	ONTAP Node 2 Port 0b

6. Activate the zoneset in production fabric B.

How to configure source arrays

Consult the array documentation for the source array in order to add a host entry for the initiator ports (LUN masking, igroup in NetApp parlance). This information can be retrieved from the Storage Groups section of your Site Survey and Planning worksheet.

Migration tests

You should perform one or more test migrations in order to verify that your arrays, switches, and hosts are properly configured and also in order to get several samples that can be extrapolated from to determine migration durations and levels of effort.

Test migration example using Hitachi AMS2100

The following is an example test migration using a Hitachi AMS2100 as the foreign array. Depending on the arrays involved, host operating systems, and other variables, your steps may be different.

You can use the following example as a general guide to the steps required to perform test migrations. NetApp recommends performing test migrations as early as possible in order to find and have as much time as possible to resolve any issues brought to light by the tests. A test migration should be performed on all combinations of source and destination arrays before proceeding with the production migrations.

To perform a test migration, complete the following steps:

Steps

1. Create a 2 GB test LUN on the source array.
2. Log in to Hitachi Storage Navigator Modular as system.
3. Select AMS 2100 array.

4. Click **Show and Configure Array**.
5. Log in using root.
6. Expand **Groups** and select **Logical Units**.
7. Select **Create LU** to create the test LUN.
8. Create a test LUN of 2 GB.
9. Click **OK**.
10. Skip the LUN assignment here and proceed by clicking **Close**.
11. Verify LUN 0026 is created.
12. Expand **Groups** and select **Logical Units**.
13. Select **Host Groups** to map the test LUN to the cDOT_FLI host group.
14. Select host group cDOT_FLI created in the previous step and click **Edit Host Group**.
15. Choose the ports for the host group. In this example we choose 0a, 0e, 1a, 1e. Select the Forced Set to All Selected Ports option.

HSNM2

Edit Host Group - Port0A:012

Host Group Property

Enter the information for the host group to be created.

Host Group No.: 012

* Name:
 32 characters or less (alphanumeric characters, '!', '#', '\$', '%', '&', "'", '+', '-', '.', '=', '@', '^', '_', '{', '}', '~', '(', ')', '[', ']' or '.').

Options:

Platform: Linux
 Middleware: not specified

* Edit to:

Available Ports	
<input type="checkbox"/>	Port
<input checked="" type="checkbox"/>	0A
<input type="checkbox"/>	0B
<input checked="" type="checkbox"/>	0E
<input type="checkbox"/>	0F

☒ Forced set to all selected ports

16. Click **Logical Units** and add the test LUN LUN0026.
17. Click **OK** to map the LUN.
18. Select **Yes, I Have Read the Above Warning and Want to Edit Host Group** and click **Confirm**.
19. Verify host group creation and click **Close**.
20. Verify the test LUN and mapping from the source storage to destination storage and perform Foreign LUN Import (FLI) import.
21. Log in to the ONTAP storage through SSH using admin user.
22. Change the mode to Advanced. `DataMig-cmode::> set -privilege advanced`
23. Enter y when asked if you want to continue with advanced commands.
24. Discover the source array on ONTAP. Wait for a few minutes and retry to detect the source array.storage

```
array show
```

- a. 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.

For example, the DataMig-cmode cluster initiator ports 0a and 0b of ONTAP are connected to Cisco ports 4/9 and 4/11. To reset port 4/9 on the Cisco switch:

```
conf t
interface fc4/9
shutdown
no shutdown
exit
exit
```

Resetting one port is usually enough. Check the array list and LUN paths after resetting one port.

25. Verify the source array is discovered through all the initiator ports: `storage array config show -array-name HITACHI_DF600F_1`

Node Initiator	LUN Group	LUN Count	Array Name	Array Target Port

DataMig-cmode-01 0a	0	1	HITACHI_DF600F_1	50060e801046b960
0b				50060e801046b964
0a				50060e801046b968
0b				50060e801046b96c
DataMig-cmode-02 0a	0	1	HITACHI_DF600F_1	50060e801046b960
0b				50060e801046b964
0a				50060e801046b968
0b				50060e801046b96c

26. List the test LUN mapped from Hitachi storage and verify the disk properties and paths: `storage disk show -array-name HITACHI_DF600F_1 -instance`

```

        Disk: HIT-1.1
    Container Type: unassigned
        Owner/Home: - / -
        DR Home: -
    Stack ID/Shelf/Bay: - / - / -
        LUN: 0
        Array: HITACHI_DF600F_1
        Vendor: HITACHI
        Model: DF600F
        Serial Number: 83017542001A
        UID:
48495441:43484920:38333031:37353432:30303236:00000000:00000000:00000000:
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
    -----
    -----
    -----
    DataMig-cmode-01    0a              0  DM-Cisco9506-1:4-9    DM-Cisco9506-
    1:2-24    AO  INU  50060e801046b968          2  2 Gb/s          0
    0
    DataMig-cmode-01    0b              0  DM-Cisco9506-2:4-9    DM-Cisco9506-
    2:2-24    AO  INU  50060e801046b96c          2  2 Gb/s          0
    0
    DataMig-cmode-01    0b              0  DM-Cisco9506-2:4-9    DM-Cisco9506-
    2:1-14    AO  INU  50060e801046b964          1  2 Gb/s          0
    0
    DataMig-cmode-01    0a              0  DM-Cisco9506-1:4-9    DM-Cisco9506-
    1:1-14    AO  INU  50060e801046b960          1  2 Gb/s          0
    0
    DataMig-cmode-02    0a              0  DM-Cisco9506-1:4-11    DM-Cisco9506-
    1:2-24    AO  INU  50060e801046b968          2  2 Gb/s          0
    0
    DataMig-cmode-02    0b              0  DM-Cisco9506-2:4-11    DM-Cisco9506-
    2:2-24    AO  INU  50060e801046b96c          2  2 Gb/s          0
    0

```

```

DataMig-cmode-02    0b                0  DM-Cisco9506-2:4-11  DM-Cisco9506-
2:1-14    AO  INU  50060e801046b964                1    2 Gb/s                0
0
DataMig-cmode-02    0a                0  DM-Cisco9506-1:4-11  DM-Cisco9506-
1:1-14    AO  INU  50060e801046b960                1    2 Gb/s                0
0

Errors:
-

DataMig-cmode::*>

```

27. Mark the source LUN as foreign using the serial number: `storage disk set-foreign-lun { -serial-number 83017542001A } -is-foreign true`
28. Verify the source LUN is marked as foreign: `storage disk show -array-name HITACHI_DF600F_1`
29. List all foreign arrays and their serial numbers: `storage disk show -container-type foreign -fields serial-number`



The LUN create command detects the size and alignment based on partition offset and creates the LUN accordingly with the foreign-disk argument.

30. Create a destination volume: `vol create -vserver datamig flivol aggr1 -size 10g`
31. Create a test LUN using a foreign LUN: `lun create -vserver datamig -path /vol/flivol/testlun1 -ostype linux -foreign-disk 83017542001A`
32. List the test LUN and verify the size of the LUN with the source LUN: `lun show`



For FLI offline migration, the LUN must be online to map it to an igroup and then must be offline before creating the LUN import relationship.

33. Create test igroup of protocol FCP without adding any initiators: `lun igroup create -vserver datamig -igroup testig1 -protocol fcp -ostype linux`
34. Map the test LUN to the test igroup: `lun map -vserver datamig -path /vol/flivol/testlun1 -igroup testig1`
35. Offline the test LUN: `lun offline -vserver datamig -path /vol/flivol/testlun1`
36. Create import relationship with test LUN and foreign LUN: `lun import create -vserver datamig -path /vol/flivol/testlun1 -foreign-disk 83017542001A`
37. Start the migration (import): `lun import start -vserver datamig -path /vol/flivol/testlun1`
38. Monitor the import progress: `lun import show -vserver datamig -path /vol/flivol/testlun1`
39. Check the import job is completed successfully: `lun import show -vserver datamig -path /vol/flivol/testlun1`

```

vserver foreign-disk    path                                operation admin operational
percent                                                         in progress state state
complete
-----
-----
datamig 83017542001A    /vol/flivol/testlun1
                                                         import    started
                                                         completed
100

```

40. Start the verify job to compare source and destination LUNs. Monitor the verify progress: `lun import verify start -vserver datamig -path /vol/flivol/testlun1`

```

DataMig-cmode::*> lun import show -vserver datamig -path
/vol/flivol/testlun1
vserver foreign-disk    path                                operation admin operational
percent                                                         in progress state state
complete
-----
-----
datamig 83017542001A    /vol/flivol/testlun1
                                                         verify    started
                                                         in_progress
44

```

41. Check the verify job is complete without any errors: `lun import show -vserver datamig -path /vol/flivol/testlun1`

```

vserver foreign-disk    path                                operation admin operational
percent                                                         in progress state state
complete
-----
-----
datamig 83017542001A    /vol/flivol/testlun1
                                                         verify    started
                                                         completed
100

```

42. Delete the import relationship to remove the migration job: `lun import delete -vserver datamig -path /vol/flivol/testlun1`lun import show -vserver datamig -path`

```
/vol/flivol/testlun1
```

43. Unmap the test LUN from the test igroup: `lun unmap -vserver datamig -path /vol/flivol/testlun1 -igroup testig1`
44. Online the test LUN: `lun online -vserver datamig -path /vol/flivol/testlun1`
45. Mark the foreign LUN attribute to false: `storage disk modify { -serial-number 83017542001A } -is-foreign false`



Do not remove the host group created on source storage with ONTAP initiator ports. The same host group is reused during migrations from that source array.

46. Remove test LUN from source storage.
 - a. Log in to Hitachi Storage Navigator Modular as a system.
 - b. Select AMS 2100 array and click **Show and Configure Array**.
 - c. Log in using root.
 - d. Select **Groups**, then select **Host Groups**.
 - e. Select *cDOT_FLI Igroup* and click **Edit Host Group**.
 - f. In the **Edit Host Group** window, select all target ports chosen to map the test LUN and select **Forced Set to All Selected Ports**.
 - g. Select the **Logical Units** tab.
 - h. Select the test LUN from the **Assigned Logical Units** window.
 - i. Select **Remove** to remove the LUN mapping.
 - j. Click OK.
 - k. Do not remove the host group and continue deleting the test LUN.
 - l. Select Logical Units.
 - m. Select the test LUN created in the previous step (LUN0026).
 - n. Click **Delete LUN**.
 - o. Click **Confirm** to delete the test LUN.
47. Delete the test LUN on the destination storage.
 - a. Log in to the ONTAP storage through SSH using admin user.
 - b. Offline the test LUN on the NetApp storage system: `lun offline -vserver datamig -path /vol/flivol/testlun1`



Make sure you do not select another host LUN.

- c. Destroy the test LUN on the NetApp storage system: `lun destroy -vserver datamig -path /vol/flivol/testlun1`
- d. Offline the test volume on the NetApp storage system: `vol offline -vserver datamig -volume flivol`
- e. Destroy the test volume on the NetApp storage system: `vol destroy -vserver datamig -volume flivol`

FLI offline workflow

FLI offline workflow

This section provides an example of the FLI offline workflow, one of the four FLI workflows.

This workflow uses an HDS AMS2100 array as the source array. The offline workflow has the following tasks:

1. Preparation for cutover
2. Importing the data
3. Verifying migration results (optional)
4. FLI offline post-migration tasks

FLI offline: Preparation for cutover

FLI offline: Preparation for cutover

During pre-migration of foreign LUN imports (FLIs), validate and verify the hosts and source LUN paths. After the host reboots, it is shut down in preparation for the migration.

When migration and remediation are complete, hosts can be brought up connected to the new destination storage, and the applications can be verified by end users.

Rebooting the host to validate the system state

Migration hosts are rebooted prior to making any changes to their configuration. Before proceeding with migration, verify that the system is in a known good state.

To verify that the server configuration is persistent and pristine across reboots, complete the following steps:

Steps

1. Shut down all your open applications.
2. Reboot the host.
3. Review the logs for errors.

Verifying host LUN path and multipath configuration verification

Verifying host LUN path and multipath configuration verification

Prior to any migrations, verify that multipathing is correctly configured and working properly. All available paths to LUNs should be active.

Multipath verification for Windows hosts

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

Complete the following steps for Windows hosts.

Steps

1. Open Disk Management.
 - a. On the Windows desktop, click **Start**.
 - b. In the Start Search field, type `diskmgmt.msc`.
 - c. In the Programs list, click `diskmgmt`.
2. Right-click each disk for which you want to verify the multiple paths and then click **Properties**.
3. On the MPIO tab, in the Select the MPIO policy list, click all the paths that are active.



To verify multipathing using the command line, complete the following steps:

4. Open Windows command prompt.
5. Run `mpclaim.exe --v c:\multipathconfig.txt` to capture multipath configuration.

Multipath verification for Linux hosts

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

Complete the following steps for Linux hosts.

Step

1. To verify that DM-MP multipath is configured and functioning correctly on a Linux host, run the following commands:
`multipath -ll`

```

mpath2 (360060e801046b96004f2bf4600000012) dm-6 HITACHI,DF600F
[size=2.0G][features=0][hwhandler=0][rw]
\_ 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
[size=2.0G][features=0][hwhandler=0][rw]
\_ 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
[size=20G][features=0][hwhandler=0][rw]
\_ 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
[size=3.0G][features=0][hwhandler=0][rw]
\_ 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 hosts.

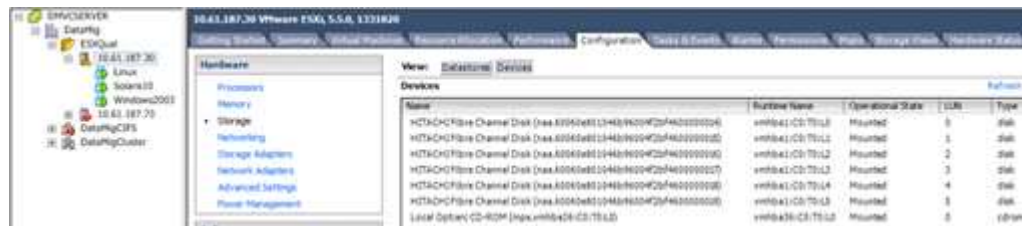
Complete the following steps for ESXi hosts.

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/270b9371-8fbcdc2b-1f3b-47293e2ce0da
270b9371-8fbcdc2b-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.020002000060060e801046b96004f2bf4600000016444636303046
~ # 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.020003000060060e801046b96004f2bf4600000017444636303046
~ # 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.020005000060060e801046b96004f2bf4600000019444636303046
~ # 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.020004000060060e801046b96004f2bf4600000018444636303046
~ #
```



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.020002000060060e801046b96004f2bf4600000016444636303046
naa.60060e801046b96004f2bf4600000016
vml.020002000060060e801046b96004f2bf4600000016444636303046
~ # esxcfg-scsidevs -u | grep
vml.020003000060060e801046b96004f2bf4600000017444636303046
naa.60060e801046b96004f2bf4600000017
vml.020003000060060e801046b96004f2bf4600000017444636303046
~ # esxcfg-scsidevs -u | grep
vml.020005000060060e801046b96004f2bf4600000019444636303046
naa.60060e801046b96004f2bf4600000019
vml.020005000060060e801046b96004f2bf4600000019444636303046
~ # esxcfg-scsidevs -u | grep
vml.020004000060060e801046b96004f2bf4600000018444636303046
naa.60060e801046b96004f2bf4600000018
vml.020004000060060e801046b96004f2bf4600000018444636303046
~ #

```

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.

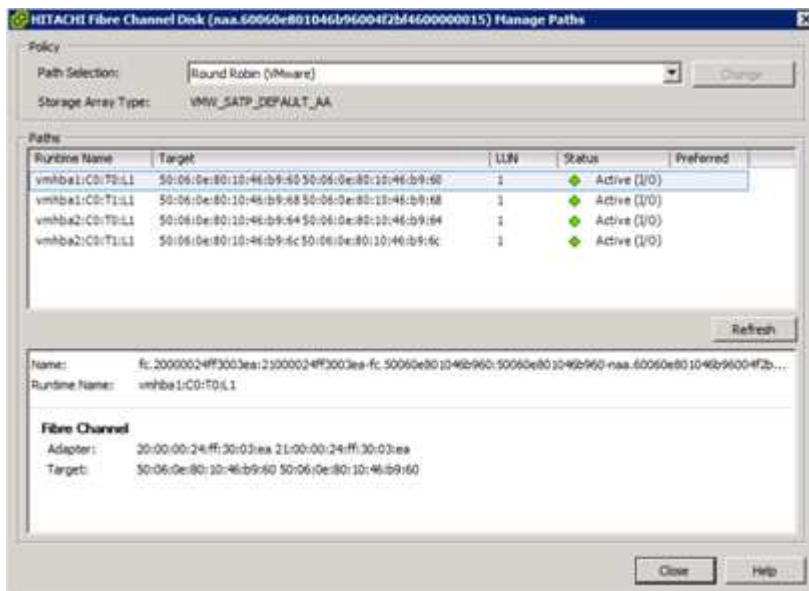
You will need this information later, when adding RDM devices to the VM.

```

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
```

Prepare hosts for FLI offline migration

The FLI offline execution phase includes the preparation of migration hosts.

In many instances it may be possible to have performed this remediation prior to this step. If not, then this is where you would perform any host remediation such as installing host attach kits or DSMs. From the analysis phase, you will have a gap list of items that need to be performed on each host in order for that host to be in a supported configuration using ONTAP. Depending on the type of migration being performed, either the host would be remediated and then rebooted (online FLI/7-Mode to ONTAP FLI), or it would be remediated and then shut down pending the completion of the migration process (offline FLI).

Presenting source LUNs to ONTAP storage during FLI

As part of the offline FLI process, you must present your source LUNs to your ONTAP storage.

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.

Verifying source LUNs on destination storage for offline FLI

As part of the offline Foreign LUN Import process, you must verify your source LUNs on your destination storage.

Steps

1. Verify the source LUNs and mapping from source storage to destination storage.
2. Log in to the ONTAP storage 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`

```
DataMig-cmode::*> 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.

```
DataMig-cmode::*> storage array config show -array-name HITACHI_DF600F_1
```

Node	LUN Group	LUN Count	Array Name	Array Target Port
Initiator				

DataMig-cmode-01	0	1	HITACHI_DF600F_1	50060e801046b960
0a				50060e801046b964
0b				50060e801046b968
0a				50060e801046b96c
0b				
DataMig-cmode-02	0	1	HITACHI_DF600F_1	50060e801046b960
0a				50060e801046b964
0b				50060e801046b968
0a				50060e801046b96c
0b				

7. List the source LUNs mapped from Hitachi storage. Verify the disk properties and paths.

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.

```
DataMig-cmode::*> 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.

DataMig-cmode::*>
```

Configuring migration jobs

The FLI offline workflow requires configuration of the source LUN and destination LUNs.

Steps

1. For FLI migration, the source LUN needs to be marked as foreign. Mark the source LUNs as foreign using the serial number.

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

2. Verify the source LUN is marked as foreign.

```
DataMig-cmode::~*> 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.
```

3. Create destination volumes.

```
DataMig-cmode::~*> vol create -vserver datamig winvol aggr1 -size 100g
[Job 5606] Job succeeded: Successful
```

4. Disable default Snapshot policy on each volume. If default Snapshot copies exist prior to FLI migration, the volume needs additional space to store changed data.

```
DataMig-cmode:::> 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.
```

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

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

6. Check your volume settings.

```
DataMig-cmode::> vol show -vserver datamig -volume * -fields fractional-
reserve,snapshot-policy
vservervolumesnapshot-policyfractional-reserve
-----
datamig datamig_rootnone0%
datamigwinvolnone0%
Volume modify successful on volume winvol of Vserver datamig.
```

7. Delete any existing Snapshot copies.

```
DataMig-cmode::> set advanced; snap delete -vserver datamig -vol winvol
-snapshot * -force true
1 entry was acted on.
```



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.



The LUN create command detects the size and alignment based on partition offset and creates the LUN accordingly with foreign-disk option. For a review, see the NetApp Knowledgebase article **What is an unaligned I/O?** Also note that some I/O will always appear be partial writes and will therefore look misaligned. Examples of this would be database logs.

What is an unaligned I/O?

8. Create destination LUNs using foreign LUN.

```
DataMig-cmode::~*> 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-cmode::~*> lun create -vserver datamig -path
/vol/linuxvol/lvmlun1 -ostype linux -foreign-disk 830175420011

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

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

9. List the destination LUNs and verify the size of LUN with source LUN.

```
DataMig-cmode::*> 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.

DataMig-cmode::*>
```



For FLI offline migration, the LUN must be mapped to the igroup and then be offlined before creating the LUN import relationship.

10. Create host igroup of protocol FCP and add initiators. Find initiator WWPNs from storage groups section of your Site Survey planning worksheet.

```
DataMig-cmode::*> 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-cmode::*> 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-cmode::*> 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.

11. Map the destination LUNs to igroup.


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

12. Offline the destination LUNs.

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

13. Create import relationship with destination LUN and source LUN.

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

14. Verify the import job creation.

```

DataMig-cmode::*> 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.

```

FLI offline: Importing the data

These steps describe how to import the data from the source LUN to the destination LUN.

Steps

1. Start the migration import.

```

DataMig-cmode::*> lun import start -vserver datamig -path
/vol/winvol/bootlun

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

DataMig-cmode::*> lun import start -vserver datamig -path
/vol/winvol/gdrive

```

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

```
DataMig-cmode::~*> lun import show -vserver datamig -fields vsriver,
foreign-disk, path, admin-state, operational-state, percent-complete,
imported-blocks, total-blocks, , estimated-remaining-duration
vsriver 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. Check the import job is completed successfully.

```
DataMig-cmode::~*> lun import show -vserver datamig -fields vsriver,
foreign-disk, path, admin-state, operational-state, percent-complete,
imported-blocks, total-blocks, , estimated-remaining-duration
vsriver 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 completed
100
3 entries were displayed.
```

FLI offline: Verifying migration results

A verify job is optional, but recommended. It is a block-by-block comparison of the source and destination LUNs. Verify jobs take almost the same or slightly more time than migration time.

Steps

1. Start the verify job to compare source and destination LUN. Monitor the verify progress.

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

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

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

2. Monitor the verify job status.

```
DataMig-cmode::*> 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.
```

3. Confirm that verify jobs are completed.

```
DataMig-cmode::*> 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 -
datamig 83017542000F /vol/winvol/gdrive started completed
100 - 6291456 -
datamig 830175420010 /vol/linuxvol/bootlun
started completed
100 - 41943040 -
3 entries were displayed.
```

4. Stop the verify job after verify is completed.

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

5. Delete the import relationship to remove the migration job.

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

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

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

6. Verify import jobs are deleted.

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

7. Mark the foreign LUN attribute to false.

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

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

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

8. Verify the foreign LUNs are marked as false after import.

```
DataMig-cmode::*> 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.
```

9. Bring the destination LUNs online using the lun online command.

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

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

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

10. Verify the LUNs are online.

```
DataMig-cmode::*> 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.



Import logs are stored in cluster event log file.

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

```
7/7/2014 18:37:21 DataMig-cmode-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-cmode-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-cmode-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.
```

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.

FLI online workflow

FLI online workflow

This is the second of the four FLI workflow examples, which covers FLI online migration. The source array in this example is an EMC VNX5500.

the online workflow has the following tasks:

1. Preparing the LUN path
2. Performing a disruptive cutover
3. Importing the source LUN data
4. Verifying migration results
5. Cleaning up the FLI online migration
6. FLI online post-migration tasks



If the NetApp controller destination is a MetroCluster, do NOT use the online workflow. 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 the destination is MetroCluster, use the FLI offline process.

Rebooting hosts

You have the option to reboot hosts prior to starting this workflow in order to verify that the host is in a known good state.

Before rebooting your host, it would also be a good time to take a Snapshot copy in order to facilitate a revert if needed later. To verify that the server configuration is persistent and pristine across reboots, complete the following steps:

Steps

1. Shut down all your open applications.
2. Reboot the host.
3. Review the logs for errors.

Supported host operating systems for FLI online

The FLI online workflow can be used for LUNs connected to hosts running one of the following operating systems starting with the versions listed.

1. Microsoft (all versions of the servers listed are supported):
 - Windows Server 2008 and later (includes Windows Server failover clusters)
 - Microsoft Hyper-V server 2008 and later
 - Windows Server 2012 and later (includes Windows Server 2012 cluster)
 - Microsoft Hyper-V Server 2012 and later
2. VMware:
 - All ESXi 5.x and later releases

3. Linux:

- Red Hat Enterprise Linux (RHEL) 5.x and later

Consider using the FLI offline workflow for host operating systems not on the preceding list.



If the NetApp controller destination is a MetroCluster, do NOT use the online workflow. 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 the destination is MetroCluster, use the FLI offline process, regardless of the host OS.

Verify host LUN path and multipath configuration

Prior to migration, you should verify that multipathing is correctly configured and working properly. All available paths to LUNs should be active.

Prepare hosts for FLI online migration

The FLI online execution phase includes the preparation of migration hosts in order to be in a supported configuration.

In many instances it may be possible to have performed this remediation prior to this step. If not, then this is where you would perform any host remediation such as installing host attach kits or DSMs. From the analysis phase, you will have a gap list of items that need to be performed on each host in order for that host to be in a supported configuration using ONTAP. Depending on the type of migration being performed, either the host would be remediated and then rebooted, or simply remediated.

FLI online: Preparing the LUN path

To prepare for FLI online migration, you verify the host and source LUN paths and other details.

Steps

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

```
cluster::> set adv
```

```
Warning: These advanced commands are potentially dangerous; use them  
only when directed to do so by NetApp personnel.
```

```
Do you want to continue? {y|n}: y
```

2. Verify that the source array can be seen on the destination controller.

```
cluster::*> storage array show
```

Prefix	Name	Vendor	Model Options
DGC-1	DGC_LUNZ_1	DGC	LUNZ

1 entries were displayed.

3. Display source LUN 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.
```

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

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

Node	LUN	LUN	Array Name	Array Target
Port Initiator	Group	Count		

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.



The word wrapping in the following output has no significance.

5. List the LUNs mapped from the source storage. Verify the disk properties and paths.

```

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:
-

```

6. View the source LUN.

```
cluster::*> storage disk show -array-name DGC_LUNZ_1
```

	Usable		Disk	Container	Container
Disk	Size	Shelf	Bay	Type	Name
Owner					
-----	-----	-----	---	-----	-----

DGC-1.9	-	-	-	LUN	unassigned -

7. Mark the source LUN as foreign.

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

8. Verify the source LUN is marked as foreign.

```
cluster::*> storage disk show -array-name DGC_LUNZ_1
```

	Usable		Disk	Container	Container
Disk	Size	Shelf	Bay	Type	Name
Owner					
-----	-----	-----	---	-----	-----

DGC-1.9					

9. Serial numbers are used in FLI LUN import commands. List all foreign LUNs and their serial numbers.

```
cluster::*> storage disk show -container-type foreign -fields serial-  
number
```

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

10. Create a destination volume.

```
cluster::*> vol create -vserver fli -volume fli_vol -aggregate aggr1  
-size 2t  
[Job 13888] Job succeeded: Successful
```

11. Verify volume.

```
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.

12. Set `fraction_reserve` option for each volume to 0 and set the Snapshot policy to `none`.

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

13. Check your volume settings.

```
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.
```

14. Delete any existing Snapshot copies.

```
cluster::*> set advanced; snap delete -vserver datamig -vol winvol
-snapshot * -force true
1 entry was acted on.
```



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.



The LUN create command detects the size and alignment based on partition offset and creates the LUN accordingly with `foreign-disk` option. For a review of I/O misalignment, review NetApp Knowledgebase article **What is an unaligned I/O?** Also note that some I/O will always appear to be partial writes and will therefore look misaligned. Examples of this would be database logs.

What is an unaligned I/O?

15. Create the target LUN. The `LUN create` command detects the size and alignment based on partition offset and creates the LUN accordingly with the `foreign-disk` argument.

```
cluster::*> lun create -vserver fli -path /vol/fli_vol/OnlineFLI_LUN
-ostype windows_2008 -foreign-disk 600601603F103100662E70861000E511

Created a LUN of size 1t (1099511627776)
```

16. Verify new LUN.

```
cluster::*> lun show -vserver fli
```

Vserver	Path	State	Mapped	Type
fli	/vol/fli_vol/OnlineFLI_LUN	online	unmapped	windows_2008

```
Size
-----
1TB
```

17. Create an igroup of protocol FCP with host initiators.

```
cluster::*> igroup create -vserver fli -igroup FLI -protocol fcp -ostype
windows -initiator 10:00:00:00:c9:e6:e2:79
```

18. Verify that the host logs in on all paths to the new igroup.

```
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)

19. Offline the destination LUN.

```
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
```

20. Map the destination LUN to the igroup.

```
cluster::*> lun map -vserver fli -path /vol/fli_vol/OnlineFLI_LUN
-igroup FLI
```

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

```
cluster::*> lun import create -vserver fli -path
/vol/fli_vol/OnlineFLI_LUN -foreign-disk
600601603F103100662E70861000E511
```

FLI online: Performing a disruptive cutover

This example gives you the general steps for performing a disruptive cutover for the FLI online migration process.

For host remediation walkthrough of Windows, Linux, and ESXi, see the follow-on sections of this guide as well as the host operating system and host-attach kit documentation.

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 the *ESXi CAW/ATS remediation* topic.
3. Unmap the source LUN from the hosts.



The disruption window begins here.

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.

You must ensure that this is the only LUN that is mapped to this igroup, because removing the host (initiator) from the igroup affects other LUNs that are mapped to the igroup. See the vendor documentation for the appropriate commands.

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.

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

6. Verify that the LUN is online.

```
cluster::*> lun show -vserver fli
```

Vserver	Path	State	Mapped	Type
fli	/vol/fli_vol/OnlineFLI_LUN	online	mapped	windows_2008

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.

At this point, 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.

FLI online: Importing the data

These are the steps to import the data from the source LUN to the destination LUN.

Steps

1. Start the migration import.

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

2. Display FLI status.

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

FLI online: Verifying migration results

A verify job is optional, but recommended. It is a block-by-block comparison of the source and destination LUNs. Verify jobs take almost the same or slightly more time than migration time.

Start the verify job to compare source and destination LUNs. Monitor the verify progress. The LUNs being verified need to be offline for the duration of the verification session. The verification session can potentially be lengthy because it is a block-by-block comparison between source and destination LUNs. Although verification is not required, it is a good idea to verify a subset of the LUNs imported/migrated to feel comfortable about the import process. These verifications would be in addition to those performed during the test/pilot migrations.



This process is disruptive.



The LUN import verify must be explicitly stopped before bringing the LUN back online. Otherwise, the LUN online fails. See the following CLI output.

Steps

1. Offline the LUNs to be verified. <The disruption window begins here>

```
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
```

2. Start LUN verify.

```
lun import verify start -vserver fli_72C -path /vol/flivol/72Clun1
```

3. Display LUN verify status.

```
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 LUN verification. This step needs to be performed manually even if the status shows that verify is complete.

```
lun import verify stop -vserver fli_72C -path /vol/flivol/72Clun1
```

5. Online the LUN upon completion of verification. <The disruption window ends here>

```
lun online -vserver fli_72C -path /vol/flivol/72Clun1
```

Cleaning up the FLI online migration

After the FLI online migration completes, you remove the LUN import relationship.

When ready, the LUN import relationship can be safely removed because 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.

Step

1. Delete the LUN import relationship.

```
lun import delete -vserver fli_72C -path /vol/flivol/72Clun1
```

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.

FLI 7-Mode to ONTAP transition workflow

FLI 7-Mode to ONTAP transition workflow

This section provides an example of the FLI 7-Mode to ONTAP transition workflow. The transition workflow can be run as either an online or offline workflow.

The FLI transition is recommended when either the source LUN is hosted on a 32-bit aggregate and/or the LUN is misaligned. The FLI 7-Mode to ONTAP transition is able to combine transitioning the LUN from 7-Mode to ONTAP, along with correcting LUN alignment and transitioning the LUN from a 32-bit to 64-bit aggregate. Other methods of transitioning the LUN, including 7-Mode Transition Tool (7MTT), can require remediating the LUN alignment and/or converting a 32-bit to 64-bit aggregate prior to transitioning to ONTAP.

The FLI 7-Mode to ONTAP transition workflow can be either an online or offline workflow. These workflows are functionally identical to the two corresponding FLI offline and online migration workflows, with the exception that the source array is a NetApp 7-Mode storage array. Both workflows share the same rules and procedures as their migration equivalents. This includes the FLI online workflow host operating support list.

The example provided should give a thorough walkthrough of the FLI 7-Mode to ONTAP process. The FLI 7-mode to ONTAP transition flow includes the following tasks:

1. Preparing source and destination arrays
2. Performing a disruptive cutover
3. Importing the data
4. Verifying migration results
5. FLI transition post-migration tasks

7-Mode to ONTAP FLI supported configurations

It is important to verify that the host OS, HBA, switch, and ONTAP array to which you are ultimately transitioning are supported.

If you are using the FLI 7-Mode to ONTAP transition workflow, you don't need to verify your source (7-Mode controller) in the FlexArray IMT. It won't be listed but is supported expressly for this transition workflow. You do still need to verify all hosts are in a supported configuration.

There are no FLI-specific platform requirements. There are also no minimum versions of 7-Mode Data ONTAP, although the version would have to support Fibre Channel protocol (FCP).

The maximum size LUN that FLI can import is 6 TB. This is a limitation based on the current maximum size drives currently supported by ONTAP. If you attempt to mount a larger foreign LUN, the LUN will be marked as broken, and you will not be able to write a label to it.

Rebooting hosts

You have the option to reboot hosts prior to starting this workflow in order to verify that the host is in a known good state.

This would also be a good time to take a Snapshot copy in order to facilitate a revert if needed later. To verify that the server configuration is persistent and pristine across reboots, complete the following steps:

Steps

1. Shut down all your open applications.
2. Review the logs for errors.
3. Verify that the host sees all of its paths.
4. Reboot the host.

Verify host LUN path and multipath configuration

Prior to any migrations, verify that multipathing is correctly configured and working properly.

All available paths to LUNs should be active. See the SAN host multipath verification topics for examples of how to verify multipathing on Windows, Linux, and ESXi hosts.

Prepare hosts for the transition

The execution phase includes the preparation of migration hosts.

In many instances it may be possible to have performed the remediation prior to this step. If not, then this is where you would perform any host remediation such as installing host attach kits or DSMs. From the analysis phase, you will have a gap list of items that need to be performed on each host in order for that host to be in a supported configuration using NetApp ONTAP. Depending on the type of migration being performed, either the host would be remediated and then rebooted (FLI 7-Mode to ONTAP online) or hosts would be rebooted, remediated, and then shut down (FLI 7-Mode to ONTAP offline).

Preparing source and destination arrays for migration

To prepare for the FLI 7-mode to ONTAP migration, verify the host and source LUN paths and other details.

Steps

1. In ONTAP, change to advanced privilege level.

```
cluster::> set adv
```

```
Warning: These advanced commands are potentially dangerous; use them  
only when directed to do so by NetApp personnel.
```

```
Do you want to continue? {y|n}: y
```

```
cluster:*>
```

2. Verify that the source array can be seen on the destination controller.

```

cluster::*> storage array show
Prefix                               Name      Vendor      Model Options
-----
NET-1                                NETAPP_LUN_1  NETAPP      LUN

cluster::*> storage array config show -array-name NETAPP_LUN_1
      LUN  LUN
Node      Group Count      Array Name      Array Target
Port Initiator
-----
ontaptme-fc-cluster-01
      1      2      NETAPP_LUN_1
500a0981880b813d      0d

500a0981980b813d      0d
ontaptme-fc-cluster-02
      1      2      NETAPP_LUN_1
500a0981880b813d      0d

500a0981980b813d      0d
4 entries were displayed.

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

```

3. View details on any storage errors listed. Some errors might require action before proceeding. However, the errors shown in the following example, “This device is an ONTAP® LUN.” can be safely ignored.



The error message “This device is an ONTAP(R) LUN.” is caused because FLI relies on FlexArray technology which doesn’t support virtualizing ONTAP or ONTAP targets. FLI is able to import the LUNs, however, FlexArray doesn’t support virtualizing them.

```
cluster::*> storage errors show
Disk: NET-1.1
UID:
60A98000:44306931:452B4738:5767366B:00000000:00000000:00000000:00000000:
00000000:00000000
-----
NET-1.1 (60a9800044306931452b47385767366b): This device is an ONTAP(R)
LUN.

Disk: NET-1.2
UID:
60A98000:44306931:452B4738:5767366D:00000000:00000000:00000000:00000000:
00000000:00000000
-----
NET-1.2 (60a9800044306931452b47385767366d): This device is an ONTAP(R)
LUN.

2 entries were displayed.
```

4. Display source LUN details.

```

cluster::*> storage array config show -array-name NETAPP_LUN_1 -instance

    Controller Name: ontaptme-fc-cluster-01
        LUN Group: 1
    Array Target Ports: 500a0981880b813d
        Initiator: 0d
        Array Name: NETAPP_LUN_1
    Target Side Switch Port: stme-5010-4:2-6
Initiator Side Switch Port: stme-5010-4:2-3
    Number of array LUNs: 2

    Controller Name: ontaptme-fc-cluster-01
        LUN Group: 1
    Array Target Ports: 500a0981980b813d
        Initiator: 0d
        Array Name: NETAPP_LUN_1
    Target Side Switch Port: stme-5010-4:2-5
Initiator Side Switch Port: stme-5010-4:2-3
    Number of array LUNs: 2

~~~~~ Output truncated ~~~~~
4 entries were displayed.

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

```

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


```
cluster::*> storage array config show -array-name NETAPP_LUN_1
```

Node	LUN	LUN	Group Count	Array Name	Array Target
Port	Initiator				

ontaptme-fc-cluster-01					
		1	2	NETAPP_LUN_1	
500a0981880b813d			0d		
500a0981980b813d			0d		
ontaptme-fc-cluster-02					
		1	2	NETAPP_LUN_1	
500a0981880b813d			0d		
500a0981980b813d			0d		

4 entries were displayed.

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

6. List the LUNs mapped from the 7-Mode storage. Verify the disk properties and paths.

```
cluster::*> storage disk show -array-name NETAPP_LUN_1 -instance
```

```

Disk: NET-1.1
Container Type: unassigned
Owner/Home: - / -
DR Home: -
Stack ID/Shelf/Bay: - / - / -
LUN: 0
Array: NETAPP_LUN_1
Vendor: NETAPP
Model: LUN
Serial Number: D0i1E+G8Wg6k
UID:
60A98000:44306931:452B4738:5767366B: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
                                0d              0  stme-5010-4:2-4      stme-5010-
4:2-6      ANO RDY  500a0981880b813d              1  4 Gb/S
0              0
ontaptme-fc-cluster-02
                                0d              0  stme-5010-4:2-4      stme-5010-
4:2-5      AO  INU  500a0981980b813d              0  4 Gb/S
0              0
ontaptme-fc-cluster-01
                                0d              0  stme-5010-4:2-3      stme-5010-
4:2-6      ANO RDY  500a0981880b813d              1  4 Gb/S
0              0
ontaptme-fc-cluster-01
                                0d              0  stme-5010-4:2-3      stme-5010-
4:2-5      AO  INU  500a0981980b813d              0  4 Gb/S
0              0

Errors:
NET-1.1 (60a9800044306931452b47385767366b): This device is a ONTAP(R)
LUN.
~~~~~ Output truncated ~~~~~
2 entries were displayed.

```

7. Verify the source LUN is marked as foreign.

```

cluster::*> storage disk show -array-name NETAPP_LUN_1
                                Usable      Disk      Container      Container
Disk      Size Shelf Bay Type      Type      Name
Owner
-----
NET-1.1      -      -      - LUN      unassigned -      -
NET-1.2      -      -      - LUN      foreign   -      -
2 entries were displayed.

```

8. Serial numbers are used in FLI LUN import commands. List all foreign LUNs and their serial numbers.

```
cluster::*> storage disk show -container-type foreign -fields serial-
number
disk      serial-number
-----
NET-1.2   D0i1E+G8Wg6m
```

9. Create the target LUN. The LUN create command detects the size and alignment based on partition offset and creates the LUN accordingly with the foreign-disk argument

```
cluster::*> vol create -vserver fli_72C -volume flivol -aggregate aggr1
-size 10G
[Job 12523] Job succeeded: Successful
```

10. Verify volume.

```
cluster::*> vol show -vserver fli_72C
Vserver   Volume      Aggregate   State      Type      Size
Available Used%
-----
-----
fli_72C   flivol      aggr1       online     RW        10GB
9.50GB    5%
fli_72C   rootvol     aggr1       online     RW        1GB
972.6MB   5%
2 entries were displayed.
```

11. Create the target LUN.

```
cluster::*> lun create -vserver fli_72C -path /vol/flivol/72Clun1
-ostype windows_2008 -foreign-disk D0i1E+G8Wg6m

Created a LUN of size 3g (3224309760)
```

12. Verify new LUN.

```
cluster::*> lun show -vserver fli_72C
```

Vserver	Path	State	Mapped	Type
fli_72C	/vol/flivol/72Clun1	online	unmapped	windows_2008

```
Size
-----
3.00GB
```

13. Create an igroup of protocol FCP with host initiators.

```
cluster::*> lun igroup create -vserver fli_72C -igroup 72C_g1 -protocol
fc -ostype windows -initiator 10:00:00:00:c9:e6:e2:79
```

```
cluster::*> lun igroup show -vserver fli_72C -igroup 72C_g1
```

```

Vserver Name: fli_72C
Igroup Name: 72C_g1
Protocol: fcp
OS Type: windows
Portset Binding Igroup: -
Igroup UUID: 7bc184b1-dcac-11e4-9a88-00a0981cc318
ALUA: true
Initiators: 10:00:00:00:c9:e6:e2:79 (logged in)
```

14. Map the test LUN to the test igroup.

```
cluster::*> lun map -vserver fli_72C -path /vol/flivol/72Clun1 -igroup
72C_g1
```

```
cluster::*> lun mapping show -vserver fli_72C
```

Vserver	Path	Igroup	LUN ID
fli_72C	/vol/flivol/72Clun1	72C_g1	0

```
Protocol
-----
fc
```

15. Offline the test LUN.

```
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

cluster::*> lun show -vserver fli_72C
```

Vserver	Path	State	Mapped	Type
fli_72C	/vol/flivol/72Clun1	offline	mapped	windows_2008

```
Size
-----
3.00GB
```

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

```
cluster::*> lun import create -vserver fli_72C -path /vol/flivol/72Clun1
-foreign-disk D0i1E+G8Wg6m

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 import stopped
0 stopped
```

Performing a disruptive cutover of FLI 7-Mode to ONTAP

This example gives you the general steps for performing a disruptive cutover for the FLI transition process.

For a host remediation walkthrough of Windows, Linux, and ESXi hosts, see related topics in this guide as well as the host operating system and host-attach kit documentation.

Steps

1. On the 7-Mode system, display the igroup to which the source LUN is mapped.

```
stme-7ma> igroup show
FLI_on_fcp (FCP) (ostype: windows):
  10:00:00:00:c9:e6:e2:79 (logged in on: 0c, vtic)
  50:0a:09:81:00:96:43:70 (logged in on: 0c, vtic)
  50:0a:09:81:00:96:3c:f0 (logged in on: 0c, vtic)
```



The disruption begins immediately after the unmap command is executed. Generally, the disruption window can be measured in minutes. It is literally the length of time it takes to move the host to the new NetApp target and scan for LUNs.

2. If the LUNs being imported are for ESXi hosts, review and follow the instructions in the *ESXi CAW/ATS remediation* topic.
3. Use the `unmap` command to move the LUN from its hosts. (The disruption window begins here.)

```
stme-7ma> igroup remove -f FLI_on_fcp 10:00:00:00:c9:e6:e2:79
```

4. Verify that the host initiators are no longer present.

```
stme-7ma> igroup show
FLI_on_fcp (FCP) (ostype: windows):
  50:0a:09:81:00:96:43:70 (logged in on: 0c, vtic)
  50:0a:09:81:00:96:3c:f0 (logged in on: 0c, vtic)
```

5. On the ONTAP cluster, bring the destination LUN online and verify that it's mapped.

```
cluster::*> lun online -vserver fli_72C -path /vol/flivol/72Clun1

cluster::*> lun show -path /vol/flivol/72Clun1
```

Vserver	Path	State	Mapped	Type
fli_72C	/vol/flivol/72Clun1	online	mapped	windows_2008

```
Size
-----
3.00GB
```

6. Rescan disks on the host; find the LUN on the ONTAP target.



The disruption window ends here.

The LUNs are online and mapped, and 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 also the original source LUN. Both source and destination LUNs will remain in sync until the

migration is complete and the LUN relationship has been broken.

Importing the data from FLI 7-Mode to ONTAP

These steps describe how to import the data from a 7-Mode source LUN to an ONTAP destination LUN using FLI.

Steps

1. Start the migration import.

```
cluster::*> lun import start -vserver fli_72C -path /vol/flivol/72Clun1
```

2. Display FLI status.

```
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 import      started
                                                completed
100
```

If you want to make sure the source LUN remains consistent after the migration completes, you will need to:

- After the import show indicates it is completed, shut down the host.
- Delete the LUN relationship: `lun import delete -vserver fli_72C -path /vol/flivol/72Clun1`.



Remember that after the LUN relationship is broken, the LUNs will quickly lose sync because changes are made to the new LUN only. Therefore, while it may be beneficial to maintain a consistent state in the event you want to restore the original state, the new LUN will likely have changes not reflected in the source LUN.



After the import is stopped, you can destroy the import relationship unless you intend to verify the import.

Verifying FLI 7-Mode to ONTAP migration results

You have the option to verify that LUNs have been properly migrated from FLI 7-Mode to ONTAP.

Start the verify job to compare source and destination LUNs. Monitor the verify progress. The LUNs being verified need to be offline for the duration of the verification session. The verification session can potentially be lengthy because it is a block-for-block comparison between source and destination LUNs. It should take approximately the same amount of time as the migration. Verification is not required, but we encourage you to verify a subset of the LUNs imported/migrated to feel comfortable about the import process.



The LUN import verify must be explicitly stopped before bringing the LUN back online. Otherwise, the LUN online fails. This behavior will be changed in an upcoming release of ONTAP.

Steps

1. Offline the LUNs to be verified.

```
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
```

2. Start LUN verify.

```
lun import verify start -vserver fli_72C -path /vol/flivol/72Clun1
```

3. Display LUN verify status.

```
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
```



The LUN import verify must be explicitly stopped before bringing the LUN back online. Otherwise, the LUN online fails. See the following CLI output.

4. Stop LUN verification. This step needs to be performed manually even if the status shows that verify is complete.

```
lun import verify stop -vserver fli_72C -path /vol/flivol/72Clun1
```


5. Online the LUN upon completion of verification.

```
lun online -vserver fli_72C -path /vol/flivol/72Clun1
```

FLI transition workflow post-migration tasks

The post-migration tasks for the FLI 7-mode to ONTAP workflow are similar to the other FLI workflows.

- When ready, you can delete the LUN import relationship.

The LUN import relationship can be safely removed because the host is now accessing the new NetApp array for all I/O to the new ONTAP LUN, and the source 7-Mode LUN is no longer in use.

- All server remediations are 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.

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

FLI using workflow automation (WFA)

Workflow automation can be used in conjunction with FLI to automate pre- and post-migration, migration, and transition tasks and status checks. In an automated migration, FLI uses workflow automation software to automate parts of the migration process. FLI with WFA is available in either online or offline mode.

In order to use WFA in conjunction with FLI, you need to download and install WFA on a suitable server in your environment. After WFA is installed, you download the specified workflows. The two FLI automation packs available for download are FLI offline and FLI online. The automation packs follow the same support rules as the FLI offline and FLI online workflows. This includes the list of host operation systems that support FLI online.

WFA automation packs can be downloaded from the WFA automation store. For more information about the specific actions performed and other detailed workflow information, review the help file embedded with each pack.

Related information

[OnCommand Workflow Automation - Workflow Developer's Guide](#)

FLI post-migration procedures

Removing source LUNs from ONTAP storage

The following steps describe how to remove source LUNs from your ONTAP storage after migration is complete.



This task uses an *HDS AMS2100* array in the examples. Your tasks may be different if you are using a different array or a different version of the array GUI.

Steps

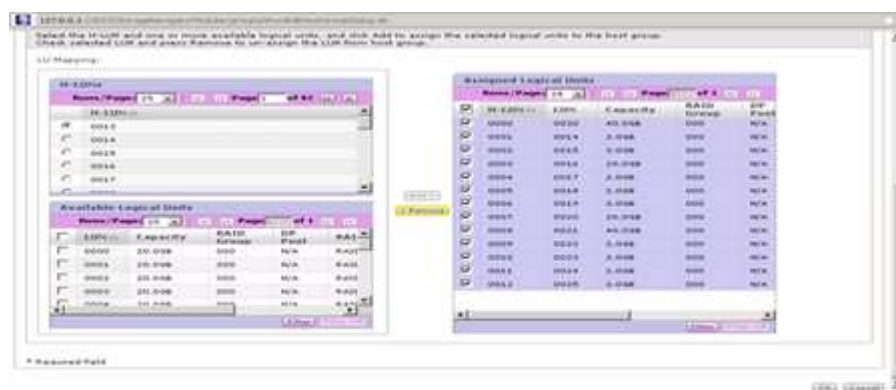
1. Log in to Hitachi Storage Navigator Modular.
2. Select the ONTAP host group created during the plan phase and select **Edit Host Group**.



3. Select the **Ports** and select **Forced set** to all selected ports.



4. Select the host LUNs that are migrated from Assigned Logical LUNs. Use LUN Names for each host mentioned in the Source LUNs worksheet. Here, select LUNs of Windows 2012, RHEL 5.10, and ESXi 5.5 hosts and select **Remove**.



Removing source LUNs from hosts

The following steps describe how to remove source LUNs from your host after FLI migration is complete.



This task uses an *HDS AMS2100* array in the examples. Your tasks may be different if you are using a different array or a different version of the array GUI.

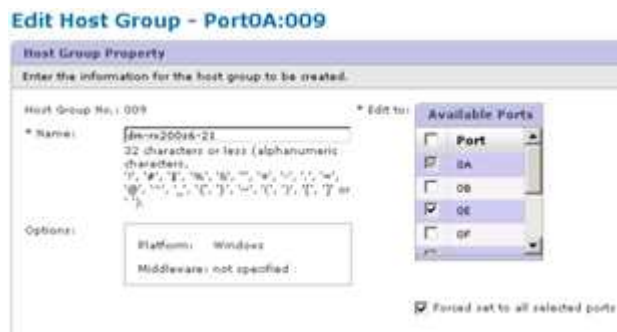
To remove source LUNs from the host, complete the following steps:

Steps

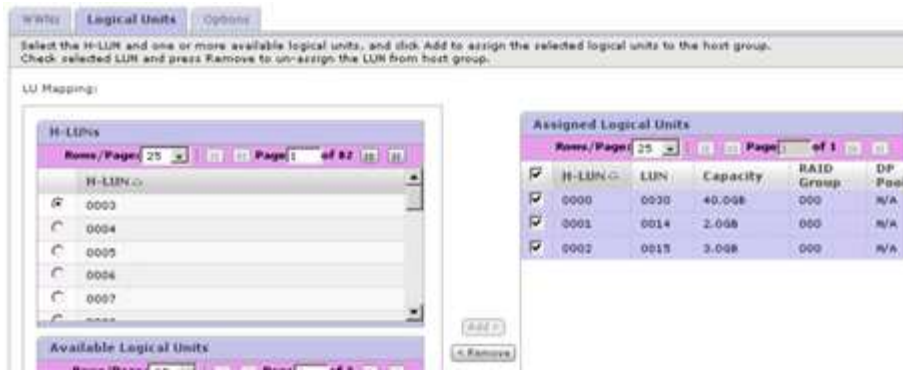
1. Log in to Hitachi Storage Navigator Modular.
2. Select the host that is migrated and select **Edit Host Group**.



3. Select the **Ports** and select **Forced set** to all selected ports.



4. Select the host LUNs that are migrated from Assigned Logical LUNs. Use LUN Names for each host mentioned in Source LUNs worksheet. Here, select LUNs of Windows 2012 host and select **Remove**.



5. Repeat the steps for Linux and VMware ESX hosts.

Removing source storage and host zone from the zoneset

Brocade fabric example

This procedure shows removing the source storage and host zone from a Brocade fabric zoneset.



The zone name for the examples is *rx21_AMS2100*.

Steps

1. Remove the zone from the zoneset in fabric A.

```
cfgDelete "PROD_LEFT", "rx21_AMS2100"
cfgDelete "PROD_LEFT", "rx22_AMS2100"
cfgDelete "PROD_LEFT", "rx20_AMS2100"
```

2. Activate the zoneset in fabric A.

```
cfgEnable "PROD_LEFT"
cfgSave
```

3. Remove the zone from the zoneset in fabric B.

```
cfgDelete "PROD_RIGHT", "rx21_AMS2100"
cfgDelete "PROD_RIGHT", "rx22_AMS2100"
cfgDelete "PROD_RIGHT", "rx20_AMS2100"
```

4. Activate the zoneset in fabric B.

```
cfgEnable "PROD_RIGHT"
cfgSave
```

Cisco fabric example

This procedure shows removing the source storage and host zone from a Cisco fabric zoneset.



The zone name for the examples is *rx21_AMS2100*.

Steps

1. Remove the zone from the zoneset in fabric A.

```
conf t
zoneset name PROD_LEFT vsan 10
no member rx21_AMS2100
no member rx22_AMS2100
no member rx20_AMS2100
exit
```

2. Activate the zoneset in fabric A.

```
zoneset activate name PROD_LEFT vsan 10
end
copy running-config startup-config
```

3. Remove the zone from the zoneset in fabric B.

```
conf t
zoneset name PROD_RIGHT vsan 10
no member rx21_AMS2100
no member rx22_AMS2100
no member rx20_AMS2100
exit
```

4. Activate the zoneset in fabric B.

```
zoneset activate name PROD_RIGHT vsan 10
end
copy running-config startup-config
```

Creating post-migration Snapshot copies

You can create a post-migration Snapshot copy to facilitate a revert if needed later.

Step

1. To create a post-migration Snapshot copy, run the `snap create` command.

```
DataMig-cmode::> snap create -vserver datamig -volume winvol -snapshot post-migration
```

```
DataMig-cmode::> snap create -vserver datamig -volume linuxvol -snapshot post-migration
```

```
DataMig-cmode::> snap create -vserver datamig -volume esxvol -snapshot post-migration
```

FLI migration cleanup and verify phase

In cleanup phase, you collect FLI migration logs, remove source storage configuration from NetApp storage, and remove the NetApp storage host group from source storage. Also, delete source to destination zones. Verification is the point where the accuracy of the migration plan execution is determined.

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

Migration report

Import logs are stored in the cluster event log file. You should review the logs for errors to verify that your migration was successful.

The migration report should appear as follows:

```
DataMig-cmode::*> rows 0; event log show -nodes * -event fli*
7/7/2014 18:37:21    DataMig-cmode-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.
~~~~~ Output truncated ~~~~~
```



The verification steps to compare the source and destination LUNs are covered in the execute migration phase. The importing and LUN verification steps are covered in the execute migration phase because they are linked to the import job and the foreign LUN.

Unzoning source and destination array

After all migrations, transitions, and verifications are completed, you can unzone source and destination arrays.

To unzone source and destination arrays, remove the source storage to destination zone from both fabrics.

Brocade fabric example

Steps

1. Remove the zone from the zoneset in fabric A.

```
cfgDelete "PROD_LEFT", "ZONE_AMS2100_cDOT_Initiator_fabA"  
zoneDelete "ZONE_AMS2100_cDOT_Initiator_fabA"
```

2. Activate the zonesets in fabric A.

```
cfgEnable "PROD_LEFT"  
cfgSave
```

3. Remove the zone from the zoneset in fabric B.

```
cfgDelete "PROD_RIGHT", "ZONE_AMS2100_cDOT_Initiator_fabB"  
zoneDelete "ZONE_AMS2100_cDOT_Initiator_fabA"
```

4. Activate the zonesets in fabric B.

```
cfgEnable "PROD_RIGHT"  
cfgSave
```

Cisco fabric example

Steps

1. Remove the zone from the zoneset in fabric A.

```
conf t  
zoneset name PROD_LEFT vsan 10  
no member ZONE_AMS2100_cDOT_Initiator_fabA  
no zone name ZONE_AMS2100_cDOT_Initiator_fabA vsan 10  
exit
```

2. Activate the zonesets in fabric A.

```
zoneset activate name PROD_LEFT vsan 10  
end  
copy running-config startup-config
```

3. Remove the zone from the zoneset in fabric B.

```
conf t
zoneset name PROD_RIGHT vsan 10
no member ZONE_AMS2100_cDOT_Initiator_fabB
no zone name ZONE_AMS2100_cDOT_Initiator_fabB vsan 10
exit
```

4. Activate the zonesets in fabric B.

```
zoneset activate name PROD_RIGHT vsan 10
end
Copy running-config startup-config
```

Removing the source array from ONTAP

The following steps show how to remove the source array from the destination array after FLI migration is complete.

Steps

1. Display all visible source arrays.

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

2. Remove the source storage array.

```
DataMig-cmode::> storage array remove -name HITACHI_DF600F_1
```

Removing destination array configuration

The following steps show how to remove the destination array configuration from the source array after FLI migration is complete.

Steps

1. Log in to Hitachi Storage Navigator Modular as system.
2. Select **AMS 2100** array and click **Show** and **Configure Array**.
3. Log in using root.
4. Expand Groups and select **Host Groups**.
5. Select **cDOT_FLI** host group and click **Delete Host Group**.

Host Group	Port	Platform	Middleware
H00-0000	00	not specified	not specified
H00-DTMS_VP01	00	Windows	not specified
H01-010_010_01	00	AIX	not specified
H01-DTMS_VP01	00	Windows	not specified
H04-010_010_01	00	Windows	not specified
H04-010_010_01	00	Windows	not specified
H04-DTMS_VP01	00	Windows	not specified
H07-010-010-01	00	Windows	not specified
H08-DTMS_VP01	00	not specified	not specified
H09-010-010-01	00	Windows	not specified
H10-010-010-01	00	not specified	not specified
H11-010-010-01	00	Linux	not specified
H12-010-010-01	00	Linux	not specified
H12-010_010_01	00	Linux	not specified
H12-010_010_01	00	not specified	not specified
H12-010_010_01	00	not specified	not specified
H12-DTMS_VP01	00	Windows	not specified
H12-010_010_01	00	AIX	not specified
H12-010_010_01	00	not specified	not specified

6. Confirm the host group deletion.



Documenting the newly migrated environment

You will need to issue the AutoSupport command to document the customer environment.

To document the customer environment, complete the following steps:

Steps

1. Issue an AutoSupport command to document the final configuration.

```
B9CModeCluster::*> autosupport invoke -node DataMig-cmode-01 -type all
-message "migration-final"
```

2. Fully document the newly migrated environment.

Foreign LUN Import Performance

Performance enhancements in ONTAP 8.3.1

There have been some enhancements to FLI to better manage performance and stop workload starvation from occurring. FLI enhancements in ONTAP 8.3.1 include a new throttle command and LUN import show enhancements showing throughput and QoS policy groups.

The `LUN import throttle` command is used to limit the maximum speed at which an import can run.

```
cluster::*> lun import throttle -vserver fli_72C -path /vol/flivol/72Clun1
-max-throughput-limit

{<integer>[KB|MB|GB|TB|PB]} Maximum Throughput Limit (per sec)
```

Use the instance switch with `lun import show` to display extended LUN import information, including throttle and QoS information.

```
cluster::*> lun import show -instance

Vserver Name: fli_72C
LUN Path: /vol/flivol/72Clun1
Foreign Disk Serial Number: D0i1E+G8Wg6m
Import Home Node: ontaptme-fc-cluster-01
Import Current Node: ontaptme-fc-cluster-01
Operation In Progress: import
Admin State: stopped
Operational State: stopped
Percent Complete: 0
Blocks Imported: -
Blocks Compared: -
Total Blocks: 6297480
Estimated Remaining Duration: -
Failure Reason: -
Maximum Throughput Limit(per sec): -
Current Throughput (per sec): -
QoS Policy Group: -
```

The values for the `current throughput` show the current rate of throughput of import or verify operations. Users should check this before setting a throttle value. It is empty when not running. The `QoS policy group` shows the QoS group if the LUN import throttle was used.

Variables that affect Foreign LUN Import migration performance

There are a number of variables that affect how quickly a given migration completes.

These variables include:

- How many concurrent migrations are running between a given source and destination
- Source array capabilities
- Source array load
- Destination array capabilities

- Destination array load
- How much I/O is being generated to the LUN during migration
- The type, bandwidth, and fan-ins/fan-outs on front-end fabrics

For best performance, use no more than 16 concurrent FLI migrations per node.

Given the number of variables that affect migration performance, it is recommended that a number of test migrations be performed. Generally, the larger the test sample, the better the characterization will be. Therefore, we recommend that a number of different sized test migrations be performed in order to get an accurate sampling of throughput performance. Performance data from those tests can then be used to extrapolate timing and durations of the planned production migrations.

Benchmarks for estimating migration durations

For planning purposes certain assumptions can be used to estimate the level of effort and duration of data migrations.

To get an accurate estimate of your actual performance, you should run a number of test migrations of different sizes in order to get accurate performance numbers for your specific environments.



The following benchmarks are strictly for planning purposes and are unlikely to be particularly accurate for specific environments.

Assumptions: Five hours per host migration based on a host with 8 LUNs with a total of 2 TB of data. These parameters provide a planning number of approximately 400 GB per hour.

Best practices for Foreign LUN Import migration

NetApp strongly recommends a professional services or partner professional services, engagement to scope and plan the migration as well as to train customer personnel on how to perform data migrations using Foreign LUN Import (FLI) 7-Mode to ONTAP.

- Perform one or more test migrations at least a week prior to your migration project in order to verify configuration, connectivity, and throughput; uncover any other issues; and validate your methodology.
- For maximum throughput, don't run more than 16 migrations concurrently per node.
- Verification is not required, but we encourage you to verify a subset of the LUNs imported/migrated to validate the import process.
- Use the throughput observed in your test migrations to plan production migration durations.
- For best performance, migrate LUNs during non-peak demand periods.

ESXi CAW/ATS remediation

Online FLI does not support VMware Atomic Test and Set (ATS)/SCSI Compare and Write (CAW). This is important if you are using VMFS5 and your source array supports CAW. To remediate the host you must follow the process outlined in this section.

FLI online LUN relationships don't support ATS/CAW commands, and the VMFS5 file system would fail mounting on the destination ESXi 5.x host. This is the result of a VMware maintaining an ATS bit on the VMFS5 header, which enforces CAW/ATS and will not allow the header to work on a host or array without ATS.

The ATS bit is carried in the VMFS header, which is part of the first LUN listed in the *Partitions spanned*. This is the only LUN, if there are multiple extents listed, that needs to be remediated.

If the LUN is shared by more than one host, then updating it on one of the hosts is sufficient. All other hosts automatically update after a rescan. Disabling ATS/CAW will fail if any VM or ESXi active I/O from any of the sharing hosts is running on the LUN. We recommend shutting down the VMs and other host machines sharing the LUN while making the necessary ATS/CAW changes. This action can be performed at the beginning of disruptive parts of the host repoint/cutover listed in the *Disruptive Cutover* section of the appropriate FLI workflow.

If the LUN is shared by more than one host, all hosts will need to be offline while the ATS bit is enabled or disabled. After enabling or disabling ATS, you will need to refresh LUNs. After you have completed any remapping, you can then bring the hosts back up and verify that you are able to access the LUNs.

If you are running a previous version of VMFS or upgraded from a previous version, then you shouldn't have to perform any remediation. If you do need to either enable or disable ATS/CAW, you can use the commands listed below. However, neither will work if the VM is active and there is any I/O running to the VMFS5 datastore. We recommend shutting down the host machine, making the necessary ATS/CAW changes, and performing the rest of the disruptive parts of the host repoint/cutover listed in the *Disruptive Cutover* section of the appropriate FLI workflow.

You can check ATS/CAW status by running the following command:

```
~ # vmkfstools -Ph -v 1 /vmfs/volumes/fli-orig-3
VMFS-5.58 file system spanning 1 partitions.
File system label (if any): fli-orig-3
Mode: public ATS-only
Capacity 99.8 GB, 58.8 GB available, file block size 1 MB, max file size
62.9 TB
Volume Creation Time: Wed Jun 10 13:56:05 2015
Files (max/free): 130000/129979
Ptr Blocks (max/free): 64512/64456
Sub Blocks (max/free): 32000/31995
Secondary Ptr Blocks (max/free): 256/256
File Blocks (overcommit/used/overcommit %): 0/41931/0
Ptr Blocks (overcommit/used/overcommit %): 0/56/0
Sub Blocks (overcommit/used/overcommit %): 0/5/0
Volume Metadata size: 804159488
UUID: 557841f5-145136df-8de6-0025b501a002
Partitions spanned (on "lvm"):
naa.60080e50001f83d4000003075576b218:1
Is Native Snapshot Capable: YES
OBJLIB-LIB: ObjLib cleanup done.
~ # vmkfstools -Ph -v 1 /vmfs/volumes/fli-orig-3
~ # vmkfstools --help
```

If the mode had listed the word *public only*, no remediation would be necessary. In the case above *public ATS-only* means that the ATS is enabled and needs to be disabled until the import is completed, at which time it can be reenabled.

To disable ATS/CAW on a LUN, use the following command:

```
# vmkfstools --configATSTOnly 0 /vmfs/devices/disks/naa.aaaaaaaaaaaaaaaa
```

To reenable ATS/CAW, after the migration is complete, use:

```
# vmkfstools --configATSTOnly 1 /vmfs/devices/disks/naa.aaaaaaaaaaaaaaaa
```

Host remediation

Depending on the type of migration, host remediation may take place inline to the migration (Foreign LUN Import online, and 7-Mode to ONTAP) or might it occur after the migration is complete (Foreign LUN Import offline).

Use the for remediation steps for different host OSs. Consult your gap analysis, put together during the planning and analysis phases, and appropriate NetApp and vendor documentation for steps specific to your migration.



FLI uses the same remediation procedures that would be used with the 7MTT. Therefore, it makes sense to leverage the same remediation document rather than document those procedures multiple times in different places.



For CAW remediation, use the ESXi CAW/ATS remediation process.

Related information

[SAN host transition and remediation](#)

Clearing SCSI-3 persistent reservations

If you have a Windows cluster, you need to remove SCSI-3 reservations for the quorum disk, even if all clustered hosts are offline.

If you attempt to label the source LUN as a foreign disk, the following error message will appear:

```
Error: command failed: The specified foreign disk has SCSI persistent
reservations. Disk serial number: "6006016021402700787BAC217B44E411".
Clear the reservation using the "storage disk remove-reservation" command
before creating the import relationship.
```

You can remove SCSI-3 reservations for the quorum disk on the NetApp controller using the `storage disk remove-reservation` command:

```
storage disk remove-reservation -disk disk_name
```

Here is a snippet showing this error and the remediation for it:

```

cluster-4b:*> lun offline -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS
cluster-4b:*> lun import create -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS -foreign-disk 6006016021402700787BAC217B44E411
Error: command failed: The specified foreign disk is not marked as
foreign. Disk serial number: "6006016021402700787BAC217B44E411".

cluster-4b:*> sto disk show -disk DGC-1.6 -fields serial-number,is-
foreign
  (storage disk show)
disk is-foreign serial-number
-----
DGC-1.6 true 6006016021402700787BAC217B44E411

cluster-4b:*> lun import create -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS -foreign-disk 6006016021402700787BAC217B44E411

Error: command failed: The specified foreign disk has SCSI persistent
reservations. Disk serial number: "6006016021402700787BAC217B44E411".
Clear the reservation using the "storage disk remove-reservation" command
before creating the import relationship.

cluster-4b:*> storage disk remove-reservation -disk DGC-1.6
cluster-4b:*> lun import create -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS -foreign-disk 6006016021402700787BAC217B44E411
cluster-4b:*> lun online -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS
cluster-4b:*> lun import show

vserver foreign-disk path operation admin operational percent in progress
state state complete
-----
-----
fli_cluster 6006016021402700787BAC217B44E411 /vol/fli_volume/cluster_CVS
import stopped stopped 0

cluster-4b:*> lun import start -vserver fli_cluster -path
/vol/fli_volume/cluster_CVS
cluster-4b:*> lun import show

vserver foreign-disk path operation admin operational percent in progress
state state complete
-----
-----
fli_cluster 6006016021402700787BAC217B44E411 /vol/fli_volume/cluster_CVS
import started in_progress 7

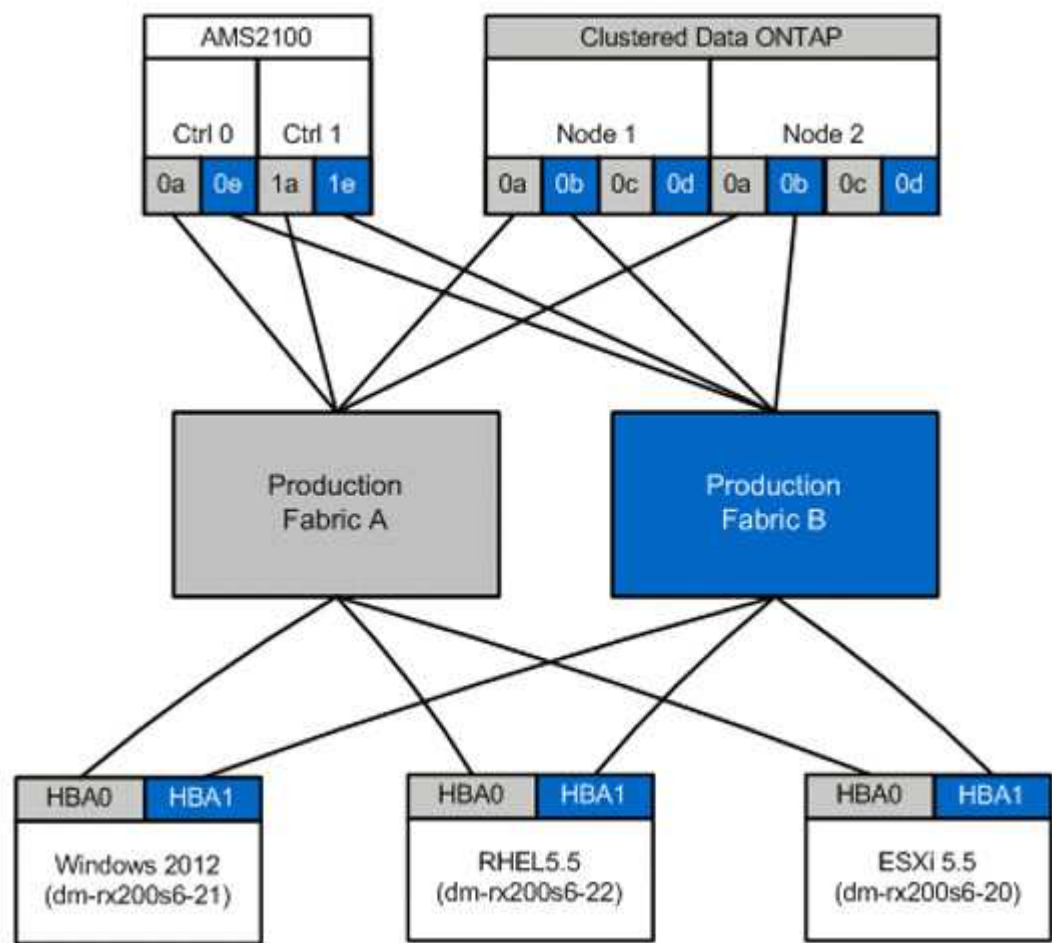
```

Creating the host to destination zones

Creating the host to destination zones

You will need to create the host to destination zones. There are two types of production fabric, fabric A and fabric B.

The following is an illustration of the host and destination storage zoning.



Production zones available in production fabric A.

Zone	WWPN	Zone Members
Zone: rx21_flicDOT	21:00:00:24:ff:30:14:c5	RX21 HBA 0
	20:01:00:a0:98:2f:94:d1	flicDOT lif1
	20:03:00:a0:98:2f:94:d1	flicDOT lif3
Zone: rx22_flicDOT	21:00:00:24:ff:30:04:85	RX22 HBA 0
	20:01:00:a0:98:2f:94:d1	flicDOT lif1
	20:03:00:a0:98:2f:94:d1	flicDOT lif3

Zone	WWPN	Zone Members
Zone: rx20_flicDOT	21:00:00:24:ff:30:03:ea	RX20 HBA 0
	20:01:00:a0:98:2f:94:d1	flicDOT lif1
	20:03:00:a0:98:2f:94:d1	flicDOT lif3

Production zones available in production fabric B.

Zone	WWPN	Zone Members
Zone: rx21_flicDOT	21:00:00:24:ff:30:14:c4	RX21 HBA 1
	20:02:00:a0:98:2f:94:d1	flicDOT lif2
	20:04:00:a0:98:2f:94:d1	flicDOT lif4
Zone: rx22_flicDOT	21:00:00:24:ff:30:04:84	RX22 HBA 1
	20:02:00:a0:98:2f:94:d1	flicDOT lif2
	20:04:00:a0:98:2f:94:d1	flicDOT lif4
Zone: rx20_flicDOT	21:00:00:24:ff:30:03:eb	RX20 HBA 1
	20:02:00:a0:98:2f:94:d1	flicDOT lif2
	20:04:00:a0:98:2f:94:d1	flicDOT lif4

Brocade fabric in production fabric A example

The following is an example of a Brocade fabric in production fabric A.

Steps

1. Create the zone in production fabric A.

```
zoneCreate "rx21_flicDOT", "21:00:00:24:ff:30:14:c5"
zoneAdd "rx21_flicDOT", "20:01:00:a0:98:2f:94:d1"
zoneAdd "rx21_flicDOT", "20:03:00:a0:98:2f:94:d1"
zoneCreate "rx22_flicDOT", "21:00:00:24:ff:30:04:85"
zoneAdd "rx22_flicDOT", "20:01:00:a0:98:2f:94:d1"
zoneAdd "rx22_flicDOT", "20:03:00:a0:98:2f:94:d1"
zoneCreate "rx20_flicDOT", "21:00:00:24:ff:30:03:ea"
zoneAdd "rx20_flicDOT", "20:01:00:a0:98:2f:94:d1"
zoneAdd "rx20_flicDOT", "20:03:00:a0:98:2f:94:d1"
```

2. Activate the zone in production fabric A.

```
cfgAdd "PROD_LEFT", "rx21_flicDOT"  
cfgAdd "PROD_LEFT", "rx22_flicDOT"  
cfgAdd "PROD_LEFT", "rx20_flicDOT"  
cfgEnable "PROD_LEFT"  
cfgSave
```

Brocade fabric in production fabric B example

The following is an example of a Brocade fabric in production fabric B

Steps

1. Create the zone in production fabric B.

```
zoneCreate "rx21_flicDOT", "21:00:00:24:ff:30:14:c4"  
zoneAdd "rx21_flicDOT", "20:02:00:a0:98:2f:94:d1"  
zoneAdd "rx21_flicDOT", "20:04:00:a0:98:2f:94:d1"  
zoneCreate "rx22_flicDOT", "21:00:00:24:ff:30:04:84"  
zoneAdd "rx22_flicDOT", "20:02:00:a0:98:2f:94:d1"  
zoneAdd "rx22_flicDOT", "20:04:00:a0:98:2f:94:d1"  
zoneCreate "rx20_flicDOT", "21:00:00:24:ff:30:03:eb"  
zoneAdd "rx20_flicDOT", "20:02:00:a0:98:2f:94:d1"  
zoneAdd "rx20_flicDOT", "20:04:00:a0:98:2f:94:d1"
```

2. Activate the zone in production fabric B.

```
cfgAdd "PROD_RIGHT", "rx21_flicDOT"  
cfgAdd "PROD_RIGHT", "rx22_flicDOT"  
cfgAdd "PROD_RIGHT", "rx20_flicDOT"  
cfgEnable "PROD_RIGHT"  
cfgSave
```

Cisco fabric in production fabric A example

The following is an example of a Cisco fabric in production fabric A.

Steps

1. Create the zone in production fabric A.

```
conf t
zone name rx21_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:14:c5
member pwn 20:01:00:a0:98:2f:94:d1
member pwn 20:03:00:a0:98:2f:94:d1
zone name rx22_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:04:85
member pwn 20:01:00:a0:98:2f:94:d1
member pwn 20:03:00:a0:98:2f:94:d1
zone name rx20_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:03:ea
member pwn 20:01:00:a0:98:2f:94:d1
member pwn 20:03:00:a0:98:2f:94:d1
exit
end
```

2. Activate the zone in production fabric A.

```
conf t
zoneset name PROD_LEFT vsan 10
member rx21_flicDOT
member rx22_flicDOT
member rx20_flicDOT
exit
zoneset activate name PROD_LEFT vsan 10
end
copy running-config startup-config
```

Cisco fabric in production fabric B example

The following is an example of a Cisco fabric in production fabric B.

Steps

1. Create the zone in production fabric B.

```
conf t
zone name rx21_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:14:c4
member pwn 20:02:00:a0:98:2f:94:d1
member pwn 20:04:00:a0:98:2f:94:d1
zone name rx22_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:04:84
member pwn 20:02:00:a0:98:2f:94:d1
member pwn 20:04:00:a0:98:2f:94:d1
zone name rx20_flicDOT vsan 10
member pwn 21:00:00:24:ff:30:03:eb
member pwn 20:02:00:a0:98:2f:94:d1
member pwn 20:04:00:a0:98:2f:94:d1
exit
end
```

2. Activate the zone in production fabric B.

```
conf t
zoneset name PROD_RIGHT vsan 10
member rx21_flicDOT
member rx22_flicDOT
member rx20_flicDOT
exit
zoneset activate name PROD_RIGHT vsan 10
end
copy running-config startup-config
```

Sample Site Survey and Planning worksheet

Sample Site Survey and Planning worksheet

During the analysis and planning phases of the migration methodology you will need to document your existing configuration, target configurations, gaps, and remediation plans using a Site Survey and Planning worksheet.

This section provides examples of types of information the Site Survey and Planning spreadsheet should contain. The following tabs are recommended:

- Contact
- Questionnaire
- Switches
- Storage Devices (Source)

- Storage Devices (Destination)
- Hosts
- HBA and Zone Information
- Source LUNs
- Storage Groups
- LUN Details
- NetApp LUN Layouts
- Migration Schedule
- Aggregate Status
- FAS Config
- SDS CLI Scripts

Site Survey and Planning worksheet Contacts tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing migration project contact information.

The following is an example of how to set up your Contacts tab.

Migration Project Contact Information					
Resource Name	Organization	Project Role	Office Phone	Cell Phone	Email

Site Survey and Planning worksheet Questionnaire tab

As part of your Site Survey and Planning worksheet, you should have a tab containing migration project information from your initial migration questionnaire.

The following is an example of how to set up your Questionnaire tab.

Migration Project Information		
Project Type	<input type="checkbox"/> Data Migration <input type="checkbox"/> Other	
Data Migration Objectives	[Objectives]	
Source Devices	Storage: [Storage Type] No. of Devices: [No. of arrays] Thin-provisioned: <input type="checkbox"/> Yes <input type="checkbox"/> No	Enumerate all devices

Migration Project Information		
Client Devices	Operating System: [OS Version] SAN boot: <input type="checkbox"/> Yes <input type="checkbox"/> No MPIO: [MPIO Version] HBAs: [HBA Vendor, Model, Firmware]	
Fabric Switches	Vendor: Model: Firmware: No. of Ports:	
Current Protocols	<input type="checkbox"/> FCP <input type="checkbox"/> iSCSI	
Volume Manager	Vendor: Product: Version:	
Destination Devices (Storage)	Storage: [Storage] No. [Number] Thin-provisioned: <input type="checkbox"/> Yes <input type="checkbox"/> No	For this service, NetApp filers only
Amount of Data to be Migrated (in TB)	[Amount of Data]	Summary and detail (each source device)
Number of LUNs	[Number of LUNs]	Summary and detail (each source device)
Data Reorganization	<input type="checkbox"/> Yes <input type="checkbox"/> No	Does the customer desire to move volumes/directories/folders/files into different data structures as part of the migration?

Migration Project Information		
Outage Expectations	Outage Window <input type="checkbox"/> Pre-defined <input type="checkbox"/> Flexible Standard Maintenance window polices : [Info]	Number and durations of outages that can be utilized. Please list maintenance windows, if any.
Desired Time frame for Completion	[Desired Time frame for Completion][Time Sensitivities]	
Other Relevant Information	[Other Relevant Information]	
Customer Organization Name and Location (City and State)		

Site Survey and Planning worksheet Switches tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing migration switch information.

The following is an example of how to set up your Switches tab.

Switches							
Current							NetApp Recommended
Host Name	IP Address	Vendor	Model	Fabric Name	VSAN/Domain	Firmware	Firmware
C9506-1-A	10.x.x.x	Cisco	9506	Prod A	10	3.3(5a)	

Site Survey and Planning worksheet Source Storage Devices tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your migration source storage devices.

The following is an example of how to set up your Source Storage Devices tab.

Storage Systems				
Array Name	IP Address	Vendor	Array Model	Microcode FW/ONTAP
AMS2100	10.x.x.x	Hitachi	AMS 2100	0893/B-X

Storage Systems				
AMS2100	10.x.x.x	Hitachi	AMS 2100	0893/B-X
AMS2100	10.x.x.x	Hitachi	AMS 2100	0893/B-X
AMS2100	10.x.x.x	Hitachi	AMS 2100	0893/B-X

Storage Systems				
Controller/Node	Port Name	WWPN	Fabric Name	Target Type
Controller0	0a	50060E80xxxxxxx	Production Fabric A	Source
Controller0	0e	50060E80xxxxxxx	Production Fabric B	Source
Controller1	1a	50060E80xxxxxxx	Production Fabric A	Source
Controller1	1e	50060E80xxxxxxx	Production Fabric A	Source

Site Survey and Planning worksheet Destination Storage Devices tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your destination storage devices.

Storage Systems					
Cluster Name	IP Address	Array Mode	ONTAP	vserver	Port Type
DataMig-cDOT	10.x.x.x	FAS8080	8.3.1	datamig	Target
DataMig-cDOT	10.x.x.x	FAS8080	8.3.1	datamig	Target
DataMig-cDOT	10.x.x.x	FAS8080	8.3.1	DataMig-01	Initiator
DataMig-cDOT	10.x.x.x	FAS8080	8.3.1	DataMig-01	Initiator

Storage Systems				
Port Name	LIF Name	WWPN	Fabric Name	Target Type
0c	miglif1	20:01:00:a0:98:2f:xx :xx	Prod A	Target

Storage Systems				
0d	miglif2	20:01:00:a0:98:2f:xx:xx	Prod B	Target
0a	n/a	50:0a:09:81:00:xx:xx:xx	Prod A	Target
0b	n/a	50:0a:09:81:00:xx:xx:xx	Prod B	Target

The following is an example of how to set up your Destination Storage Devices tab.

Site Survey and Planning worksheet Hosts tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing migration project host information.

The following is an example of how to set up your Hosts tab.

Hosts							
Current	NetApp Recommended						
Host Name	Driver	Firmware	HUK	MPIO	SnapDrive	SnapManager	Hotfixes
dm-rx200s6-21							
dm-rx200s6-22							
dm-rx200s6-20							

Site Survey and Planning worksheet HBA and Zone Information tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing information on your HBA and zone information.

The following is an example of how to set up your HBA and Zone Information tab.

Fabric Details			
Host Name	Description	WWPN	Fabric Name
dm-rx200s6-21	HBA0	21:00:00:24:ff:xx:xx:xx	Prod A

Fabric Details			
dm-rx200s6-21	HBA1	21:00:00:24:ff:xx:xx:xx	Prod B

Fabric Details			
VSAN/Domain	Port Number	Pre-migration Zone Membership	Post-migration Zone Membership
10	fc2/3	rx21_AMS2100	rx21_flicDOT
10	fc2/3	rx21_AMS2100	rx21_flicDOT

Site Survey and Planning worksheet Source LUNs tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing information on your source LUNs.

The following is an example of how to set up your Source LUNs tab.

Source LUNs				
Masked LUNs				
Storage Group Name	Host LUN ID	Array LUN ID	Thick/Thin	UID
dm-rx200s6-21	0	30	Thick	60060e801046b96004f2bf460000001e
dm-rx200s6-21	1	14	Thick	60060e801046b96004f2bf460000000e
dm-rx200s6-21	2	15	Thick	60060e801046b96004f2bf460000000f

Source LUNs				
All LUNS .2a				Custom Prefix
LUN Name	UID	Starting Sector	Partition Offset	
LUN30			368050176	0
LUN14			33619968	0

Source LUNs				
LUN15			33619968	0

Site Survey and Planning worksheet Storage Groups tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your storage groups.

The following is an example of how to set up your Storage Groups tab.

Storage Groups			
Source			Destination
Host Name	Storage Group	WWPN	iGroup Commands
dm-rx200s6-21	dm-rx200s6-21	21:00:00:24:ff:30:14:c521: 00:00:24:ff:30:14:c4	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
dm-rx200s6-22	dm-rx200s6-22	21:00:00:24:ff:30:04:8521: 00:00:24:ff:30:04:84	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
dm-rx200s6-20	dm-rx200s6-20	21:00:00:24:ff:30:03:ea21: 00:00:24:ff:30:03:eb	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

Site Survey and Planning worksheet LUN Details tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your LUN details.

The following is an example of how to set up your LUN Details tab.

LUN Details				
Source				
Host Name	Storage Group	Operating System	Clustered	Storage Controller
dm-rx200s6-21	dm-rx200s6-21	Microsoft Windows Server 2012 R2 Datacenter	No	AMS2100
dm-rx200s6-22	dm-rx200s6-22	Red Hat Enterprise Linux Server release 5.10	No	AMS2100
dm-rx200s6-20	dm-rx200s6-20	ESXi 5.5.0 build-1331820	No	AMS2100
dm-rx200s6-20	dm-rx200s6-20	ESXi 5.5.0 build-1331820	No	AMS2100

LUN Details				
Source				
Mount Point	Physical Drive Number	Port	Bus	Target
C:	PHYSICALDRIVE0	2	0	0
/	sda	0	0	0
BootLUN_Datastore	naa.60060e801046b96004f2bf4600000014	0	0	0
VM_Datastore	naa.60060e801046b96004f2bf4600000015	0	0	0

LUN Details				
Source				
LUN	PG80 SN	PG83 SN / UID	LUN Size (GB)	Starting Offset

LUN Details				
0		60060e801046b960 04f2bf460000001e	40	0
0		60060e801046b960 04f2bf4600000010	20	
0		60060e801046b960 04f2bf4600000014	20	
1		60060e801046b960 04f2bf4600000015	40	

LUN Details				
Source				
LUN Type	Aligned	Custom Prefix (Blocks)	Custom Prefix (Bytes)	
windows	Aligned	0	0	
linux	Aligned	0	0	
vmware	Aligned	0	0	
vmware	Aligned	0	0	

Site Survey and Planning worksheet NetApp LUN Layouts tab

As part of your Site Survey and Planning worksheet, you should set up a tab containing information on your LUN layouts.

The following is an example of how to set up your NetApp LUN Layouts tab.

NetApp LUN Information						
Storage Controller	Aggregate	Volume Name	Volume Size	Volume Guarantee	Snap Reserve	LUN Name

NetApp LUN Information						
S/N	LUN Type	Custom Prefix	LUN Description	GB Size	LUN Reservation	Fractional Reserve

NetApp LUN Information						
Volume Autosize	Snap Auto Delete	iGroup	LUN ID	Host Type	Drive Letter	Host

Site Survey and Planning worksheet Migration Schedule tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your migration schedule.

The following is an example of how to set up your Migration Schedule tab.

Migration Schedule							
Migration Date	Host	OS	Application	Storage Controller	LUN UID	LUN Size	Status

Site Survey and Planning worksheet Aggregate Status tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your aggregate status.

The following is an example of how to set up your Aggregate Status tab.

NetApp Aggregate Information					
Controller	Aggregate	Total Size (GB)	Used Capacity (GB)	Available (GB)	Previous to Build out

Site Survey and Planning worksheet FAS Config tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your FAS configuration.

The following is an example of how to set up your FAS Config tab.

Cluster Name	Cluster Management IP Address	Cluster Management Credentials Available	ONTAP System Manager Host	
			IP Address	Credentials Available

Network Ports					
Node	Interface Name	Port type	Port speed	VLAN Name/ID	IFGRP

SVM Name	Type	Protocols	Aggregate	SVM Root Volume

SVM	Volume	Aggregate	Size	SAN
			LUN Name	LUN Size

SVM Network Interfaces					
SVM	Interface Name	Interface Role	IP address/Netmask	Home Node/Home Port	Failover Group

SVM FCP Target Ports					
SVM	FCP Port Name	WWPN	WWNN	Home Node	Home Port

Node FCP Initiator Ports					
Node Name	FCP Port Name	WWPN	WWN	Home Node	Home Port

Site Survey and Planning worksheet SDS CLI Scripts tab

As part of your Site Survey and Planning worksheet, you should have a tab containing information on your SDS CLI scripts.

The following is an example of how to set up your SDS CLI Scripts tab.

Controller 1	Controller 2
vol size vol0 aggr0 108g	
snap reserve bootcampvol 0	
snap reserve vol0 20	
snap autodelete bootcampvol on	
snap autodelete bootcampvol commitment try	
snap autodelete bootcampvol trigger volume	
snap autodelete bootcampvol target_free_space 20	
snap autodelete bootcampvol defer_delete user_created	

Controller 1	Controller 2
snap autodelete vol0 on	
snap autodelete vol0 commitment try	
snap autodelete vol0 trigger volume	
snap autodelete vol0 target_free_space 20	
snap autodelete vol0 defer_delete user_created	
vol autosize bootcampvol on	
vol autosize vol0 on	
vol options bootcampvol try_first volume_grow	
vol options bootcampvol fractional_reserve 100	
vol options vol0 try_first volume_grow	
vol options vol0 fractional_reserve 100	
qtree security /vol/bootcampvol unix	
qtree security /vol/vol0 ntfs	
snap sched bootcampvol 0 0 0	
snap sched vol0 0 2 6@8,12,16,20	
#LUN mapping skipped for /vol/qavol_narayan/testlun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm25_boot_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm25_data1_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm25_data2_lun since LUN is not mapped to an iGroup.	

Controller 1	Controller 2
#LUN mapping skipped for /vol/bootcampvol/dm26_boot_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm26_data1_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm26_data2_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm27_boot_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm27_data1_lun since LUN is not mapped to an iGroup.	
#LUN mapping skipped for /vol/bootcampvol/dm27_data2_lun since LUN is not mapped to an iGroup.	

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