



Get Started

ONTAP FLI

NetApp
July 22, 2026

This PDF was generated from <https://docs.netapp.com/us-en/ontap-fli/get-started/learn-about-data-migration.html> on July 22, 2026. Always check docs.netapp.com for the latest.

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Get Started

Learn about the ONTAP data migration program

The data migration program offers proven solutions to help customers move data from foreign (third party) arrays to ONTAP, and to transition LUNs from NetApp 7 Mode systems to ONTAP—with Foreign LUN Import (FLI) serving as a key component of this migration portfolio. To improve migration success and reduce effort, the program provides the tools, guidance, and enablement needed to execute migrations efficiently and consistently, helping customers adopt NetApp technologies faster and with greater confidence.

Data migrations often come with real operational challenges—extended downtime windows, risk to production workloads, limited resources, and gaps in specialized expertise. As availability expectations continue to rise and downtime becomes less acceptable, migrations must be planned around business continuity. Because performance impact, data integrity, and potential data loss are common concerns in any migration, understanding the core FLI concepts and workflow upfront helps streamline execution and lowers the initial configuration and operational overhead.

FLI is an ONTAP data migration capability that copies user data from a foreign (third party) array LUN into a native ONTAP LUN. ONTAP performs the migration by acting as a SCSI initiator: it reads blocks from the foreign LUN and writes them into the destination ONTAP LUN.

ONTAP FLI was supported when the foreign LUN was reached through Fibre Channel (FC). Beginning with ONTAP 9.19.1, iSCSI FLI support was added to access foreign array LUNs using iSCSI transport on the backend. With iSCSI FLI, the backend path to the source array is iSCSI/TCP, while the front end host access to the ONTAP LUN can be either FC or iSCSI (the backend and frontend can differ).

iSCSI and FC ONTAP FLI support both offline imports (no host I/O during the import) and online imports (host stays connected, with a single short cutover outage).

Key terms

Foreign array

Any storage system that does not run ONTAP (including NetApp 7 Mode in a 7 Mode to ONTAP transition context).

Foreign LUN

A LUN containing user data on the foreign array in that array's native format.

Import relationship

A persistent pairing between the foreign LUN (source) and ONTAP LUN (destination) used for data copy.

LUN import

The process that transfers the blocks from the foreign LUN into the ONTAP LUN.

High level methodology

Discovery phase

Gather a complete inventory of the environment—hosts, storage systems, and SAN/network fabrics—so you understand what exists and how everything is connected.

Analysis phase

Review the collected inventory and determine the most appropriate migration approach for each host and source array based on compatibility, risk, and operational constraints.

Planning phase

Build and validate the migration plan, provision the destination ONTAP storage, and prepare the required migration and qualification tools and operational runbooks.

Execution phase

Perform the migration (import/copy) and complete the required host remediation and cutover actions according to the selected workflow (online or offline).

Verification phase

Confirm the migrated data and configuration behave as expected, validate host access and multipathing, and document the final state and outcomes for operational handover.

Intended audience

This information is intended for customers, partners, and NetApp field teams who are planning or executing SAN (block/LUN) data migrations to ONTAP, especially migrations that use Foreign LUN Import (FLI) and related migration options.

Primary readers

- Customer storage administrators / SAN administrators responsible for planning migration approach, preparing ONTAP, coordinating change windows, and validating host access/multipathing.
- Migration leads / technical project owners who need high-level guidance to choose between FLI, appliance-based options, or host/application-based migration methods, and to estimate timelines and effort.
- NetApp and partner professional services engineers supporting migration scoping, planning, qualification, and customer enablement (recommended for most but the simplest migrations).

Readers should have basic familiarity with:

- SAN concepts (LUN masking/mapping, zoning or iSCSI networking, multipathing/ALUA), and standard change-control practices.
- ONTAP administration fundamentals and the use of supporting planning tools (such as environment data collection and interoperability validation utilities).

Learn about SAN data migration to ONTAP

Migrating SAN data is often constrained by tight downtime windows, production risk, and limited specialist resources. ONTAP Foreign LUN Import (FLI) is a built-in block migration capability that copies data from a foreign (third-party) array LUN to a native ONTAP LUN and supports both offline and online migration styles. While ONTAP does not require a professional-services-led migration, it is still strongly recommended to involve NetApp or qualified partners for scoping, planning, and training—especially for non-trivial

environments.

Choosing the right migration approach (high level)

A practical migration strategy may use one primary method and supplement it with other approaches where they fit best. For SAN/LUN-level migrations into ONTAP, FLI is commonly a strong choice; however, some scenarios may be better served by alternatives that are non-disruptive by design.

Common options:

Foreign LUN Import (FLI)

Block/LUN-level migration into ONTAP with online and offline workflows.

Data Transfer Appliance (DTA)

A SAN-attached appliance model that is licensed per TB migrated and supports offline and online migrations.

Host OS or application-based migrations

Useful when the platform provides native mobility or when host or application control is preferred (For examples, VMware storage mobility and host-based copy approaches).

Planning migration duration

For initial planning only, a commonly cited benchmark assumption is ~5 hours per host for a host with 8 LUNs totaling ~2 TB, which equates to roughly ~400 GB/hour. This is intentionally a rough planning figure and is unlikely to match every environment. The recommended way to obtain an accurate estimate is to run multiple test migrations of different sizes to measure real throughput in your own storage, network, and host conditions.

Recommended tools (data collection, compatibility, automation, qualification)

Service tools provide a standardized way to collect environment data, validate supportability, and reduce human error during planning and execution.

Active IQ OneCollect

Collects data from storage, hosts, fabrics, and switches for troubleshooting, validation, migration planning, and upgrade assessments.

Interoperability Matrix Tool (IMT)

A web-based utility to confirm supported configurations across NetApp and third-party components.

Solaris Relabeler (when applicable)

Updates VTOC disk labels post-migration so systems reflect updated inquiry information after block-level migrations.

SAN LUN Migrate (sanlunmigrate for FLI projects)

Use a qualification approach to validate foreign array/LUN behavior in the customer environment prior to committing to production migration; this is especially important when transport or vendor behavior differs.

Learn about ONTAP Foreign LUN Import

Foreign LUN Import (FLI) is an ONTAP capability that enables block level (LUN) data migration by copying user data from a foreign array LUN into an ONTAP LUN. ONTAP

performs the migration by acting as a SCSI initiator that reads from the foreign LUN and writes to the destination ONTAP LUN.

FLI operates strictly at the LUN level and is intended for SAN migrations; it is not a file-level migration tool (NAS/file protocol migrations such as NFS/SMB require different approaches). FLI supports both offline and online migrations. In offline mode, host I/O is stopped for the duration of the import; in online mode, host operations resume after a short cutover while the import continues in the background.

Foreign LUNs appear in the ONTAP storage stack and must be explicitly marked as foreign to prevent accidental overwrite/ownership. FC FLI used FC backend connectivity (initiator ports, zoning/masking), while iSCSI FLI, the backend uses a iSCSI software initiator bound to intercluster connectivity, while the host-facing (frontend) protocol after migration can still be FC or iSCSI depending on design.

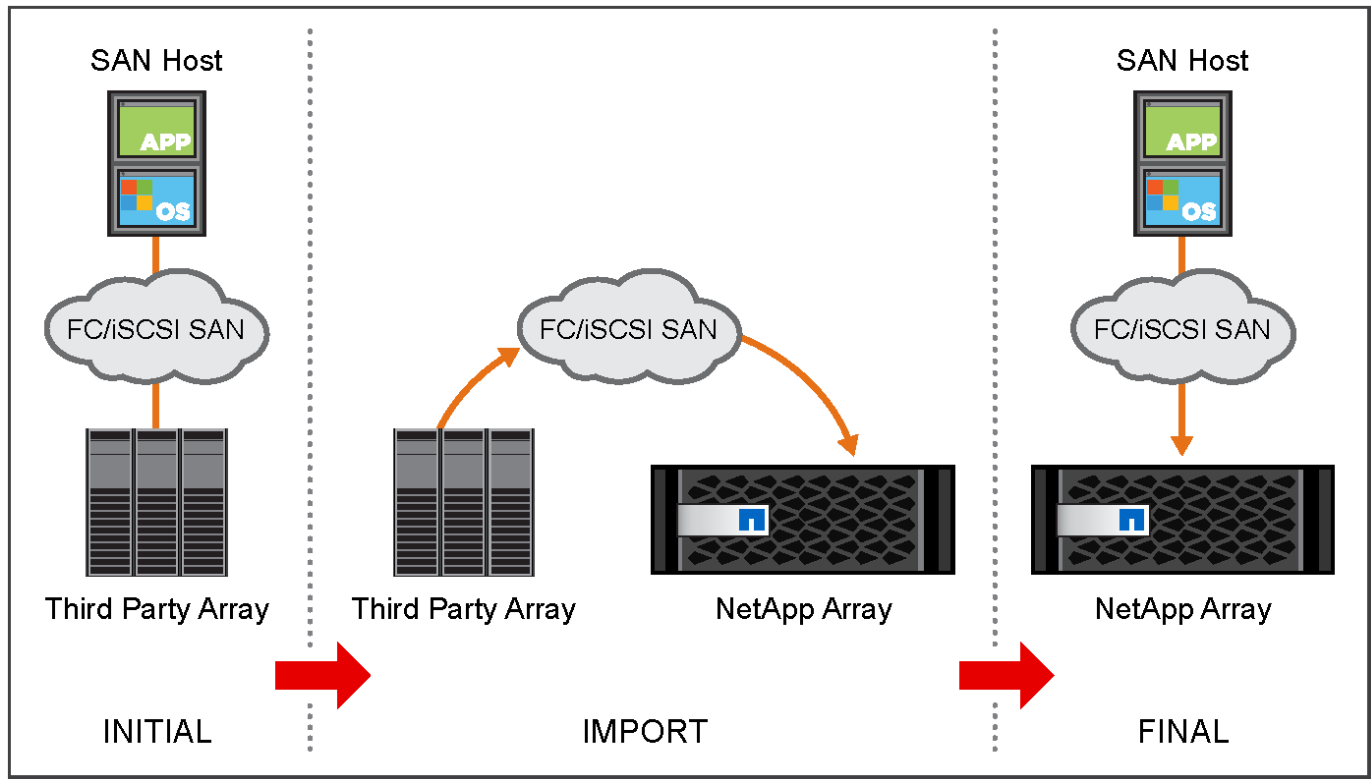
Offline and online FLI comparison

The following summarizes the key differences between the offline and online migration approaches.

Area	Offline FLI	Online FLI
Host I/O during import	Host I/O is stopped for the full import duration.	Host I/O can run while the import copy continues (after cutover).
Downtime profile	Requires downtime throughout the import window.	Designed to be mostly non-disruptive, typically requiring only a short outage for cutover.
Operational use case	Best when longer downtime is acceptable or required by the application or host model.	Best when downtime must be minimized and you can tolerate background copy activity.

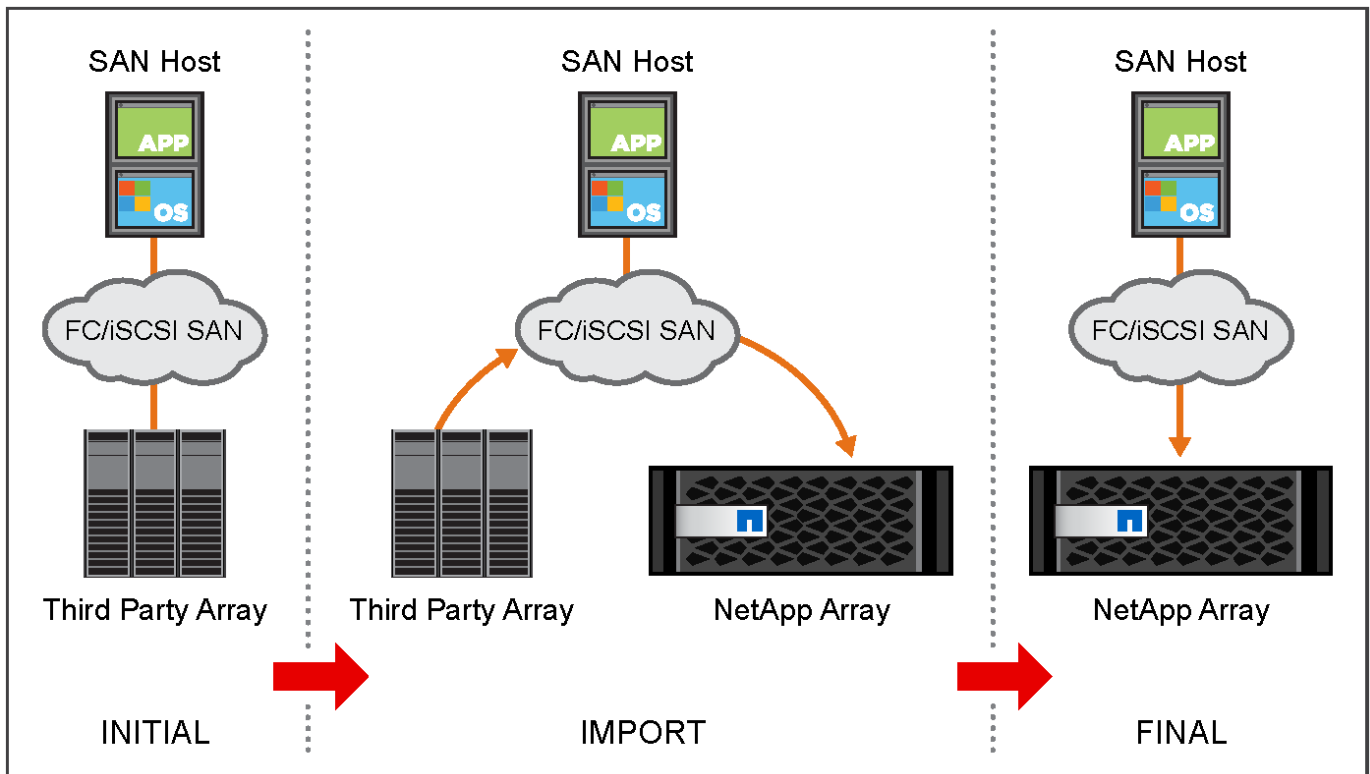
Offline FLI workflow

In the offline workflow, the host is disconnected for the entire duration of the import.



Online FLI workflow

In the online workflow, the host is disconnected only for a short cutover period while the import transitions from copying to completion.



Learn about Foreign LUN Import 7-mode to ONTAP transition

The data migration using foreign LUN import between 7 Mode and cluster mode ONTAP when the source LUN is hosted on a NetApp system running ONTAP 7 Mode and wants to migrate that LUN to clustered ONTAP. This approach is especially useful for legacy scenarios such as LUNs hosted on 32 bit aggregates or misaligned LUNs, because the foreign LUN import can be used for other use cases as well.

The data migration using foreign lun import can be performed using either an online or offline workflow. Operationally, it follows the same sequence and rules as standard FLI online and offline migrations, the only difference is that the source array is a NetApp 7 Mode controller rather than a third party array.

In other words, the core FLI migration workflow is the same whether the source is a foreign array or a NetApp 7 Mode array; only the source platform changes.

iSCSI FLI is not supported for importing from a NetApp 7 Mode source.

Learn about key features and benefits of ONTAP Foreign LUN Import

ONTAP Foreign LUN Import (FLI) is a built-in block migration capability that copies data from a foreign (third-party) array LUN to a native ONTAP LUN and supports both offline

and online migration styles. FLI is designed to migrate SAN LUNs from a range of third party arrays into ONTAP, and it offers a consistent migration methodology that helps standardize planning, execution, and validation across different hosts and arrays.

Key features

- Online and offline migrations to match business downtime requirements.
- Block-level, OS-independent migration does not rely on host volume managers or OS utilities to move the data.
- Works across heterogeneous SAN environments and is designed to migrate SAN LUNs from a range of third party arrays into ONTAP.
- Backend transport is flexible with both FC and iSCSI backend connectivity, although supported configurations depend on interoperability validation.
- Native multipathing and load balancing support that leverages standard SAN pathing models.
- CLI-driven control and visibility, enabling repeatable execution and operational monitoring.

Key benefits

- ONTAP FLI is included with ONTAP. A separate migration appliance is not required to perform FLI-based LUN imports.
- Reduces downtime risk by enabling an online workflow where host access can resume after a short cutover while the import continues in the background.
- Consistent migration methodology that helps standardize planning, execution, and validation across different hosts and arrays.
- Supports complex transition scenarios, including 7 Mode to ONTAP migrations where alignment and format considerations can be addressed as part of the transition workflow.
- Strongly supported operational model, although professional services are not mandatory, NetApp recommends professional services or qualified partners for scoping, planning, and training for anything beyond simple migrations.

Learn about the ONTAP Foreign LUN Import prerequisites

Before starting an ONTAP Foreign LUN Import (FLI), there are several prerequisites that must be in place to ensure a successful migration. These prerequisites cover compatibility, connectivity, and configuration requirements that are essential for the FLI process to function correctly.

- Backend connectivity must be available for the chosen transport:
 - FC FLI requires at least one FC port per controller that can operate in initiator mode (two ports, one per fabric, are preferred for redundancy).
 - iSCSI FLI requires intercluster (IC) LIFs (or Ethernet ports capable of hosting IC LIFs), because the iSCSI software initiator binds outbound sessions to IC connectivity.
- Foreign LUN must be discoverable in ONTAP before import. The foreign array LUN must be visible in the ONTAP storage stack (discovery is a prerequisite for import).
- Mark the source LUN as “foreign” in ONTAP. After the foreign LUN is discovered, it must be explicitly marked foreign to prevent accidental ownership or overwrite behaviors.

- The source LUN must be stable. The foreign LUN must not be expanding or contracting during the import workflow.
- The foreign LUN must use 512 byte sectors (512B block size) for import compatibility, other sector sizes are not supported for import.
- The destination ONTAP LUN must match the source LUN size. The “create LUN using foreign disk” workflow ensures the destination LUN is created to the correct size.
- The destination ONTAP LUN must be mapped to at least one igroup based on the frontend protocol plan so the host can be attached at the correct stage of the workflow.
- The foreign LUN and destination ONTAP LUN must be paired via an import relationship before starting the import copy.

Keep the destination ONTAP LUN offline before creating the import relationship; after the relationship is created, the LUN may be brought online only when performing online FLI so the host can resume I/O while copy continues.

Learn about ONTAP Foreign LUN Import supported configurations and platforms

ONTAP FLI must be deployed in a supported configuration to ensure predictable behavior and full supportability.

- All FLI migrations are performed at the LUN (block) level; file and protocol-level migrations are outside of the ONTAP FLI scope.
- Plan for up to 8 concurrent imports per node. The actual safe concurrency depends on observed host latency and import latency.
- The maximum foreign LUN size for import is 4 TB per LUN.
- iSCSI session scaling limits (backend iSCSI):
 - 1 initiator per IC LIF
 - Up to 16 sessions per LIF
 - Up to 32 sessions per node
- iSCSI protocol constraints:
 - No iSCSI discovery sessions
 - No multi connection sessions (MCS)
 - Error Recovery Level > 0 is not supported (ERL0 only)
 - IPv6 is not supported for iSCSI initiator LIF usage
- Security and management availability notes:
 - CHAP is not included
 - REST API coverage for iSCSI FLI operations is not available (CLI workflow only).
- Operational planning note for online imports:
 - In online FLI, the host I/O and import copy share backend resources
 - Imports may be paused and resumed to protect host latency
 - Migrations should be scheduled during non-peak windows if possible

Supported configurations and platform

ONTAP FLI must be deployed in a supported configuration to ensure predictable behavior and full supportability. As new configurations are qualified over time, supported combinations can change. For each migration, validate the end to end stack (source array + host + fabric/network + ONTAP target) against the current interoperability guidance.

Supported destination (where you can migrate to)

- ONTAP is the only supported destination for FLI migrations. FLI is designed to import data into ONTAP LUNs; migrations to third party destination storage are not supported.
- For iSCSI FLI, the iSCSI software initiator is integrated with the FLI stack and is intended specifically to enable foreign LUN discovery and import using iSCSI/TCP backend connectivity.

Supported ONTAP platform coverage (destination platforms)

Platform coverage depends on the backend transport used for discovery/import:

- FC backend FLI (traditional) supports ONTAP on AFF / ASA / ASA r2 / FAS (per the comparison table in the iSCSI test design).
- iSCSI backend FLI expands coverage to include AFF / ASA / ASA r2 / FAS / ONTAP Select / Cloud Volumes ONTAP (CVO) (per the same comparison).

Supported source arrays and qualification approach

- With FC backend FLI, supported foreign arrays are typically validated through established interoperability listings and qualification guidance (the supported list evolves as new arrays are qualified).
- With iSCSI backend FLI, no foreign arrays are pre-qualified by default; customers are expected to perform field qualification using the provided qualification tools (for example, sanlunmigrate / offtap sanlunmigrate) before committing to a production migration.

Host operating systems and fabric/switch support (end to end validation)

- Host OS support should align with the SAN host interoperability guidance for the chosen front end protocol (FC or iSCSI) and the post migration host configuration.
- Switch/fabric support must also be validated as part of the end to end configuration (especially for FC environments where zoning/masking is required).

Post migration requirement (stay supported after cutover)

After the import is complete and hosts are running on ONTAP LUNs, ensure that the final steady state configuration is supported. This includes host multipathing, HBA/driver/firmware levels, zoning/masking (FC), iSCSI configuration (if used), and any ONTAP feature interactions you plan to use.

iSCSI FLI-specific guardrails (important for supportability)

- iSCSI FLI uses intercluster (IC) LIFs for backend iSCSI sessions. Creating new IC LIFs on a different subnet solely to reach foreign targets when existing IC LIFs are already established on another subnet is treated as unsupported planning guidance.
- The iSCSI initiator session configuration is intended to exist only for the migration and should be cleaned up after migration completion to avoid operational side effects, including upgrade and revert considerations.

Best practices

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 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 and migrated to validate the import process.
- Use the throughput observed in your test migrations to plan production migration

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