

Dell EMC Unity: Migration Technologies

A Detailed Review

Abstract

This white paper reviews moving data within a Dell EMC™ Unity system and the options available for migrating data from a Dell EMC CLARiiON, Celerra, VNX, VNXe, VMAX, SC/Compellent, PS/EqualLogic, and some third-party systems to the Dell EMC Unity platform. An overview of each solution is provided, followed by a discussion of the solution's merits and applications. This paper serves as a centralized resource for migration options and contributes to the overall decision-making process of arriving at Dell EMC Unity.

June 2021

Revisions

Date	Description
June 2021	Template and format updates. Updated for Unity OE 5.1.

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Executive summary

Choosing a Dell EMC Unity system for its truly Unified platform and management operations has never been easier. With a series of flexible deployment options, from purpose-built All Flash and Hybrid configurations, to the software defined Dell EMC UnityVSA and the converged offering within Converged Platforms and Solutions Division of Dell EMC Vblock, the Dell EMC Unity series can fit the needs of a small to medium business and enterprise class business alike. Whether chosen as part of a tech refresh or to operate alongside existing Dell EMC hardware, it is important for Dell EMC Unity to support a broad set of options for performing migration.

Data migration involves the transferal of data and host connectivity from one storage device to another. When considering which form of migration to use, many factors are considered. The type of data: block, file, or both, influences which tools can be used. The amount of data and its scale (number of block devices, file systems, so forth) also are important considerations. The means of migration can be a factor, whether it is done natively or through a host-based solution. Tolerance to downtime is another major concern – can the migrated data be held inaccessible for a period of time or is absolute or near-absolute cutover a necessity? Finally, cost will often lead the decision-making process to a conclusion.

The intention of this paper is to provide a single resource which lists the supported migration options for each platform and help guide the decision-making process. It should not however be the only resource consulted for making this decision and following through with the migration itself. To this end, links and references to supporting material will be provided at the end of each subsection, with Dell EMC Unity-specific documentation included at the end of this document, under References.

This white paper reviews the various options available for performing migration to Dell EMC Unity. The first portion of the paper outlines the options available for a specific platform: Dell EMC CLARiiON, Dell EMC Celerra, the Dell EMC VNX family, and the Dell EMC VNXe series. The second half of the paper discusses each solution and reviews the various focus areas of consideration. It is recommended to use the first section to identify the specific solutions for your particular hardware, then investigate those solutions over the second section.

Audience

This white paper is intended for IT administrators, storage architects, partners, Dell EMC employees and any other individuals involved in the evaluation, acquisition, management, operation, or design of a Dell EMC networked storage environment using the Dell EMC Unity family of storage systems. It is written with the assumption that the reader is planning to perform a migration to Dell EMC Unity themselves or for an end user and assumes a basic understanding of migration concepts and workflow.

Terminology

Commit – A part of the migration process used by some migration solutions. After a migration session is cutover and access is provided from the destination system, a commit removes any existing migration connections and ends any data transfer between systems. For some migration solutions, the cutover operation includes the commit process.

Cutover – The process of changing the primary storage node from the source system in a migration session to the destination system. During this process, host access to the device on the source is removed and presented from the destination.

Disruption – A period of downtime associated with the cutover process during a migration session. With some migration solutions, a disruption period is necessary in order to begin hosting resources from the destination system.

Migration or **Tech-refresh** – A term used to describe the process of changing an existing production storage system with another storage system. Migrations are often necessary when a company installs replacement storage hardware as part of a tech refresh or to replace systems going end of life.

Rollback – The act of returning the state of systems in a migration session to their pre-migration status. For example, if a migration is cutover and hosts are accessing data from the new storage system, but it is desired to return storage responsibility to the source system, a rollback can be performed.

1 Introduction

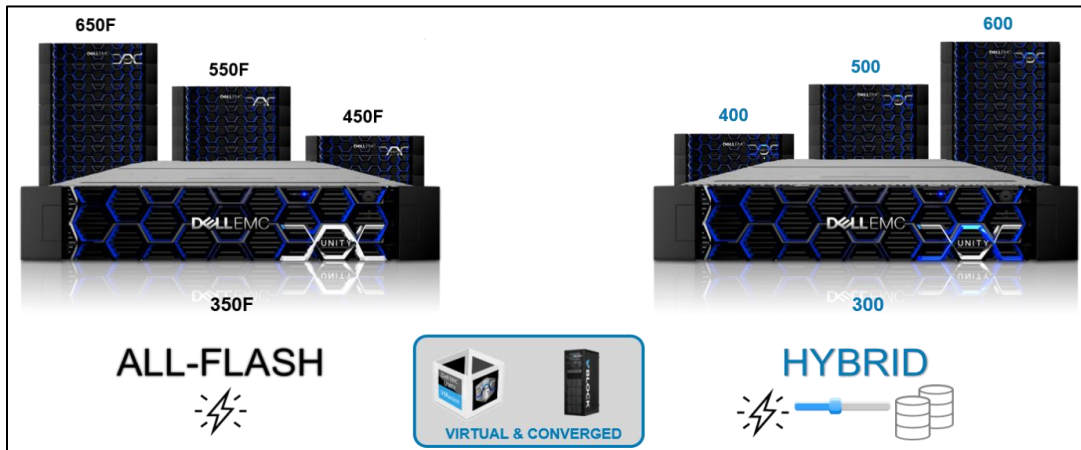


Figure 1 Dell EMC Unity Family

Dell EMC Unity sets the new standards for midrange storage with a powerful combination of simplicity, modern design, affordable price point, and deployment flexibility – perfect for resource-constrained IT professionals in large or small companies. Dell EMC Unity is perfect for midsized deployments, Remote Office/Branch Office locations, and cost-sensitive mixed workload environments. It is designed for all-flash, delivers the best value, and is available in purpose-built (all flash or hybrid flash), converged deployment (through Converged Platforms and Solutions Division of Dell EMC), and as a software-defined virtual edition. With all-inclusive software, new differentiated features, internet-enabled management, and a modern design, Dell EMC Unity is where powerful meets simplicity.

2 Migration Overview by Platform

For Dell EMC Unity, synchronous block replication is only supported on physical deployments. The supported systems include the All Flash models, and the Hybrid models. For Dell EMC Unity All Flash and Hybrid systems, Synchronous Block Replication license comes included at no additional cost.

2.1.1 Moving within Dell EMC Unity

The Dell EMC Unity series allows for the relocation of storage resources on the system through the Local LUN Move feature. This feature is available for VMFS Datastores and Block LUNs, including LUNs within a Consistency Group. The ability to relocate data between pools or within the same pool at the LUN level allows for manual control over data distribution and load balancing.

2.1.2 Migration from Dell EMC VNX1 and VNX2

The Dell EMC VNX series provides effective block, file, and Unified storage for the midrange market and has been a cornerstone of the Dell EMC portfolio for several years. With the introduction of Dell EMC Unity many customers seek a migration path from VNX1/VNX2, and as a result there are many solutions available for both block and file migration.

For the migration of block resources from the Dell EMC VNX1 and VNX2 platforms, the following solutions are available:

- Dell EMC Unity Native Block Import (Block LUNs/CGs)
- Dell EMC RecoverPoint
- Dell EMC PowerPath Migration Enabler
- Dell EMC VPLEX
- Host-Based LVM Migration

For file migration from the Dell EMC VNX1 and VNX2 platforms, the following solutions are:

- Dell EMC Unity Native File Import
- Dell EMC Select Datadobi DobiMigrate
- EMCopy
- Robocopy
- Rsync

In virtualized environments leveraging VMware ESXi and vCenter Server, the following solutions are available:

- Dell EMC RecoverPoint for VMs
- Dell EMC VPLEX
- VMware Storage vMotion

2.1.3 Migration from Dell EMC VNXe1600/VNXe3200

The Dell EMC VNXe1600 and VNXe3200 deliver a cost-efficient, easy to deploy block or Unified environment for small business and ROBO use cases. With systems starting at only 2U in size, the VNXe1600 and VNXe3200 offer enterprise-level functionality and data services within a small footprint for maximum efficiency.

For the migration of block resources from the Dell EMC VNXe1600 and VNXe3200 platforms, the following solutions are available:

- Dell EMC Unity Asynchronous Block Replication
- Dell EMC RecoverPoint (3200 only)
- Dell EMC PowerPath Migration Enabler
- Dell EMC VPLEX
- Host-Based LVM Migration

For file migration solutions from the Dell EMC VNXe3200 platform, the following solutions are:

- Dell EMC Select Datadobi DobiMigrate
- EMCopy
- Robocopy
- Rsync

In virtualized environments leveraging VMware vSphere ESXi and vCenter Server, the following solutions are available:

- Dell EMC RecoverPoint for VMs
- Dell EMC VPLEX
- VMware Storage vMotion

2.1.4 Migration from Dell EMC VNXe3100/VNXe3300

The Dell EMC VNXe3100 and VNXe3300 offer unified storage capabilities with easy to provision storage resources that can offer integrated application awareness. The VNXe3100 and VNXe3300 were designed with the IT generalist in mind, such as someone operating an environment with fewer users or performance requirements than an enterprise-level deployment.

For the migration of block resources from the Dell EMC VNXe3100 and VNXe3300 platforms, the following solutions are available:

- Host-Based LVM Migration

For file migration solutions from the Dell EMC VNXe3100 and VNXe3300 platforms, the following solutions are:

- Dell EMC Select Datadobi DobiMigrate
- EMCopy
- Robocopy
- Rsync

In virtualized environments leveraging VMware ESXi and vCenter Server, the following solutions are available:

- Dell EMC RecoverPoint for VMs
- VMware Storage vMotion

2.1.5 Migration from Dell EMC CLARiiON

With the Dell EMC CLARiiON, block storage capabilities are offered and enhanced by a robust feature set which includes storage tiering between drive types and virtual provisioning. While the Dell EMC CLARiiON series is no longer sold, the product continues to see use in the industry. Migration to the Dell EMC Unity platform will enable additional feature functionality offered by the Dell EMC Unity series.

For the migration of block resources from the Dell EMC CLARiiON platform, the following solutions are available:

- SAN Copy Incremental Push (From CLARiiON)
- Dell EMC RecoverPoint
- Dell EMC PowerPath Migration Enabler
- Dell EMC VPLEX
- Host-Based LVM Migration

In virtualized environments leveraging VMware ESXi and vCenter Server, the following solutions are available:

- Dell EMC RecoverPoint for VMs
- VMware Storage vMotion

2.1.6 Migration from Dell EMC Celerra

The Dell EMC Celerra family provides file-based provisioning in a standalone format or with a Dell EMC CLARiiON array. Support for multiprotocol file systems and quotas made Dell EMC Celerra a top choice for the small to medium business market when it was introduced. While the product is no longer sold, customers are actively using Dell EMC Celerra and seek out ways to move their data to a Dell EMC Unity product.

For file migration solutions from the Dell EMC Celerra platform, the following solutions are:

- Dell EMC Select Datadobi DobiMigrate (OE version 6.0.364 and later)
- EMCopy
- Robocopy
- Rsync

In virtualized environments leveraging VMware ESXi and vCenter Server, the following solutions are available:

- Dell EMC RecoverPoint for VMs
- Dell EMC VPLEX
- VMware Storage vMotion

2.1.7 Migration from Other Storage Systems

In some instances, a user may want to migrate block data from a system not mentioned in the sections above to a Dell EMC Unity system. While many host-based options are available and documented in this guide, Dell EMC Unity OE version 4.4 includes SAN Copy Pull, which migrates block resources from several supported systems to a storage resource on a Dell EMC Unity system. More information about this feature and the supported source systems can be seen later in this guide.

3 Migration Solutions Review (Block)

In this section, the sets of migration solutions available for performing block migrations are reviewed. Considerations will be made for the supported configurations, execution process, and cost. Additional references to supporting material will also be covered. For a full listing of block migration solutions alongside the various platforms, refer to Appendix B.

3.1 Local LUN Move

With the Local LUN Move feature, available starting in Dell EMC Unity OE version 4.1, Dell EMC Unity provides native support for moving LUNs and VMFS Datastores online between pools or within the same pool. This ability allows for manual control over load balancing and rebalancing of data between pools. Local LUN Move leverages Transparent Data Transfer (TDX) technology, a multi-threaded, data copy engine. TDX is designed to help ensure a low impact on host access during a move session.

With the Local LUN Move feature, you can perform and administer LUN moves by using the Unisphere HTML5 GUI, the UEMCLI, or the REST API. The following examples focus on administering and monitoring move sessions on LUNs through Unisphere, although this is fully supported for VMFS Datastores with the same workflow. For more information about UMECLI and REST API commands, see the CLI and REST API guides at Dell EMC support. When a move is initiated on a LUN, the session starts automatically and transparently handles the cutover to the destination pool. You can monitor the progress of the move by viewing the session details, the average transfer rate, the current transfer rate, and the estimated time remaining through the GUI or the CLI. To move a LUN, from the Block Storage page, you can select the LUN and click More Actions > Move (Figure 2).

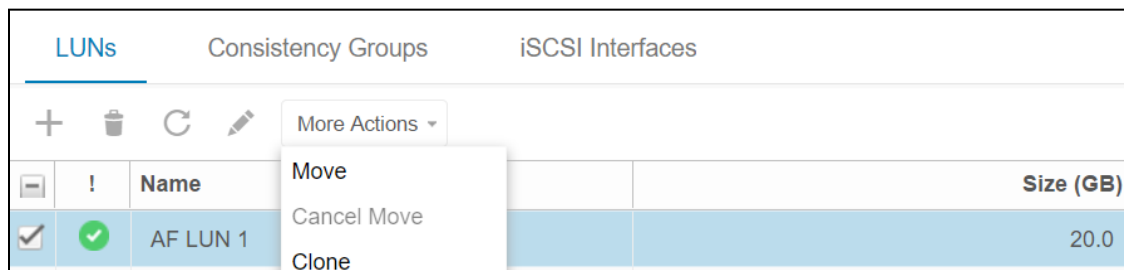


Figure 2 More Actions - Move

The Move LUN dialog box appears, where you can select the destination pool. You will have the option to enable Data Reduction if the destination pool is all flash (this option may appear as Compression in older version of Dell EMC Unity OE). If you select the Data Reduction option, the data within the LUN is processed by the data reduction algorithm as the data is moved to the destination pool. While a move is in progress, you can monitor the session by viewing the side bar when the LUN is selected or by opening the LUN Properties window. Information such as the move progress percent, the time remaining, the transfer rate, and the session priority are displayed. After the session is completed, and for 3 days following the move, the Move Session State field displays “Completed”.

LUN properties such as snapshot schedules, LUN metrics, and LUN attributes are moved with the LUN. LUN properties such as replication sessions and snapshots are not moved with the LUN. If a replication session is configured on a LUN or its Consistency Group, the session must be deleted before the move can begin, and then configured again when the move is completed. If snapshots are associated with the LUN, or the Consistency Group that the LUN is contained in, they will be deleted once the move has completed. If the LUN has any Thin Clones, then a move operation cannot be performed. If the move session is canceled, the

snapshots will remain. Snapshot schedules for a LUN or its Consistency Group persist throughout the move and continue to take snapshots of the LUN after the move is completed.

To be eligible for the Local LUN Move feature, the LUN or its Consistency Group cannot be participating in a replication session, expanding or shrinking, restoring from a snapshot, participating in a VNX Import Session, or offline. The LUN cannot be a source for any Thin Clones. Sufficient space must be available in the destination pool, or the move will fail. Space requirements ignore the potential data reduction savings if you plan to apply data reduction when it is moved.

While a LUN is being moved, it cannot be deleted, modified in size, restored from a snapshot, configured in a replication session, used by an Import Session, added or removed from a Consistency Group, or have snapshots taken. The system cannot initiate a software upgrade while any move sessions are in progress.

There are limits of 100 move sessions and 16 active sessions for Dell EMC Unity systems. The TDX engine has resources for a limited number of concurrent sessions. Only 2 for 300(F)/350F, 4 for 400(F)/450F, and 5 concurrent sessions for 500(F)/550F/600(F)/650F. If there are more active sessions, then concurrent sessions, they will be multiplexed across the TDX resources based on their priority.

3.1.1 Local LUN Move with Data Reduction

The Local LUN Move feature includes a data reduction option if the destination pool is All Flash. The data in the LUN can be reduced by bringing a LUN from another pool (Hybrid or Flash) into an All Flash pool, or by moving a LUN within an All Flash pool. For Dell EMC Unity 300(F), 400(F), 500(F), and 600(F) systems running a version of code prior to Dell EMC Unity OE version 4.3, if a LUN in an All Flash pool has compression enabled, the “Compress Now” option is available from the “More Actions” dropdown. With this option, you can initiate a LUN Move on the selected LUN within the same All Flash Pool, and the data is compressed when the LUN is moved. The “Compress Now” option has been deprecated in OE version 4.3, but Local LUN Move can be used in its place.

If a LUN does not have data reduction enabled and the LUN is moved into an all Flash Pool, a checkbox is available to enable data reduction. If the LUN does not have data reduction enabled and already exists in an all Flash Pool, the move operation can be used to enable data reduction by following the above procedure and moving within the same Pool. The Local LUN Move can be also leveraged to apply Advanced Deduplication to existing LUNs.

In Dell EMC Unity OE version 4.5, Data Reduction includes an optional feature called Advanced Deduplication, which expands the deduplication capabilities of the Data Reduction algorithm. Advanced Deduplication is included as an optional feature to Data Reduction algorithm for the Dell EMC Unity 450F, 550F, and 650F systems. This feature is only available on Dynamic Pools.

For more information about data reduction as it relates to Dell EMC Unity, see the *Dell EMC Unity: Data Reduction* white paper on Dell EMC Online Support.

3.2 Dell EMC Unity Asynchronous Block Replication

Dell EMC Unity offers native support for asynchronous block replication, and this can be used for cross replication to VNXe3200 and VNXe1600 platforms. Asynchronous block replication leverages the iSCSI protocol and is supported over both copper and optical connections. Replication sessions can be configured in a one-way or bi-directional configuration between systems, allowing for migration operations and backups to the source VNXe1600 or VNXe3200 to co-exist (Figure 3).

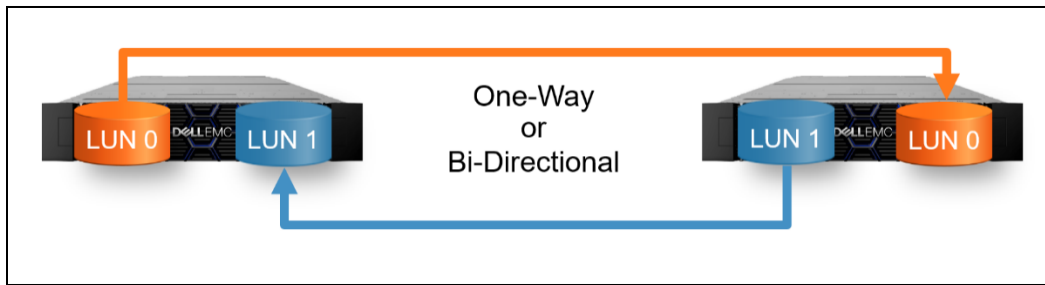


Figure 3 Dell EMC Unity Asynchronous Block Replication

From the source VNXe3200 or VNXe1600, configure a block replication session on LUNs, Consistency Groups, or VMFS Datastores to the Dell EMC Unity system (Figure 4). After data has been synchronized between the source system and the destination Dell EMC Unity system, the replication session may be failed over. Before doing so, verify host connectivity and access to the destination Dell EMC Unity system will ensure continued access after the failover is conducted. After performing the failover, block resources are then made available from the Dell EMC Unity system. If desired, the replication session may be maintained after migration in reverse direction (Dell EMC Unity as the source system, and the VNXe3200/VNXe1600 serving as the destination) to fulfill data protection requirements on the block resources.

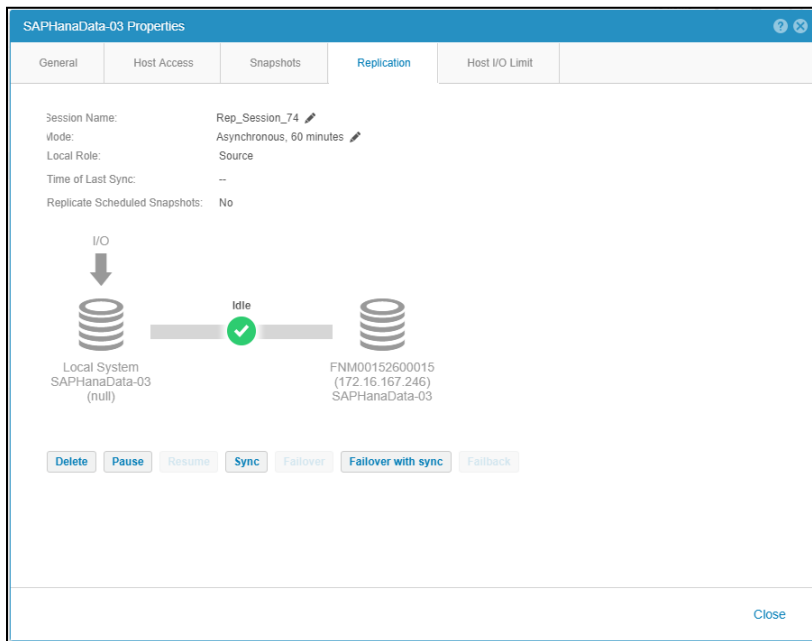


Figure 4 Dell EMC Unity Unisphere – VNXe3200 to Dell EMC Unity Migration

Dell EMC Unity asynchronous block replication is included with the Dell EMC Unity product license. For more information about Dell EMC Unity's replication offerings, please see the *Dell EMC Unity: Replication Technologies* white paper available on Dell EMC Online Support.

3.3 Dell EMC SAN Copy Incremental Push (VNX/CLARiiON)

Migration of block resources from the Dell EMC VNX and CLARiiON platforms is achievable by using SAN Copy in a push operation. SAN Copy is available for free and is found pre-installed on newer VNX2 systems. For systems that do not have SAN Copy licensed, the license is obtained from Dell EMC Online Support and is enabled by an NDU. For more information about the storage arrays supported by SAN Copy, refer to the

Dell EMC E-Lab Navigator. Dell EMC Unity Native Block Import leverages SAN Copy Incremental Push on VNX systems and automates the migration process from the Dell EMC Unity system. Native Block Import should be used in place of manually migrating data using SAN Copy Push from VNX systems to Dell EMC Unity.

SAN Copy is capable of migrating Pool LUNs, Classic LUNs, MetaLUNs, and Consistency Groups to a Dell EMC Unity system over Fibre Channel or iSCSI protocols. A SAN Copy migration session may be conducted in one of two modes: full copy or incremental copy. A full copy session is useful when a planned extended outage window is possible, as host access will be disabled while an entire copy of the block device occurs to the Dell EMC Unity system. Any changes to the source device will require a completely new full copy to be made. Choosing to use an incremental copy session retains host access to the device until the time of cutover, as changes to the block device will be updated at the destination site periodically. In order to use an incremental copy session, a Reserved LUN Pool is required. More information about Dell EMC SAN Copy can be found on Dell EMC Online Support. Documents are available from Dell EMC Online Support to review SAN Copy's various modes and options in more detail, as well as a step-by-step guide to configuring and performing SAN Copy migration to a Dell EMC Unity system.

3.4 Dell EMC Unity SAN Copy PULL

Dell EMC Unity OE version 4.4 includes SAN Copy Pull as a part of the code. SAN Copy Pull is a migration tool which migrates data from block storage resources, either standalone LUNs/Volumes or VMFS Datastores, found on supported systems to Dell EMC Unity. SAN Copy Pull works with all Dell EMC Unity models, including UnityVSA. All configuration, creation, and management of the SAN Copy Pull sessions is only available through UEMCLI or REST API. Figure 5 below outlines an example of SAN Copy Pull.

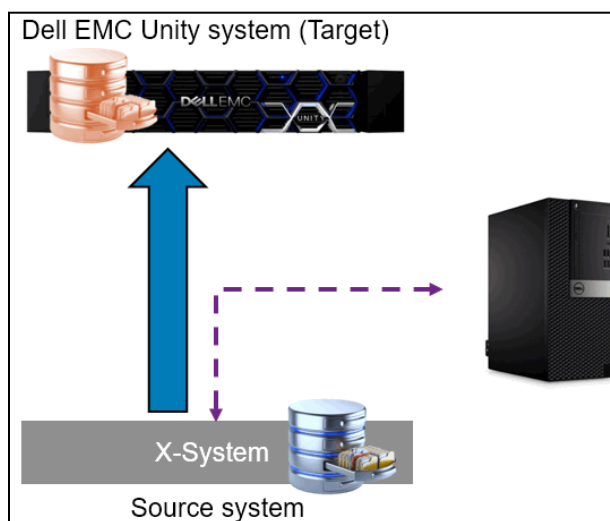


Figure 5 SAN Copy Pull

The list below includes the systems supported by SAN Copy Pull, which includes several Dell EMC and third-party storage systems. For migrations from Dell EMC VNX systems, Dell EMC Unity Native Block Import should be used. For CLARiiON systems, Dell EMC SAN Copy Push on the CLARiiON system should be leveraged.

Systems supported by Dell EMC Unity SAN Copy Pull:

- Dell EMC SC/Compellent

- Dell EMC PS/EqualLogic
- Dell EMC VMAX
- HP EVA
- HPE 3PAR
- Hitachi HDS
- NetApp

Migrations using Dell EMC Unity SAN Copy Pull to migrate from a source system to the target Dell EMC Unity system happen offline from a host accessibility perspective, and therefore should be completed during a maintenance window. All I/Os must be suspended on the source storage resource and host access should be removed for the entire duration of the migration as data changed during the migration is not tracked and does not propagate to the destination resource. Once the migration is complete, host access can be applied to the target LUNs and I/O can resume.

A SAN Copy Pull migration session can be configured over Fibre Channel (FC) or iSCSI to migrate the data. Choosing which technology to use entirely depends on the connectivity options supported for the source and destination system and the speed of the connections. For instance, if both systems support 1 Gb iSCSI and 8 Gb FC, choosing FC may be a better option due to the speed of the link that can be configured. To successfully start a migration session, both Dell EMC Unity Storage Processors (SP) must be able to access the source resource. If the source system has a top and bottom controller and you want to migrate resources from both controllers, both SPA and SPB of the Unity system need to have access to both controllers. If FC is selected, note that the Sync Replication ports cannot be used for the migration. More information about configuring connectivity between the systems can be found in the *Dell EMC Unity: Third-Party System Migration using SAN Copy Pull* guide found on Dell EMC Online Support.

Once connectivity is established between the source system and the Dell EMC Unity system, the target LUNs or VMFS Datastores on the Dell EMC Unity can be configured. As the Dell EMC Unity system has no information about the source storage resource, the person completing the migration must configure the destination storage resource manually. The destination resource can be the same size as the source or larger, be Thin or Thick, and can support Data Reduction if the system and Pool configuration support it. In some instances, the destination must be slightly larger than the source due to the difference in block sizes between the products. When configuring the resources, advanced data features such as snapshot schedules, replication, and being a member of a Consistency Group are not supported. The resource also cannot have any snapshots or thin clones created on it. All these configurations and options can be customized after the migration has completed.

Before starting the migration, it is suggested to configure host connectivity to the Dell EMC Unity system. Having the host configured to the Dell EMC Unity system before the migration helps decrease the amount of downtime seen, as those steps are not required after the migration completes. The host can either be the existing host on the source system, or a new host that will be used in its place. Consult the *Dell EMC Unity Simple Support Matrix* for supported host configurations, which can be found on Dell EMC Online Support.

Once connectivity is established and the destination resource is configured, the user needs to stop all I/O on the source resource, remove all host access, and add the Dell EMC Unity system as a host to access the source storage resource. Depending on the source system, the Dell EMC Unity system may need to be first registered as a host. If necessary, manually create a new host using the WWN of the Fibre Channel ports or the IQNs of the iSCSI ports used for the migration. Once the Dell EMC Unity system is registered as a host, provide it access to the source volume. In some case, you may need to ensure that mappings are allowed to the paths that are currently down, and not logged in.

Next the session can be created using either UEMCLI or REST API. The usage and an example of the `/import/session/generic create` UEMCLI command is shown below. Once the session starts, the SAN Copy Pull software reads the data from the source system and writes it to the destination resource on the Dell EMC Unity system. The SAN Copy Pull software does not know how much data is allocated on the source resource, so it reads all blocks on the source volume, even if it is all zeroes. SAN Copy Pull has a built-in zero detect mechanism which avoids writing zeroes to the destination. These zeros do not count towards the Data Reduction savings value if Data Reduction is enabled. Once the migration is completed, access can be provided from the Dell EMC Unity system to the host and host I/Os can resume. For more information about the command below, consult the *Dell EMC Unity: Third-Party System Migration using SAN Copy Pull* guide found on Dell EMC Online Support.

```
uemcli /import/session/generic create [ -async ] [ -name <value> ] [ -descr
<value> ] [ -srcSystemName <value> ] -srcLUNWWN <value> { -targetRes <value> | -
targetResName <value> } [ -throttle { Low | Medium | High } ]
```

An example:

```
uemcli -d SystemIP -u Username -p Password /import/session/generic create -name
migration-1 -srcLUNWWN 6000d31005639200000000000000000005 -targetResName
LUN_Migration-00 -throttle Medium
```

The default throttle value is High, which allows the session to run as fast as possible. The user can specify a different throttle when creating the session, or while the session is running.

Once a migration session is created, there are a few operations that can be run on the session using the `/import/session/generic` command:

- **Show** – Displays the details of the migration session. For example, the source LUN WWN, the target resource, what the estimated time to complete the migration is, etc.
- **Set** – Modifies some of the migration session's values. For example, the name of the migration session, throttle, etc.
- **Pause** – Pauses the migration session.
- **Resume** – Resumes the migration session when the session was paused previously.
- **Restart** – Restarts the session if the session is in a failed state. The session will restart from the last SAN Copy Checkpoint.
- **Delete** – Deletes a canceled or completed session.

While the session is running, SAN Copy Pull keeps track of the current logical block addresses that each session is currently reading from. Every 10 minutes, a SAN Copy Checkpoint is taken, which marks a block address starting point to continue a migration in case an issue is encountered. In the event of a planned or unplanned SP reboot, the session is paused until the SP fully boots. The session is restarted automatically from the latest SAN Copy Checkpoint for that session once the SP is booted. The session also has a throttle which is used to control the bandwidth of the session.

The maximum number of the SAN Copy sessions running in parallel is limited on the system. The maximum number of sessions allowed depends on the model and on the OE version of the Dell EMC Unity system. See Table 1 for the specific limits. When the number of sessions hits the system limit, the additional sessions will queue. Once one of the sessions has completed, another session from the queue is started automatically.

Each session only runs on the SP Owner for the destination storage resource. To find the SP Owner of a particular resource, review the properties of the resource. You can also change the SP Owner of a resource before starting a session to control which SP the SAN Copy Pull session runs on. The user cannot change the LUN ownership if the session has already started.

Table 1 SAN Copy Pull Sessions Limit

System Model	Dell EMC Unity OE 4.4*	Dell EMC Unity OE 4.5*
Dell EMC UnityVSA	1	1
Dell EMC Unity 300(F)	2	2
Dell EMC Unity 350F	2	4
Dell EMC Unity 400(F)/450F	2	8
Dell EMC Unity 500(F)/550F	2	8
Dell EMC Unity 600(F)/650F	2	8

*Limit Per SP

For more information about how to set up a connection between the two systems using iSCSI or Fibre Channel and how other operations work with the migration session, please check the *Dell EMC Unity: Third-Party System Migration using SAN Copy Pull* guide on Dell EMC support website.

3.5 Dell EMC Unity Native Block Import

With the Dell EMC Unity Native Block Import feature, in Dell EMC Unity OE version 4.1, Dell EMC Unity provides native support for the migration of block resources from Dell EMC VNX Systems. This feature allows you to import Block LUNs and Consistency Groups through the Unisphere GUI, or through the UEMCLI or the REST API. Native Block Import leverages a SAN Copy Incremental Push operation on the source VNX system, which is a mature program with run time and documentation associated with it. To use the Native Block Import feature, the VNX system must have a licensed and installed instance of SAN Copy. SAN Copy is available for free and is pre-installed on many VNX systems.

This feature integrates the configuration and execution aspects of the SAN Copy operations into the Dell EMC Unity migration workflow for increased ease-of-use and simplicity. Only one remote system connection is required to import block resources. The following information describes the migration of block resources by using the Native Block Import feature, including the preparation of the VNX, the creation, monitoring, and cutover on Dell EMC Unity, and the requirements for using the Native Block Import feature.

To prepare the Dell EMC Unity system for the block import, iSCSI or Fibre Channel interfaces must be configured on the system. If you are importing through iSCSI, on the VNX system create an iSCSI connection to the Dell EMC Unity iSCSI interfaces. If you are importing over Fibre Channel, configure Fibre Channel port zoning between the VNX and Dell EMC Unity Systems. Avoid using the MirrorView Ports on VNX and the Synchronous Replication Ports on the Dell EMC Unity system. If possible, avoid using Fibre Channel or iSCSI ports that are being used for host traffic. On the VNX system, you must configure a Reserved LUN Pool that is based on the LUNs that are planned for block import. This configuration requires one thick LUN for each LUN that is planned for import, sized at 20% of the provisioned size of the import LUN. For more information about VNX pre-configuration for SAN Copy, see the Migrating to Dell EMC Unity with SAN Copy white paper.

When the pre-configuration is completed, an Import Connection can be created from the Dell EMC Unity system to the source VNX system. Import Connections are created under the **Import** tab under **Protection &**

Mobility and require the VNX SPA or SPB IP and administrator credentials. After the Import Connection is established, the block resources that are eligible for migration are discovered. The block resources can include Pool LUNs, Meta LUNs, Consistency Groups, and Classic LUNs that are not: RLP LUNs, file storage LUNs, or System LUNs. A best practice is to register the associated hosts of the VNX Block resources to the Dell EMC Unity System, which allows you to assign host access to the destination resource when you create the Import Session.

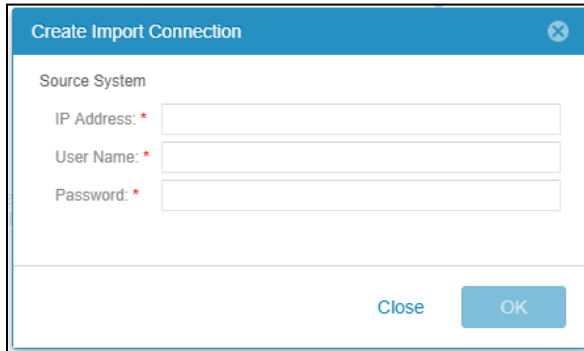


Figure 6 Unisphere – Create Import Connection

After an Import Connection is successfully established to the source VNX, Import Sessions can be created to migrate Block resources from the VNX system to the Dell EMC Unity system by using the Import Session wizard. You can specify the Block LUNs or Consistency Groups to be migrated. The attribute values of the destination resource, such as the resource name and the destination pool, are automatically populated, and these values can be modified. By default, the name is the source resource name, and if naming conflicts occur on the Dell EMC Unity system the imported resource name is automatically appended with the next available number, such as “01”. At this point, there is an option to enable data reduction if the destination pool is all flash. For multiple Import Sessions, the Dell EMC Unity system will round robin the primary SP to ensure that the destination LUNs are evenly distributed across the SP resources.

You can specify the host access and Import Session priority in the Import Session wizard. If the appropriate host was not registered with Dell EMC Unity, you can create a new host within the Import Session wizard and assign access. By default, the highest SAN Copy priority is assigned to the session. To lower the SAN Copy priority for the Import Session, you can select the Throttle Session option. The final step of the Import Session wizard is a summary page. After you verify the information and click Finish, the destination LUN or Consistency Group is created and the syncing phase begins. Incremental copies will begin from the source resource to the destination. The Import Session page displays the active Import Sessions and their respective states. Upon completion of incremental copy, the status of the session is Ready to Cutover. The Cutover Threshold can be modified after the session has been created; the lower this threshold is, the faster the cutover will be. At this point, a cutover can be performed. The cutover disables the host access from the source VNX, a final sync is performed, the SAN Copy session is deleted, and host access to the destination Dell EMC Unity system is enabled. The Cutover is a disruptive transition and the hosts will lose access during the Cutover process. You must rescan on the host once the cutover has been completed, ensure that host access has been provided from the Dell EMC Unity system.

Table 2 below displays many of the limits SAN Copy enforces on different VNX models. For a more extensive list of information, limits, and best practices as it relates to SAN Copy and Dell EMC Unity see the *Migrating to Dell EMC Unity with SAN Copy* white paper on Dell EMC Online Support.

Table 2 SAN Copy Limits

	VNX8000, VNX7600 VNX7500, VNX5700	VNX5800 VNX5500	VNX5600, VNX5400, VNX5300 VNX5200, VNX5100
Concurrent running sessions	32	16	8
Destinations per session	100	50	50
Incremental source LUNs	512	256	256
Defined incremental sessions	512	512	512
Incremental sessions per source LUN	8	8	8

3.6 Dell EMC PowerPath Migration Enable

PowerPath Migration Enabler (PPME) is a migration tool packaged with Dell EMC's PowerPath software that provides migration capabilities from a Dell EMC VNX series, VNXe1600/VNXe3200, and CLARiiON series system to a Dell EMC Unity system. It is also compatible with certain third-party storage arrays. While PPME is installed alongside PowerPath multipathing, it is not a requirement that multipathing is running on the host machine in order to take advantage of PPME. PPME requires a license, which is tied to the overall PowerPath license.

PPME offers a set of different migration options that enables compatibility between many storage systems. For Dell EMC Unity, PPME Host Copy is used. PPME Host Copy is a host-based migration operation and will use host-based resources to copy data from the source system to the destination system. A direct connection between the source storage system and destination Dell EMC Unity system is not required. Host access to the block resource is maintained during the migration's initial copy and can be configured to be non-disruptive during cutover to the Dell EMC Unity system.

For more information about the supported systems with PowerPath Migration Enabler, refer to Dell EMC's E-Lab Navigator. For more information about using PowerPath Migration Enabler, refer to Dell EMC Online Support.

3.7 Dell EMC RecoverPoint

Dell EMC RecoverPoint is an appliance-based solution that can be used for migrating block data from VNX, VNXe3200, VMAX, XtremIO, and CLARiiON to Dell EMC Unity. RecoverPoint is a Dell EMC product that provides a seamless replication solution between disparate storage systems and supports Dell EMC storage products and third-party arrays.

Dell EMC Unity supports RecoverPoint by using a RecoverPoint splitter, which sends host writes to the storage system and RecoverPoint appliances to be replicated to the destination system. This enables replication to be handled by the RecoverPoint appliances, saving the Dell EMC Unity systems from the compute effort. RecoverPoint performs data transfer over the Fibre Channel protocol, thus FC is required in either a switched configuration or using direct attach. RecoverPoint is also offered as a virtual appliance. A virtual RecoverPoint Appliance (vRPA) cluster can be deployed and will function equivalently to a migration

setup using physical RecoverPoint Appliances. A vRPA configuration does not require FC switching and could result in lower overall costs to the migration setup.

With the purchase of a Dell EMC Unity system, a license for RecoverPoint Basic is included. This license can be used to perform RecoverPoint replication and migration between a single VNX or VNXe system and the Dell EMC Unity system. To support additional systems, as well as other Dell EMC storage arrays, a separate RecoverPoint Advanced license is required.

Since RecoverPoint is a replication solution, it may be used to perform a migration to a Dell EMC Unity system and may be maintained after cutover to provide availability and data protection for the block resource by using the original source system. For more information about RecoverPoint, refer to Dell EMC Online Support.

3.8 Dell EMC VPLEX

Migration over Dell EMC VPLEX is part of the expanded use case that VPLEX addresses – continuous availability and geographical distribution of storage systems across data centers (Figure 7). For Fibre Channel environments, VPLEX can be employed to deliver distributed storage and enable hosts in different locations to access the same data. VPLEX is supported on the Dell EMC VNX series, CLARiiON, VNXe3200 and VNXe1600 platforms.

Because VPLEX is a continuous availability solution, migrations are performed non-disruptively. A Dell EMC Unity system is added to a VPLEX cluster containing one of the supported Dell EMC storage systems listed above. Data will be copied to the Dell EMC Unity system in a transparent manner. Once migration has completed, the source storage system can remain in the cluster (to maintain continuous availability and provide archiving benefits) or be decommissioned. Figure 7 is an example of a VMware stretched cluster in an active/active configuration with VPLEX and Dell EMC Unity.

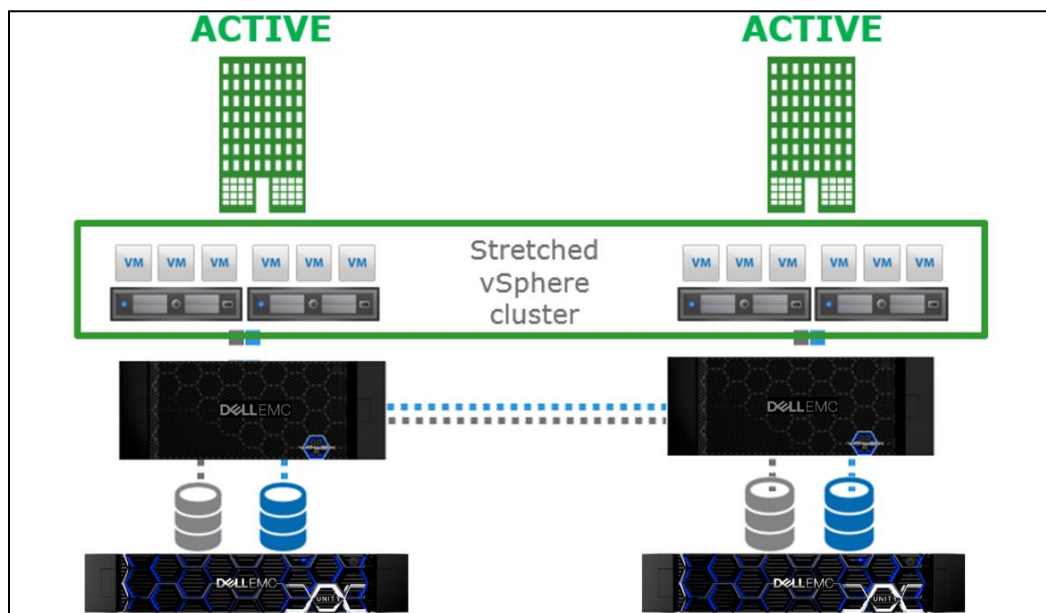


Figure 7 VPLEX Configuration

In a customer environment already leveraging a VPLEX cluster, integrating the Dell EMC Unity system into the cluster is an attractive solution for migration. VPLEX is an appliance-based solution and requires a license. For more information about Dell EMC VPLEX, refer to Dell EMC Online Support.

3.9 Metro node

Metro node is an external hardware and software add-on feature for Unity XT, and it provides active/active synchronous replication as well as standard local use cases. Additionally, it also provides a solution locally with the Local mirror feature to protect data from a potential array failure. Both use cases provide solutions for true continuous availability with zero downtime.

Unity XT is viewed by metro node as ALUA array based on SCSI response data and therefore is required to follow the four active, four passive path connectivity rules. This rule states that both nodes of the metro node must each have four active and four passive paths to all volumes provisioned from the array. For additional information about Metro node, see the Metro node best practices white paper on [Dell Support](#).

3.10 Host-Based LVM Migration

Logical Volume Management (LVM) Migration is performed on a Linux host and supports block devices that have been presented to the Linux host as a logical device. For this reason, LVM Migration may be performed from any of the Dell EMC products considered by this paper as well as third-party storage arrays. LVM Migration can be performed over iSCSI or Fibre Channel and is an included service with most standard Linux distributions.

Depending on the method of LVM Migration used, host access to the block devices can continue while the migration transfer takes place. Once complete, the migration session can be cutover so that host access can resume from the LUNs presented by the Dell EMC Unity system. The source LUNs may be decommissioned or remain in case a rollback operation is needed.

As LVM Migration is a host-based operation, supporting material for LVM Migration can be found on the associated Linux distribution of the Linux host used for LVM Migration. Process and step-by-step guides are also available online.

4 Migration Solutions Review (File)

In this section, the sets of migration solutions available for performing file migrations are reviewed. Considerations will be made for the supported configurations, execution process, and cost. Additional references to supporting material will also be covered. For a full listing of file migration solutions alongside the various platforms, refer to Appendix C.

4.1 Dell EMC Unity Native File Import

The Dell EMC Unity Native File Import feature is available for NFS in Dell EMC Unity OE version 4.1 and extended for CIFS in Dell EMC Unity OE version 4.2, provides a native option for file migration to Dell EMC Unity from a VNX1 or VNX2 system. Dell EMC Unity OE version 5.1 added support for multiprotocol. Leveraging a new Inband Migration Tool (IMT) software, this feature allows for VNX VDM migration to a Dell EMC Unity NAS Server. The Inband Migration Tool was developed to handle the communication and data transfer between VNX and Dell EMC Unity. This migration is either transparent or minimally disruptive to the host IO for NFS or CIFS respectively and allows for a full rollback to the VNX VDM at any time before the migration is committed.

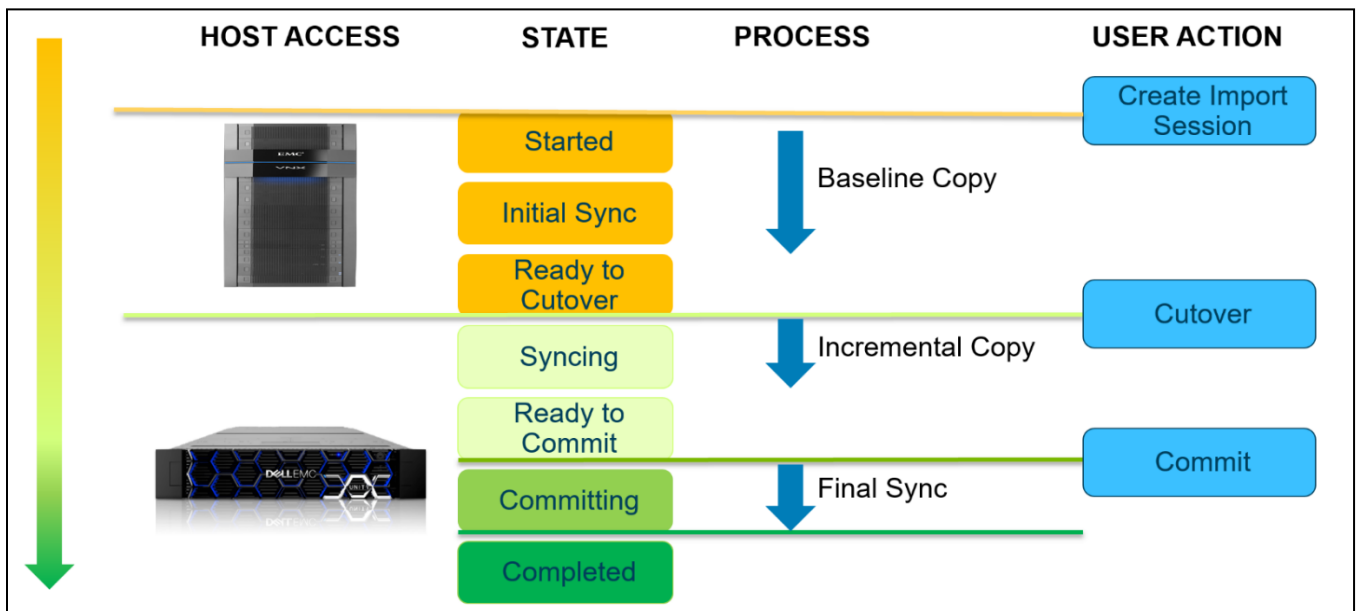


Figure 8 Import Session Lifecycle

Some preparatory work is required on the VNX system, but the creation, monitoring, and cutover operations are managed in Dell EMC Unity. This feature is fully supported through Unisphere, UEMCLI, and the REST API. Native File Import requires mobility interfaces to be configured on the Dell EMC Unity system for data transfer and an Import Connection established to the VNX to allow for communication. The mobility interfaces can be used for NFS, CIFS and Multiprotocol import, and the Import Connection can be used for all Native Imports (File and Block).

Once mobility interfaces have been created on the Dell EMC Unity system, and an Import Connection established from the Dell EMC Unity system to the source VNX, Import Sessions can be created to import VNX VDMs and their file systems. Figure 8 above shows the typical lifecycle of a file Import Session, including the state of the session, the background process during this state, where hosts are accessing their information, and any user actions required to advance the session.

While there are some differences between NFS, CIFS, and Multiprotocol Import Sessions, all will progress through the same life cycle shown above. For more information about performing a Native File Import, please see the Native File Import (NFS), Native File Import (CIFS), and Native File Import (Multiprotocol) sections below.

4.1.1 When to Use Native File Import

It is recommended to use Native File Import if the source VNX is in a supported configuration since this feature automates most of the migration process and helps alleviate common overhead with migrations. The following requirements must be met to use Native File Import:

- VNX1 or VNX2
 - VNX1 Models – VNX5100, VNX5300, VNX5500, VNX5700, VNX7500
 - VNX2 Models – VNX5200, VNX5400, VNX5600, VNX5800, VNX7600, VNX8000
- VNX Code – 7.1.x or later
- Dell EMC Unity OE – Introduced 4.1 (NFS), 4.2 (SMB) and 5.1 (Multiprotocol)
 - Dell Technologies recommends running the latest OE if possible
 - Reference the latest Release Notes for new features and fixed issues
- VDM – File systems to be migrated must reside on a VDM
- Single Protocol
 - NFS VDM – NFSv3 Only VNX VDMs can be imported with the NFS Import
 - SMB VDM – SMB Only VNX VDMs can be imported with the SMB Import
- Multiprotocol – Exports on the VDM that contains both SMB shares and NFS exports can be imported starting with Dell EMC Unity OE version 5.1
- Single CIFS Server – If using SMB or Multiprotocol import, the VDM must contain only a single CIFS Server
- Cloud Tiering – If Cloud Tiering Appliance (CTA) is used to tier data to a cloud repository, Dell EMC Unity OE version 5.1 adds support for Native File Import to be stub-aware. Stub-aware enables the ability to preserve the stub files without rehydrating the data.
 - **Workflow to complete a stub-aware import:**
 - Source VNX2 with a VDM that has tiered files to a supported cloud repository through CTA
 - On the VNX2, run `fs_dhsm -modify fsname -backup offline` against all source file systems that contain DHSM stub files to preserve stub after migration

- On Dell EMC Unity:
 - Set the `imt` parameter `dhsmEnabled` to 1. The command to do so is `svc_nas <NAS Server name> -param -f imt -s dhsmEnabled -v 1`
 - Create the import session
 - After the migration cutover phase, map the share and verify the stub preservation and data access
 - Commit the import session and verify stub access
 - To create new stubs at Unity, configure CTA to access Unity and NAS server
- CTA File Migration can be leveraged to perform a stub-aware migration. Prior to Dell EMC Unity OE version 5.1, Native File Migration causes the stubbed files to be rehydrated and full copies of those files are stored on the destination. For more information about CTA File Migration, refer to the *Dell EMC Unity: Cloud Tiering Appliance (CTA)* white paper on Dell EMC Online Support.

If any of these requirements are not met, they must be addressed prior to starting a Native File Import session. For example, if there are multiple CIFS Servers on the VDM to be migrated, all but one must be removed.

There are also times where Native File Import should not be used, even if the source VNX is in a supported configuration. Some examples include:

- Virtual Environments – Leveraging host-based migration utilities such as VMware Storage vMotion to migrate VMs from the old datastore to the new datastore that resides on the Dell EMC Unity system. This provides more granular controls, allowing the administrator to precisely control when and which VMs are migrated. Native File Import migrates all the data on the file system at the same time.

For unsupported configurations, Native File Import cannot be used. In these cases, the system must be reconfigured to a supported configuration or alternative migration methods should be explored. Some examples of unsupported configurations include:

- Multiple CIFS Servers – If using SMB, VDMs that contain multiple CIFS Servers cannot be imported
- Nested Mounted File Systems (NMFS) – Nested mounted file systems are not supported on Dell EMC Unity
- pNFS, NFSv4, or Secure NFS – VDMs that contain file systems using pNFS, NFSv4, or Secure NFS cannot be imported
- Models – Celerra, VNX gateways, and eNAS (VMAX) systems cannot be a source for import

4.1.2 Native File Import Recommendations

4.1.2.1 Before the Migration

Before migrating data using Native File Import, it is recommended to:

- Test the import procedure on a non-production VDM in the customer environment before migrating a production VDM
 - If possible, create a non-production VDM with a matching configuration to the production VDM to test the migration procedure and ensure the test data is available before, during, and after the migration
- Create a migration schedule and plan outlining when and which VDMs will be migrated
 - Ensure the plan also takes into account the system limits for import
- Document all customized VNX Data Mover parameters that will be made on the Dell EMC Unity NAS Servers
- Verify that the VNX Data Mover and Dell EMC Unity system have the same time
 - Times must be within 5 seconds of each other
 - It is recommended to use the same NTP server if possible
- Ensure network connectivity, stability, and low latency is available between the VNX and Dell EMC Unity
 - Configure FSN/LACP, MTU, VLANs, and VLAN tagging on the switch ports on Dell EMC Unity to match the VNX configuration
 - Confirm connectivity from Dell EMC Unity to DNS, NIS, LDAP, AD servers, clients, and so on.
 - Ensure migration interfaces are created and connectivity exists between the interfaces on Dell EMC Unity and VNX
 - On Dell EMC Unity, go to **Settings** → **Access** → **Routing** → **Ping/Trace** to test interface connectivity
 - On VNX, run a `server_ping <movername> -i <interface>` command to test interface connectivity
 - Ensure ports 22 (SSH), 443 (HTTPS), and 5989 (WBEM-HTTPS) are open on the firewall
- Confirm the health of the VNX and Dell EMC Unity systems
 - Ensure everything is in a healthy state before starting a migration
- Unmount any file systems and checkpoints off of the VDM that should not be migrated
- If possible, remove features that won't be migrated from the VNX
 - E.g., FTP, CAVA, CEPA, and so on
- Generate a data collect from the Dell EMC Unity system and Support Materials and SPCollects from the VNX system
- Review the following documentation:
 - *Dell EMC Unity Native File Import* sections – See Below

- *VNX Series Data Import to Dell EMC Unity* – Available on Dell EMC Online Support
- *Dell EMC Unity Release Notes* – Available on Dell EMC Online Support

SMB and Multiprotocol

Before starting an SMB or multiprotocol migration, it is recommended to:

- Ensure the following parameters are configured on the source VNX Data Mover:
 - `cifs.acl.mappingErrorAction` - 11
 - `cifs.extacl` - 28
- Ensure the physical Data Mover has an interface that can access the DNS server after the migration
 - This interface cannot be attached to a VDM that is being migrated
 - This enables DNS connectivity on the VNX to persist during and after the migration
- Set the default Administrator account's password on the VNX CIFS Server. This can be done by connecting to the CIFS Server using Computer Management
 - Alternatively, create a new user and add that user to the Local Administrators group by connecting to the CIFS Server using Computer Management
- Confirm the production IP address and computer name are allowed on the network that it is being migrated to
 - If not, the migration will not be able to successfully complete the Cutover step

NFS and Multiprotocol

Before starting an NFS or multiprotocol migration, it is recommended to:

- Verify pNFS, NFSv4, or Secure are disabled on source VDM
- Verify the NFS export names do not contain any unsupported characters
 - For example, Commas (,) or double quotes (“)

4.1.2.2 During the Migration

During the migration, it is recommended to:

- Ensure network connectivity between the VNX and Dell EMC Unity system remain up until the migration is committed
- Once the migration starts, do not change any properties, settings, or configuration on the VDM or NAS Server that is being migrated. Also, do not change any global or system-level settings on the Data Mover or Storage Processor that may impact the VDM or NAS Server. Examples of settings that should not be changed until the migration is committed include:
 - Quota settings

- NIS, LDAP, DNS, gateway, and routing configurations
- Create/delete file systems on the VDM
- Mount/unmount file systems on the VDM
- NFS exports, CIFS shares, or user privileges on the CIFS shares
- CIFS server local users or local groups
- DFS configurations
- NAS replication
- VNX VDM or Dell EMC Unity NAS server configurations
- Monitor the migration process
 - Monitor a migration operation progress
 - On Dell EMC Unity, go to **Jobs**, select the operation, and click **Details**
 - Monitor a migration session's overall progress
 - On Dell EMC Unity, go to **Import**, select the session, and click **View/Edit**
 - View the migration session's Summary Report
 - On Dell EMC Unity, go to **Import**, select the session, click **More Actions**, and click **Download Summary Report**
 - The Summary Report includes details such as time duration, state change history, user operation history, warnings and errors, migrated bytes, and files/quotas that failed to migrate for each file system
- Most migration issues happen after the 'cutover' and before the 'commit'. Before initiating a cutover:
 - Apply the applicable customized parameters to the Dell EMC Unity system using the `svc_nas` command
 - Test connectivity by creating a new non-production NAS Server on the Dell EMC Unity system with a matching configuration prior to cutover
 - Use the same ports, subnet, mask, VLAN, gateways, DNS, NIS, LDAP, AD servers, clients, and so on.
 - Confirm connectivity from the NAS Server interfaces to, DNS, NIS, LDAP, AD servers, clients, and so on.
 - On Dell EMC Unity, go to **Settings** → **Access** → **Routing** → **Ping/Trace** to test interface connectivity
 - On VNX, run a `server_ping <movername> -i <interface>` command to test interface connectivity

- Confirm the health of the VNX and Dell EMC Unity systems
 - Ensure everything is in a healthy state before issuing a cutover or commit

4.1.2.3 Cancelling the Migration

- Do not cancel an import session unless the problem cannot be resolved (see Troubleshooting section)
- Ensure network connectivity between the VNX and Dell EMC Unity system exists prior to initiating a cancel operation
 - The cancel operation fails if it is unable to communicate with the VNX Control Station and Data Mover

4.1.3 Troubleshooting

If an issue is encountered with Native File Import, review the error messages, job details, and health status and determine if the issue can be easily resolved. The most common issues encountered are configuration related issues and are documented above. You can also attempt to retry the failed operation. If more information is required to resolve the issue, consider searching for the error code on Dell EMC Online Support.

If an issue cannot be resolved and further assistance is needed, please open a case with Dell EMC Support. Having the following information available will help speed up the troubleshooting effort:

- Name of the resource being migrated
- Date/time of the issue
- Error encountered
- Logs collected from before the migration was started and also after the error was encountered
 - VNX SPCollects and Support Materials
 - Unity Data Collect
- Migration Summary Report
- Screenshots of the issue, if applicable

4.1.4 Dell EMC Unity Native File Import (NFS)

The Dell EMC Unity Native File Import (NFS) feature, available starting in Dell EMC Unity OE version 4.1, provides a native option for file migration to Dell EMC Unity from a VNX1 or VNX2 system. This feature supports NFSv3 and allows for VNX VDM transparent migration to a Dell EMC Unity NAS Server. The following information describes the file migration through Native File Import (NFS), including the preparation of the VNX, the creation, monitoring, and cutover on Dell EMC Unity, and the requirements and details of the file migration.

To prepare the VNX system for the file migration, the source VNX VDM must have at least one client network interface, and exactly one attached network interface named “*nas_migration_<name>*”, where *<name>* is a unique name provided to the interface, such as *nas_migration_vdm2*. The IMT uses this interface throughout the migration. To prepare to import VDMs, you must ensure that the associated Data Mover has DNS

connectivity through an interface that is not attached to the VDM that you want to import. If the Data Mover can access its DNS server only through the interfaces attached on the VDM, you must create a dedicated interface to persist the DNS connectivity for the Data Mover throughout and after the VDM migration.

All file systems on the VDM must be mounted and exported. If any file systems do not satisfy this requirement, the Import Session will fail. NFSv4 and Secure NFS must be disabled on the source VDM. A VDM with a Nested Mount File System (NMFS) cannot be imported. The time difference on the VDM and the Dell EMC Unity system must be within 5 seconds of each other. A best practice is to sync both systems to the same NTP server to ensure time consistency.

After the VNX system is prepared, the network interfaces must be configured on the Dell EMC Unity system. The IMT uses the interfaces to connect to the *nas_migration* interface on the VNX to ensure data transfer between systems. You can create the network interfaces on the Dell EMC Unity system in the **Interfaces** page under **Protection & Mobility**. Two interfaces must be created, one for each SP, and an Import Session is performed over only one interface. The Import Interfaces which are created must be in the same VLAN as the *nas_migration* interface on the VNX. When the Mobility Interfaces are created and the VNX pre-configuration is completed, you can create an Import Connection from the Dell EMC Unity System to the source VNX system. Import Connections are created under the **Import** tab under **Protection & Mobility**, and require the VNX SPA or SPB IP and Unisphere administrator credentials. When the Import Connection is successfully established, all the VDMs that are eligible for migration are discovered.

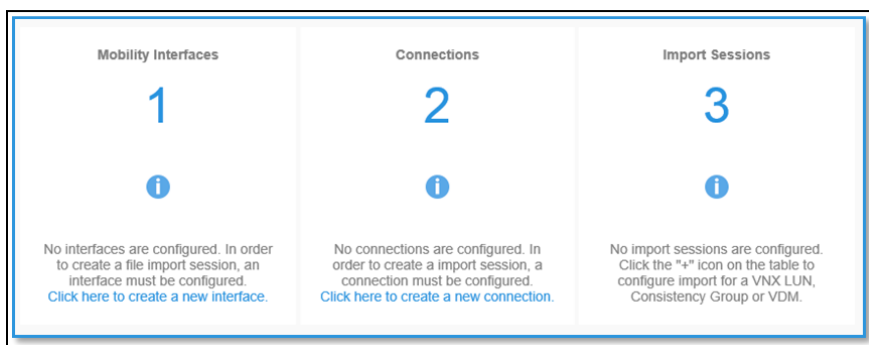


Figure 9 Dell EMC Unity Configuration Steps Shown in Unisphere

Please note that existing Import Interfaces and Import Connections can be leveraged by Native File Import (NFS), it is not required to create a separate connection or separate set of interfaces. Native File Import (NFS), Native File Import (CIFS), and Native Block Import can all share the same Import Connection and Import Interfaces.

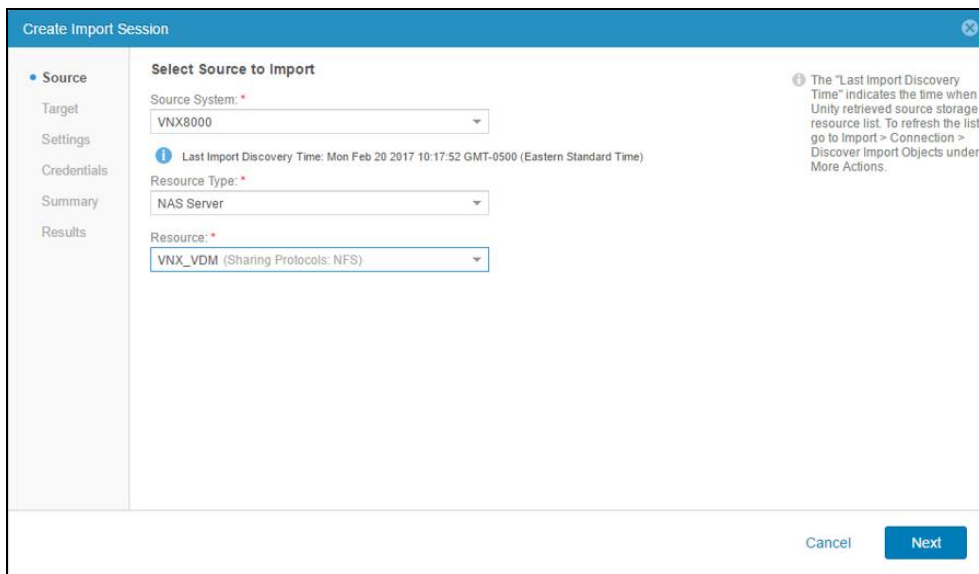


Figure 10 Create Import Session Wizard

After an Import Connection is successfully established, the Import Sessions can be created by using the **Create Import Session** wizard. This will launch a wizard which allows you to select the type of resource to import. For Native File Import (NFS) select **NAS Server** under **Resource Type** as the resource and then select the source VNX VDM for migration within the **Resource** drop-down menu. On the **Target** step options are presented to select destination pools for the NAS Server and associated NFS file systems, a Unix Directory Service to import (NIS/LDAP), and the Dell EMC Unity ports for network interfaces. The name of the imported file systems will be the same as their mount point on the source VNX. The network interface chosen in this step will dictate which SP the NAS Server is associated with, it will be the same SP as the interface.

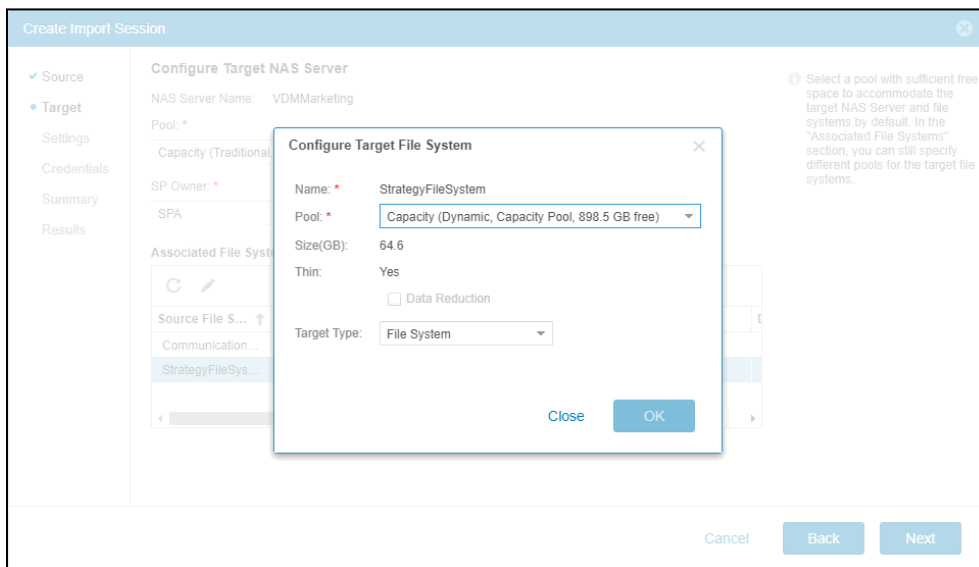


Figure 11 Configure Target File System

Due to the nature of 64-bit file system architecture, the source 32-bit file systems are inflated during migration, this results in a larger destination file system. If the source file system has compression or deduplication savings, these savings are not transferred to Dell EMC Unity and can result in a substantial increase in size on the destination. However, depending on the Dell EMC Unity OE version and capabilities of the Pool, if the

destination Pool supports either Compression or Data Reduction there is an option to apply the space saving technology, as shown in Figure 11. If enabled, the Compression and Data Reduction algorithm reviews the contents of the data as it imports to the Dell EMC Unity system and achieves space savings before data is written to the Pool. As a guideline, the destination size (Dst. File System Size) can be calculated using the formulas shown in Table 3. Ensure that the destination pool or pools have enough free space to accommodate the new file systems, otherwise the import will fail.

Table 3 Destination File System Size

Parameter	Calculation
Dst. File System Size	Max (3 GB, Src. FS Total Size, Dst. FS Used Size) + Migration Size
Dst. File System Used Size	1.5 GB + (Src. FS Used Size + Src. FS Dedupe Size) * Ratio
Migration Size	1 GB + 8 Bytes * ((Src. FS Total Size < 2T ? Src. FS Total Size: 2T) / 8525)
Ratio = 1.5	For (Src. FS Used Size + Src. FS Dedupe Size) <= 10 GB
Ratio = 1.2	For (Src. FS Used Size + Src. FS Dedupe Size) > 10 GB

Once the wizard is completed the Import Session automatically creates the destination file systems and the NAS Server and begins a baseline copy. Reference the graphic below (Figure 12) to see which configuration properties are transferred from the VNX VDM and the Data Mover to the destination Dell EMC Unity NAS Server.

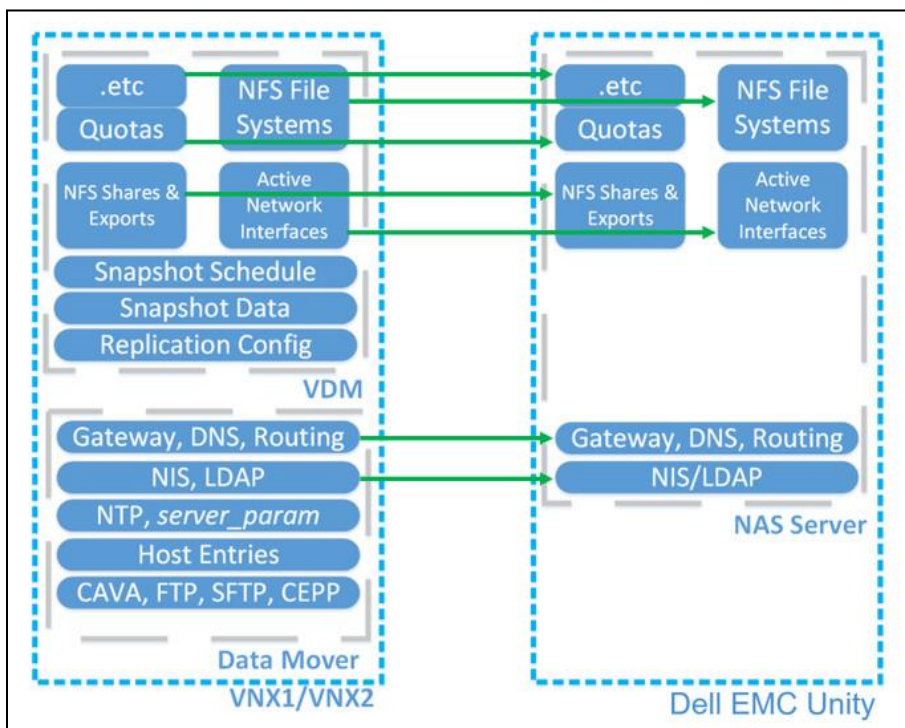


Figure 12 VDM and File System Configuration Data

The baseline copy consists of the NAS Server and file system attributes and the cold data on the file system. Cold data is data that has not been updated in the last 60 minutes. During the baseline copy, host access is routed through the original VNX interface until the session is cutover. After the baseline copy is completed, the session is eligible for cutover. In Dell EMC Unity Unisphere the cutover can be performed by selecting an Import Session and clicking More Actions > Cutover. The host access is cutover from the VNX to the Dell

EMC Unity system. The cutover is targeted at less than 30 seconds to ensure that application timeouts do not occur and the process appears transparent to hosts. After cutover, the Import Session begins the delta copy. Any new writes to the file systems are mirrored by the Inband Migration Tool to ensure consistency on the source VNX in case a rollback is required. Data continues to be transferred from the source VNX file system to the Dell EMC Unity file system. If data is referenced or updated that is not yet migrated to the Dell EMC Unity system, the IMT pulls the data from VNX into Dell EMC Unity. Due to the write mirroring and transfer of data, hosts might experience increased response times from the file systems during the delta copy process.

Figure 13 below shows the general architecture of the Native File Import (NFS) feature and how the Inband Migration Tool functions. This figure represents an Import Session that has already been cutover. The production IP port has been brought up on the Dell EMC Unity side and hosts are now accessing the file systems through the Dell EMC Unity interface. IMT leverages the Dell EMC Unity mobility interface and the VNX *nas_migration* interface to transfer file system data. New writes are mirrored to the VNX and source information continues to be transferred to the destination through this channel. A communication link exists between the Dell EMC Unity SP and VNX control station, this is used to query the VNX and make configuration changes, such as turning off a network interface during cutover.

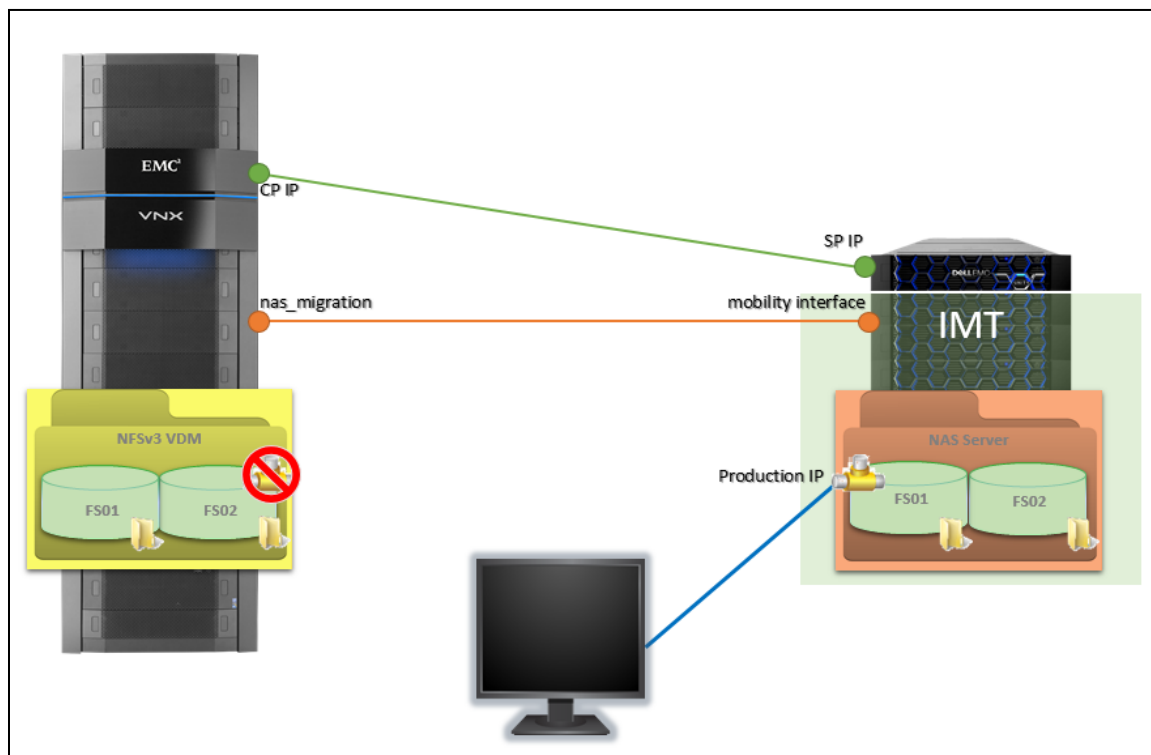


Figure 13 Inband Migration Tool Diagram

During the migration, some operations are discouraged on the source VNX. These operations include changes to Quota settings, NIS/LDAP configuration changes, DNS/Gateway/Routing changes, and creating/deleting file systems. Dell EMC Unity cannot prevent these operations from being performed on the source system. However, if these operations happen it could result in potential DU/DL (data unavailable/data loss) or even a failed Import Session. When the Dell EMC Unity file systems are completely synced with the source VNX file systems, the Import Session is ready to commit. Up until this point the Import Session can be canceled and host access is transferred back to the VNX. All writes made after cutover are mirrored to both the source and the destination file systems to ensure that there is no loss of data when canceling an Import Session.

When you commit the Import Session, data transfer procedures are stopped and removed. The source file system data will need to be manually cleaned up on the VNX in order to return that space back to the Pool. The Dell EMC Unity system is the primary node for client access for all imported NAS Servers and file systems from that Import Session. The Native File Import (NFS) feature is supported across all Dell EMC Unity models, both physical and VSA. This feature supports one VDM Import Session for each SP, for a total of two simultaneous VDM Import Sessions on physical systems. Each VDM import session can support a maximum of 500 file systems, this allows for a potential 1000 simultaneous file system imports (500 file systems for each VDM).

In the event of an SP reboot, the affected Import Session will failover to the peer SP. If a system reboot occurs, the Import Sessions are paused and will automatically resume when the system returns. If any error is encountered, such as loss of connection or VNX reboot, the session will automatically pause. You can resume the session again to retry the operation. You can generate and download a summary report through Unisphere, the UEMCLI, or the REST API that includes information about the time duration, changes in session state, user operation, progress, warnings, and errors. A report is automatically generated when a session is committed, canceled, and included in data collects.

4.1.5 Dell EMC Unity Native File Import (CIFS)

Since the release of Dell EMC Unity OE version 4.2, the Dell EMC Unity Native File Import feature now provides a native option for CIFS file migration to Dell EMC Unity from a VNX1 or VNX2 system. This feature allows for a VNX VDM with a single CIFS Server to be migrated to a Dell EMC Unity NAS Server. This transfer is a minimally disruptive migration to the host IO and allows for a full rollback to the VNX VDM at any time before the migration is committed. The following information describes the file migration through Native File Import (CIFS), including the preparation of the VNX, the creation, monitoring, and cutover on Dell EMC Unity, and the requirements and details of the file migration.

To prepare the VNX system for the file migration, the source VNX VDM must have at least one client network interface, and exactly one attached network interface named “*nas_migration_<name>*”, where *<name>* is a unique name provided to the interface, such as *nas_migration_vdm2*. The IMT uses this interface throughout the migration. The VDM must contain only a single CIFS Server and no NFS exports. This interface must be added to the CIFS Server in a separate subdomain, this ensures that any hosts querying the DNS will not be directed to the migration interface. There can be no host access on the NAS migration interface. The CLI command to add the interface to a CIFS Server is shown below, you can see the new migration domain is bolded.

```
› server_cifs vdm_fro2 -add compname=vnx2compnamefro, domain=windows.dellemc-  
fr, interface=nas_migration_vdmfro2, dns=migration.windows.dellemc-fr
```

To prepare to import VDMs, you must ensure that the associated Data Mover has DNS connectivity through an interface that is not attached to the VDM that you want to import. If the Data Mover can access its DNS server only through the interfaces attached on the VDM, you must create a dedicated interface to persist the DNS connectivity for the Data Mover throughout and after the VDM migration. The CIFS Server must have local users enabled. If it is not enabled, it can be enabled through either the GUI or through CLI. Once enabled, an account with administrator rights is required and will be used when creating the Import Session on the Dell EMC Unity side. It is required to set the default Administrator account's password, either by accessing the CIFS Server through Computer Management, or creating a new user and adding that user to the Administrator group. To prevent password expiration during the import, the Administrator password can be set to 'Never Expired'.

All file systems on the VDM must be mounted. If any file systems do not satisfy this requirement, the Import Session will fail. There must be no NFS exports on the source VDM. The extended ACL feature and the unknown SID feature must be set appropriately on the source Data Mover. The CLI command to set the features and their respective values are listed below.

```
› server_param <source_datamover> -facility cifs -modify acl.extacl -value 28

› server_param <source_datamover> -facility cifs -modify acl.mappingErrorAction -value 11
```

The source VDM cannot be utf8-based and the source CIFS Server cannot be a Windows NT 4.0 like CIFS Server. In the case of a domain joined CIFS Server, DNS must be configured for the associated domain. The time difference on the VDM and the Dell EMC Unity system must be within 5 seconds of each other. A best practice is to sync both systems to the same NTP server to ensure time consistency.

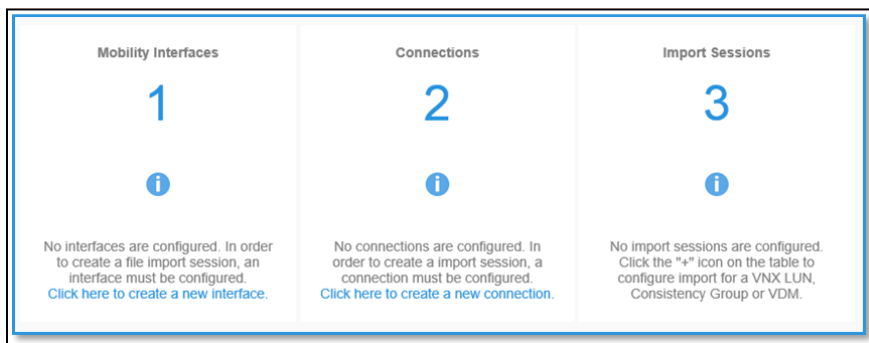


Figure 14 Dell EMC Unity Configuration Steps Shown in Unisphere

After the VNX system is prepared, the network interfaces must be configured on the Dell EMC Unity system. The IMT uses the interfaces to connect to the *nas_migration* interface on the VNX to ensure data transfer between systems. You can create the network interfaces on the Dell EMC Unity system in the **Interfaces** page under **Protection & Mobility**. Two interfaces must be created, one for each SP, and an Import Session is performed over only one interface. The Import Interfaces which are created must be in the same VLAN as the *nas_migration* interface on the VNX. When the Mobility Interfaces are created and the VNX pre-configuration is completed, you can create an Import Connection from the Dell EMC Unity System to the source VNX system. Import Connections are created under the **Import** tab under **Protection & Mobility**, and require the VNX SPA or SPB IP and administrator credentials. When the Import Connection is successfully established, all the VDMs that are eligible for migration are discovered.

Note that existing Import Interfaces and Import Connections can be leveraged by Native File Import (CIFS), it is not required to create a separate connection or separate set of interfaces. Native File Import (CIFS), Native File Import (NFS), and Native Block Import can all share the same Import Connection and Import Interfaces.

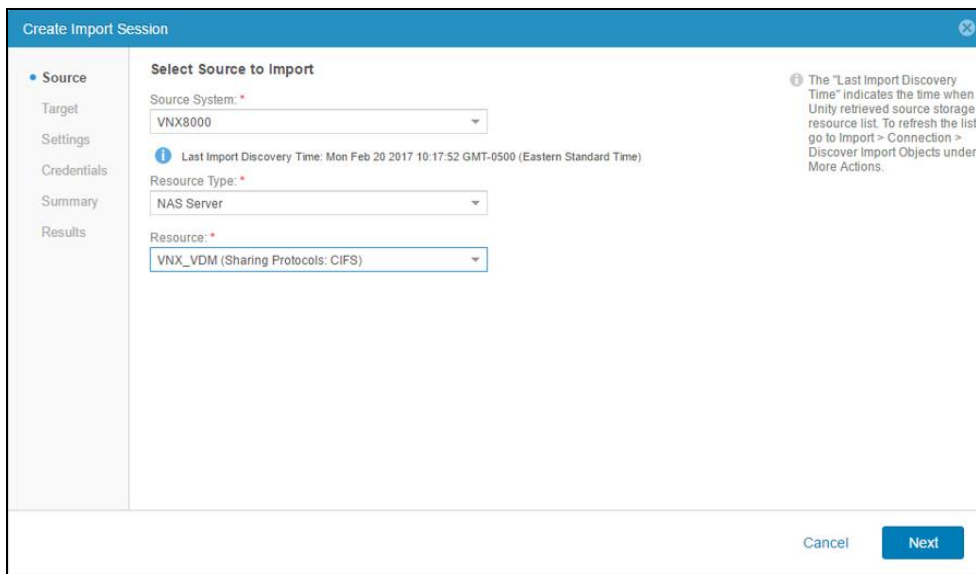


Figure 15 Create Import Session Wizard

After an Import Connection is successfully established, the Import Sessions can be created by using the **Create Import Session** wizard. This will launch a wizard which allows you to select the type of resource to import. For Native File Import (CIFS) select **NAS Server** under **Resource Type** as the resource and then select the source VNX VDM for migration within the **Resource** drop-down menu. For Native File Import (CIFS), you must select a CIFS VDM. On the **Target** step options are presented to select destination pools for the NAS Server and associated CIFS file systems and the Dell EMC Unity ports for network interfaces. The name of the imported file systems will be the same as their mount point on the source VNX. The network interface chosen in this step will dictate which SP the NAS server is associated with, it will be the same SP as the interface.

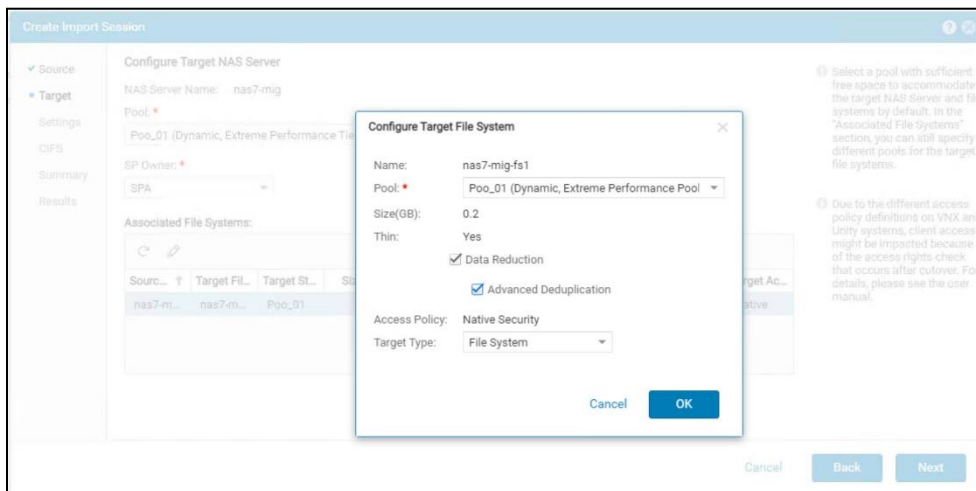


Figure 16 Configure Target File System

Due to the nature of 64-bit file system architecture, the source 32-bit file systems are inflated during migration, this results in a larger destination file system. If the source file system has compression or deduplication savings, these savings are not transferred to Dell EMC Unity and can result in a substantial increase in size on the destination. However, depending on the Dell EMC Unity OE version and capabilities of the Pool, if the destination Pool supports either compression or data reduction there is an option to apply the space saving

technology, as shown in Figure 16. If enabled, the compression or data reduction algorithm reviews the contents of the data as it imports to the Dell EMC Unity system and achieves space savings before data is written to the Pool. As a guideline, the destination size (Dst. File System Size) can be calculated using the formulas shown in Table 4. Ensure that the destination pool or pools have enough free space to accommodate the new file systems.

Table 4 Destination File System Size

Parameter	Calculation
Dst. File System Size	Max (3 GB, Src. FS Total Size, Dst. FS Used Size) + Migration Size
Dst. File System Used Size	1.5 GB + (Src. FS Used Size + Src. FS Dedupe Size) * Ratio
Migration Size	1 GB + 8 Bytes * ((Src. FS Total Size < 2T ? Src. FS Total Size: 2T) / 8525)
Ratio = 1.5	For (Src. FS Used Size + Src. FS Dedupe Size) <= 10 GB
Ratio = 1.2	For (Src. FS Used Size + Src. FS Dedupe Size) > 10 GB

Finally, credentials of a local user from the CIFS Server belonging to the Administrator group is required. Since the CIFS protocol does not have a root user, this is required to provide the Inband Migration Tool administrator privileges.

Once the wizard is completed the Import Session automatically creates the destination file systems and the NAS Server and begins a baseline copy. Reference the graphic below (Figure 17) to see which configuration properties are transferred from the VNX VDM and the DM to the destination Dell EMC Unity NAS Server.

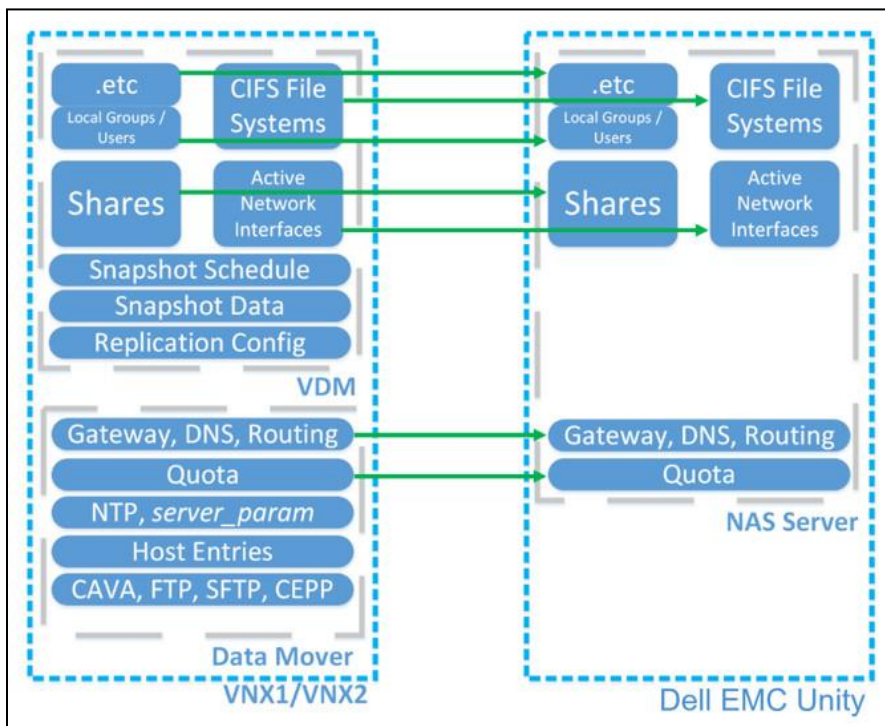


Figure 17 VDM and File System Configuration Data

The baseline copy consists of the NAS Server and file system attributes and the cold data on the file system. Cold data is data that has not been updated in the last 60 minutes. During the baseline copy, host access is routed through the original VNX. After the baseline copy is completed, the session is eligible for cutover. In

Dell EMC Unity Unisphere the cutover can be performed by selecting an Import Session and clicking More Actions > Cutover. For cutover to succeed, the source CIFS Server must be renamed, and the Dell EMC Unity SMB Server will inherit the original CIFS server named. Unisphere will prompt the user for AD credentials in order to successfully rename the source CIFS Server. By default, an underscore is appended to the original name, however the user can change the name of the source CIFS Server during this step.

When the rename operation succeeds, the host access is cutover from the VNX to the Dell EMC Unity system. The cutover is targeted at less than 30 seconds to ensure that application timeouts do not occur and the process appears transparent to hosts. Since SMB 3.0 is a stateful protocol, and Continuous Availability for SMB is not supported by Native File Migration (CIFS), the cutover will be a minimally disruptive procedure. After cutover, the Import Session begins the delta copy. Any new writes to the file systems are mirrored by the Inband Migration Tool to ensure consistency on the source VNX in case a rollback is required. Data continues to be transferred from the source VNX file systems to the Dell EMC Unity file system. If data is referenced or updated that is not yet migrated to the Dell EMC Unity system, the IMT pulls the data from VNX into Dell EMC Unity. Due to the write mirroring and transfer of data, hosts might experience increased response times from the file systems during the delta copy process.

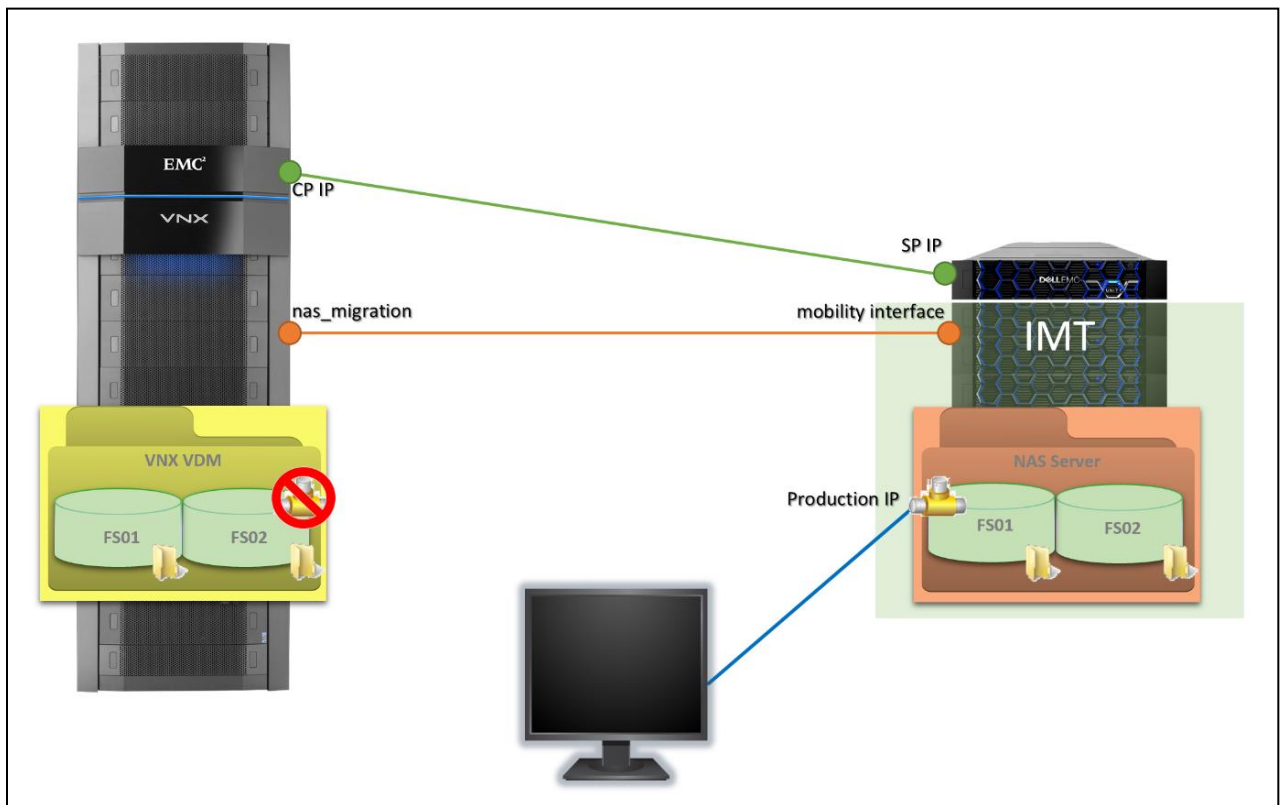


Figure 18 Inband Migration Tool Diagram

The figure above shows the general architecture of the Native File Import (CIFS) feature and how the Inband Migration Tool functions. This figure represents an Import Session that has already been cutover. The production IP port has been brought up on the Dell EMC Unity side and hosts are now accessing the file systems through the Dell EMC Unity interface. IMT leverages the Dell EMC Unity mobility interface and the VNX *nas_migration* interface to transfer file system data. New writes are mirrored to the VNX and source information continues to be transferred to the destination through this channel. A communication link exists between the Dell EMC Unity SP and VNX control station, this is used to query the VNX and make configuration changes, such as turning off a network interface during cutover.

During the migration only a limited number of configuration changes are supported. These include changes to shares, local groups, local users, privileges, home directory, and distributed file system (DFS). These are also the only configuration changes that are synchronized with the source if the migration is canceled. When the Dell EMC Unity file systems are completely synced with the source VNX file systems, the Import Session is ready to commit. Up until this point the Import Session can be canceled and host access is transferred back to the VNX. All writes made after cutover are mirrored to both the source and the destination file system to ensure that there is no loss of data when canceling an Import Session.

When you commit the Import Session, data transfer procedures are stopped and removed. The source file system data will need to be manually cleaned up on the VNX in order to return that space back to the Pool. The Dell EMC Unity system is the primary node for client access for all imported NAS Servers and file systems from that Import Session. The Native File Import (CIFS) feature is supported across all Dell EMC Unity models, both physical and VSA. This feature supports one VDM Import Session for each SP, for a total of two simultaneous VDM Import Sessions on physical systems. Each VDM import session on a physical Dell EMC Unity system can support a maximum of 500 file systems, this allows for a potential 1000 simultaneous file system imports (500 file systems for each VDM). There is a limit of 32 file systems for a Dell EMC UnityVSA Import Session.

In the event of an SP reboot, the affected Import Session will failover to the peer SP. If a system reboot occurs, the Import Sessions are paused and will automatically resume when the system returns. If any error is encountered, such as loss of connection or VNX reboot, the session will automatically pause. You can resume the session again to retry the operation. You can generate and download a summary report through Unisphere, the UEMCLI, or the REST API that includes information about the time duration, changes in session state, user operation, progress, warnings, and errors. A report is automatically generated when a session is committed, canceled, and included in data collects.

4.1.6 Dell EMC Unity Native File Import (Multiprotocol)

With Dell EMC Unity OE version 5.1, the Dell EMC Unity Native File Import feature now provides a native option for Multiprotocol file migration to Dell EMC Unity from a VNX1 or VNX2 system. This feature leverages the same framework as with the NFS and CIFS Native File Imports to migrate a multiprotocol VNX VDM as a Dell EMC Unity NAS Server.

This transfer is a minimally disruptive migration to the host IO and allows for a full rollback to the VNX VDM at any time before the migration is committed. The below information describes the file migration through Native File Import (Multiprotocol), including the preparation of the VNX, the creation, monitoring, and cutover on Dell EMC Unity, and the requirements and details of the file migration.

To prepare the VNX system for the file migration, the source VNX VDM must have at least one client network interface, and exactly one attached network interface named “*nas_migration_<name>*”, where *<name>* is a unique name provided to the interface, such as *nas_migration_vdm2*. The IMT uses this interface throughout the migration. As this is a multiprotocol import, this interface must be added to the CIFS Server in a separate subdomain, this ensures that any hosts querying the DNS will not be directed to the migration interface. There can be no host access on the NAS migration interface. The VNX CLI command to add the interface to a CIFS Server is shown below, you can see the new migration domain is bolded.

```
› server_cifs vdm1 -add
  compname=vdm1, domain=windows.dellemc.com, interface=nas_migration_vdm1, dns=
  migration.windows.dellemc.com
```

To prepare to import VDMs, you must ensure that the associated Data Mover has DNS connectivity through an interface that is not attached to the VDM that you want to import. If the Data Mover can access its DNS server only through the interfaces attached on the VDM, you must create a dedicated interface to persist the DNS connectivity for the Data Mover throughout and after the VDM migration. The CIFS Server as part of the multiprotocol VDM must have local users enabled. If it is not enabled, it can be enabled through either the GUI or through CLI. Once enabled, an account with administrator rights is required and will be used when creating the Import Session on the Dell EMC Unity side. It is required to set the default Administrator account's password, either by accessing the CIFS Server through Computer Management, or creating a new user and adding that user to the Administrator group. To prevent password expiration during the import, the Administrator password can be set to 'Never Expired'.

All file systems on the VDM must be mounted and exported. If any file systems do not satisfy this requirement, the Import Session will fail. NFSv4 and Secure NFS must be disabled on the source VDM. A VDM with a Nested Mount File System (NMFS) cannot be imported. The extended ACL feature and the unknown SID feature must be set appropriately on the source Data Mover. The CLI command to set the features and their respective values are listed below.

```
› server_param <source_datamover> -facility cifs -modify acl.extacl -value 28

› server_param <source_datamover> -facility cifs -modify acl.mappingErrorAction -value 11
```

The source VDM cannot be utf8-based and the source CIFS Server cannot be a Windows NT 4.0 like CIFS Server. In the case of a domain joined CIFS Server, DNS must be configured for the associated domain. The time difference on the VDM and the Dell EMC Unity system must be within 5 seconds of each other. A best practice is to sync both systems to the same NTP server to ensure time consistency.

After the VNX system is prepared, the network interfaces must be configured on the Dell EMC Unity system. The IMT uses the interfaces to connect to the *nas_migration* interface on the VNX to ensure data transfer between systems. You can create the network interfaces on the Dell EMC Unity system in the **Interfaces** page under **Protection & Mobility**. Two interfaces must be created, one for each SP, and an Import Session is performed over only one interface. The Import Interfaces which are created must be in the same VLAN as the *nas_migration* interface on the VNX. When the Mobility Interfaces are created and the VNX pre-configuration is completed, you can create an Import Connection from the Dell EMC Unity System to the source VNX system. Import Connections are created under the **Import** tab under **Protection & Mobility**, and require the VNX SPA or SPB IP and administrator credentials. When the Import Connection is successfully established, all the VDMs that are eligible for migration are discovered.

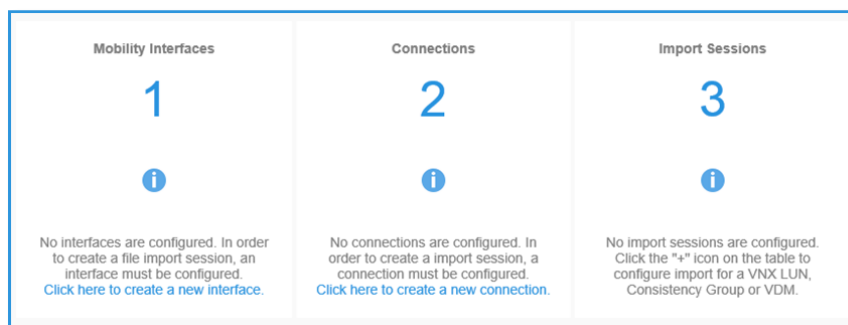


Figure 19 Dell EMC Unity Configuration Steps Shown in Unisphere

Note that existing Import Interfaces and Import Connections can be leveraged by Native File Import (Multiprotocol), it is not required to create a separate connection or separate set of interfaces. Native File Import (CIFS), Native File Import (NFS), Native File Import (Multiprotocol), and Native Block Import can all share the same Import Connection and Import Interfaces.

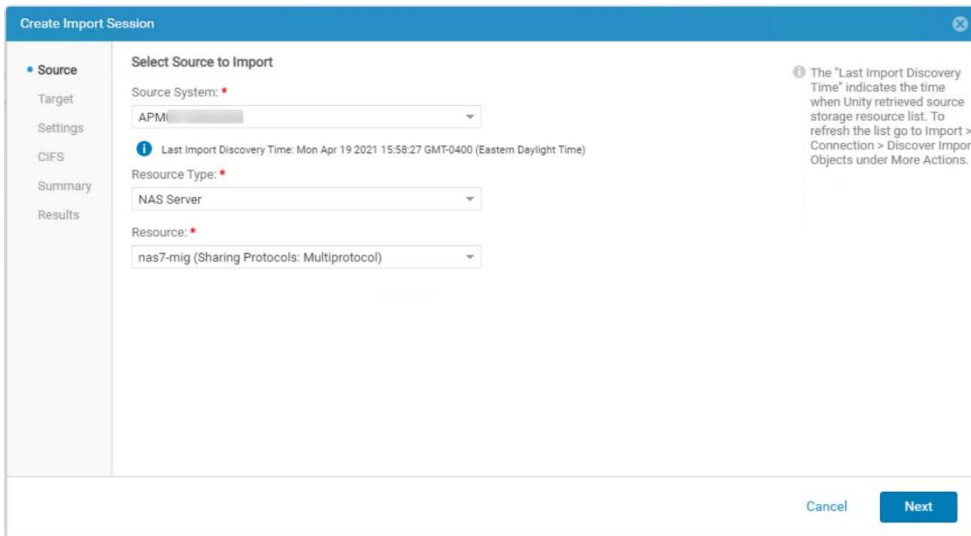


Figure 20 Create Import Session Wizard > Source step

After an Import Connection is successfully established, the Import Sessions can be created by using the **Create Import Session** wizard. This will launch a wizard which allows you to select the type of resource to import. For Native File Import (Multiprotocol) select **NAS Server** under **Resource Type** as the resource and then select the source VNX VDM for migration within the **Resource** drop-down menu. For Native File Import (Multiprotocol), you must select a Multiprotocol VDM. On the **Target** step, as shown in Figure 21, options are presented to select destination pool for the NAS Server, SP Owner, and associated file systems. Notice **Source Access Policy** and **Target Access Policy** columns, which are one of the main attributes that enables the Multiprotocol import. More details on Table 5.

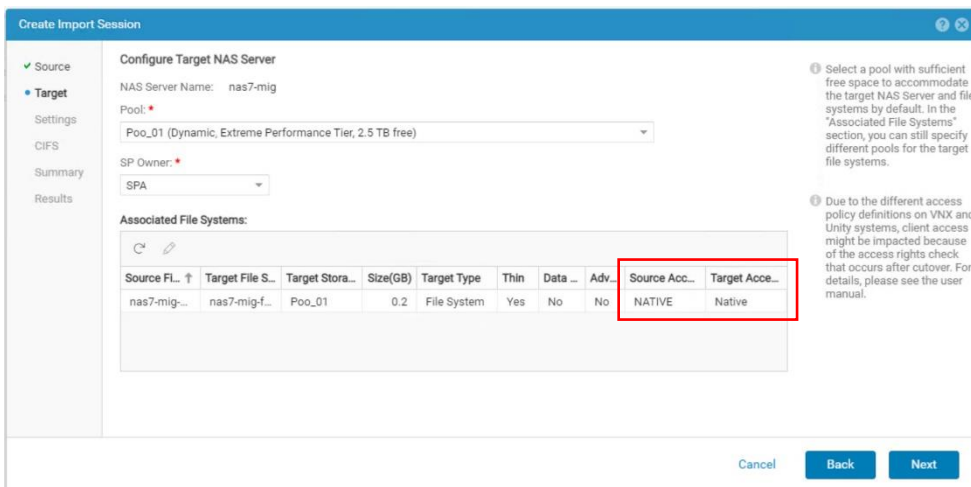


Figure 21 Create Import Session Wizard > Target step

In the **Settings** step, the user can configure the VLAN ID, the target Dell EMC Unity ports for the NAS Server network interface, and the target import interface that will be used for the import. The name of the imported

file systems will be the same as their mount point on the source VNX. The network interface chosen in this step will dictate which SP the NAS server is associated with, it will be the same SP as the interface.

Source Name	Source Port	IP Address	Subnet	VLAN ID	Target Port
nas_production_vd...	ege-2-0	[redacted]	255.255.252.0	412	Select Port...

Figure 22 Create Import Session Wizard > Settings step

Due to the nature of 64-bit file system architecture, the source 32-bit file systems are inflated during migration, this results in a larger destination file system. If the source file system has compression or deduplication savings, these savings are not transferred to Dell EMC Unity and can result in a substantial increase in size on the destination. However, depending on the Dell EMC Unity OE version and capabilities of the Pool, if the destination Pool supports either compression or data reduction there is an option to apply the space saving technology, as shown in Figure 16. If enabled, the compression or data reduction algorithm reviews the contents of the data as it imports to the Dell EMC Unity system and achieves space savings before data is written to the Pool. As a guideline, the destination size (Dst. File System Size) can be calculated using the formulas shown in Table 4. Ensure that the destination pool or pools have enough free space to accommodate the new file systems, otherwise the import will fail.

Finally, credentials of a local user from the CIFS Server belonging to the Administrator group is required, as shown in the CIFS step in Figure 23. Since the CIFS protocol does not have a root user, this is required to provide the Inband Migration Tool administrator privileges., the user can provide the credentials of the user that belongs to the local administrator which will be used to connect to the source CIFS server. Noticed that this step also shows all the prerequisites for the source CIFS server configuration.

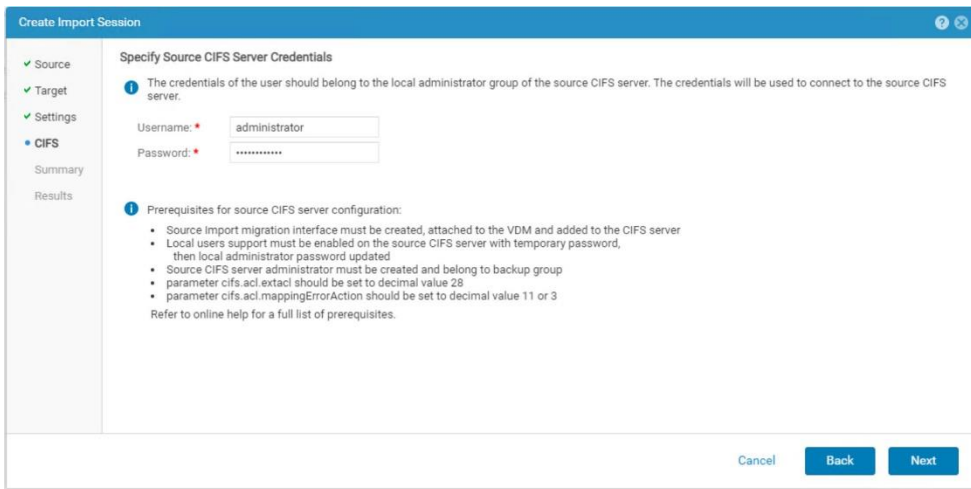


Figure 23 Create Import Session Wizard > CIFS step

Once the wizard is completed the Import Session automatically creates the destination file systems and the NAS Server and begins a baseline copy. Reference the graphic below (Figure 24) to see which configuration properties are transferred from the VNX VDM and DM to the destination Dell EMC Unity NAS Server.

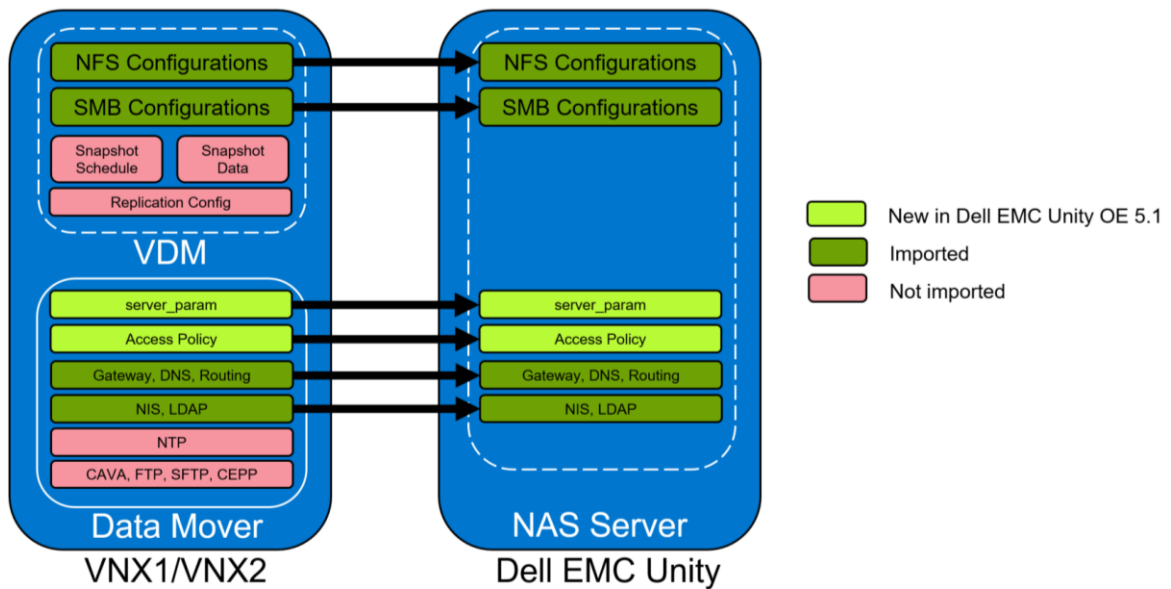


Figure 24 VDM and File System Configuration Data

The baseline copy consists of the NAS Server and file system attributes and the cold data on the file system. Cold data is data that has not been updated in the last 60 minutes. As part of the file system attributes that are imported, the Access Policy is transferred which enable the multiprotocol import. Table 5 states the default access policy that will be configured by the Unity system as part of the import.

Table 5 Access policy mapping

VNX Access Policy	Dell EMC Unity Access Policy
NATIVE	NATIVE
NT	WINDOWS
UNIX	UNIX
SECURE	NATIVE
MIXED	WINDOWS
MIXED_COMPAT	NATIVE

Table 6 below describes the Dell EMC Unity file system level access policies.

Table 6 Access policy details

Access Policy	Description
NATIVE	<p>Manages access for each protocol separately with its own native security</p> <p>Security for NFS shares use the UNIX mode bits or NFSv4 ACL</p> <p>Security for SMB shares use the SMB Access Control List (ACL)</p> <p>The two sets of permissions are independent and there is no synchronization between them</p> <p>NFSv3 UNIX mode bits or NFSv4 ACL permission changes are synchronized to each other, but SMB ACL is not changed</p> <p>SMB ACL permission changes do not change the NFSv3 UNIX mode bits or NFSv4 ACL</p>
NT	<p>Uses the SMB ACL for both protocols</p> <p>Upon request for NFS access, the Windows credential built from the DC/LGDB is used to check the ACL for permissions</p> <p>NFSv3 UNIX mode bits or NFSv4 ACLs are updated when SMB ACL permissions are changed</p> <p>NFSv3 UNIX mode bits or NFSv4 ACL permission changes are denied</p>
UNIX	<p>Uses the NFSv3 UNIX mode bits or NFSv4 ACL for both protocols</p> <p>Upon request for SMB access, the UNIX credential built from the UDS/local files is used to check the NFSv3 mode bits or NFSv4 ACL for permissions</p> <p>SMB ACL permissions are updated when NFSv3 UNIX mode bits or NFSv4 ACLs are changed</p> <p>SMB ACL permission changes are allowed to avoid causing disruption, but these permissions are not maintained</p>

The client access might be impacted due to the access policy differences. Only the Native to Native mapping is not impacted since the policy is unchanged.

Let's take two instances in more depth:

1. NT to Windows:
 - a. **NT Access Policy:** For NFS clients, the system checks both Unix and Windows permissions.
 - b. **Windows Access Policy:** For NFS clients, only needs to check Windows permissions.
 - c. **Scenario details:**
 - i. For an NFS client on the source, if the Unix permissions are deny, while Windows permissions are allow, then access is **denied** on source.
 - ii. After cutover, that NFS client access will be **permitted** because only Windows permission is checked.
2. Mixed_Compact to Native:
 - a. **Mixed_Compact Access Policy:** Client access will only check the permission last set.
 - b. **Native Access Policy:** NFS and CIFS checks its own permission separately.
 - c. **Scenario details:**
 - i. On source, Windows clients set the permission at last. A NFS client access is **permitted** by this last set, but denied by Unix permission (no effect by *Mixed_Compact* definition).
 - ii. After cutover, the Unix permission take effect because of Native definition. So that NFS client is **denied**.

During the baseline copy, host access is routed through the original VNX. After the baseline copy is completed, the session is eligible for cutover. In Dell EMC Unity Unisphere the cutover can be performed by selecting an Import Session and clicking More Actions > Cutover. For cutover to succeed, the source CIFS Server must be renamed, and the Dell EMC Unity SMB Server will inherit the original CIFS server named. Unisphere will prompt the user for AD credentials in order to successfully rename the source CIFS Server. By default, an underscore is appended to the original name, however the user can change the name of the source CIFS Server during this step.

When the rename operation succeeds, the host access is cutover from the VNX to the Dell EMC Unity system. The cutover is targeted at less than 30 seconds to ensure that application timeouts do not occur and the process appears transparent to hosts. Since SMB 3.0 is a stateful protocol, and Continuous Availability for SMB is not supported by Native File Migration (CIFS), the cutover will be a minimally disruptive procedure. After cutover, the Import Session begins the delta copy. Any new writes to the file systems are mirrored by the Inband Migration Tool to ensure consistency on the source VNX in case a rollback is required. Data continues to be transferred from the source VNX file systems to the Dell EMC Unity file system. If data is referenced or updated that is not yet migrated to the Dell EMC Unity system, the IMT pulls the data from VNX into Dell EMC Unity. Due to the write mirroring and transfer of data, hosts might experience increased response times from the file systems during the delta copy process.

Figure 18 shows the general architecture of the Native File Import (CIFS) feature and how the Inband Migration Tool functions. This figure represents an Import Session that has already been cutover. The production IP port has been brought up on the Dell EMC Unity side and hosts are now accessing the file

systems through the Dell EMC Unity interface. IMT leverages the Dell EMC Unity mobility interface and the VNX *nas_migration* interface to transfer file system data. New writes are mirrored to the VNX and source information continues to be transferred to the destination through this channel. A communication link exists between the Dell EMC Unity SP and VNX control station, this is used to query the VNX and make configuration changes, such as turning off a network interface during cutover.

During the migration only a limited number of configuration changes are supported. These include changes to shares, local groups, local users, privileges, home directory, and distributed file system (DFS). These are also the only configuration changes that are synchronized with the source if the migration is canceled. On the other hand, some operations are discouraged on the source VNX. These operations include changes to Quota settings, NIS/LDAP configuration changes, DNS/Gateway/Routing changes, and creating/deleting file systems. Dell EMC Unity cannot prevent these operations from being performed on the source system. However, if these operations happen it could result in potential DU/DL (data unavailable/data loss) or even a failed Import Session. When the Dell EMC Unity file systems are completely synced with the source VNX file systems, the Import Session is ready to commit. Up until this point the Import Session can be canceled and host access is transferred back to the VNX. All writes made after cutover are mirrored to both the source and the destination file system to ensure that there is no loss of data when canceling an Import Session.

When you commit the Import Session, data transfer procedures are stopped and removed. The source file system data will need to be manually cleaned up on the VNX in order to return that space back to the Pool. The Dell EMC Unity system is the primary node for client access for all imported NAS Servers and file systems from that Import Session. The Native File Import (Multiprotocol) feature is supported across all Dell EMC Unity models, both physical and VSA. This feature supports one VDM Import Session for each SP, for a total of two simultaneous VDM Import Sessions on physical systems. Each VDM import session on a physical Dell EMC Unity system can support a maximum of 500 file systems, this allows for a potential 1000 simultaneous file system imports (500 file systems for each VDM). There is a limit of 32 file systems for a Dell EMC UnityVSA Import Session.

In the event of an SP reboot, the affected Import Session will failover to the peer SP. If a system reboot occurs, the Import Sessions are paused and will automatically resume when the system returns. If any error is encountered, such as loss of connection or VNX reboot, the session will automatically pause. You can resume the session again to retry the operation. You can generate and download a summary report through Unisphere, the UEMCLI, or the REST API that includes information about the time duration, changes in session state, user operation, progress, warnings, and errors. A report is automatically generated when a session is committed, canceled, and included in data collects.

4.1.7 Dell EMC Unity File Import – FLR Support

File-Level Retention (FLR) is supported when using Native File Import to migrate from VNX to Unity.

- If the source file system is FLR-enabled, the destination is provisioned with the same FLR settings
- No ability to reconfigure FLR settings during import

Retention periods and lock status are migrated.

If an FLR file system is being imported, DHSM must be configured on the VNX. Enter the DHSM credentials in the Import wizard, as shown in Figure 25.

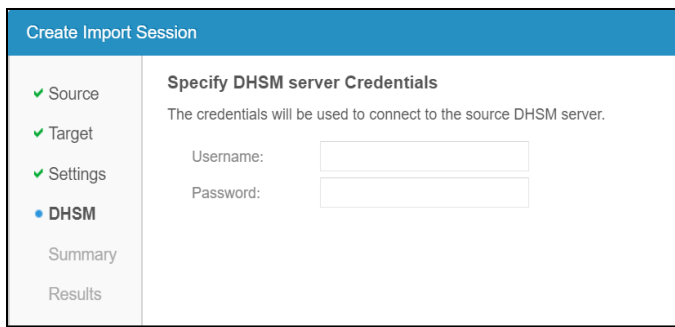


Figure 25 DHSM Credentials in the Import Session wizard

For more information about FLR, refer to the *Dell EMC Unity: File-Level Retention (FLR)* white paper on Dell EMC Online Support.

4.2 Dell EMC Select Datadobi DobiMigrate

Datadobi, a Dell EMC Select partner, offers the migration software DobiMigrate to perform file system migrations to the Dell EMC Unity platform. DobiMigrate is compatible with many different source storage systems, including the Dell EMC storage systems considered by this white paper. It is also compatible with a set of third-party storage arrays, for more details please look at the DobiMigrate support matrix.

DobiMigrate is run atop a hypervisor supporting OVA deployment (ex. VMware ESXi) or installed on a Red Hat or CentOS Linux host using an RPM. It supports NFS, SMB and basic multi-protocol migration, with host machines known as “proxies” running DobiMigrate software to handle the data transfer of the migration. Management of migration sessions using DobiMigrate is performed through an intuitive GUI that provides status and reporting options through each step of the migration operation.

Figure 26 shows a configuration diagram from the Datadobi document [NAS and Object Migration Software for Modern Data Centers](#).

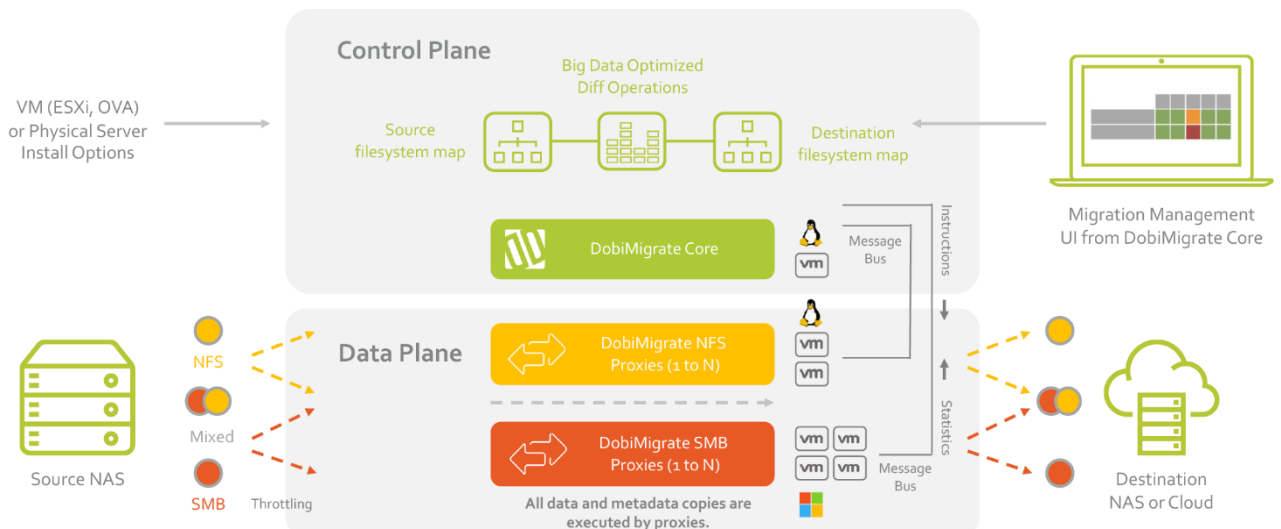


Figure 26 DobiMigrate Configuration

More information about Datadobi DobiMigrate can be found on Datadobi’s website. Additionally, information about Datadobi and its integration points with Dell EMC can be found on Dell EMC Online Support.

4.3 EMCopy

EMCOPYY is a command-line Windows tool developed by Dell EMC to facilitate the migration of data between file systems. It is available for free download from Dell EMC Online Support and can be used to migrate data from any of the Dell EMC storage systems considered by this paper and other third-party storage arrays to Dell EMC Unity.

EMCOPYY supports the SMB protocol and has awareness for a file system's access control settings, so that this information can be migrated along with the files themselves. Furthermore, EMCOPYY can be configured to run regularly on the same file systems, in order to establish an asynchronous host-based replication session. Only modified file system data is transferred when EMCOPYY is run on the same file system multiple times. While it functions and is used similarly to Robocopy, EMCOPYY is supported by Dell EMC and can complete an entire environment running on Dell EMC storage.

For more information, including download and execution details, please refer to Dell EMC Online Support.

4.4 Robocopy

Robocopy is a Microsoft published tool for performing Windows host-based file system replication. It is free to use and can serve as a migration tool for environments with SMB file systems. All Dell EMC storage systems considered by this paper are supported, including Dell EMC Unity. In addition, third-party storage arrays may also be supported.

Most modern Windows operating systems are pre-loaded with Robocopy, but it may also be downloaded from Microsoft. Robocopy is published as a command-line tool, but alternative versions exist which offer a graphical user interface. The GUI-driven Robocopy variants may be easier to configure and manage for newer users.

For more information about Robocopy, including download links and documentation, refer to Microsoft TechNet.

4.5 Rsync

Linux users interested in pursuing a host-based migration solution to Dell EMC Unity can leverage rsync. Rsync is a free command-line tool packaged in most major Linux distributions. It can be used to transfer data from NFS file systems that exist on any of the Dell EMC storage systems considered by this paper to a Dell EMC Unity system, as well as from other third-party storage arrays to Dell EMC Unity.

Rsync's place in the Linux command shell makes it easy to work with when writing scripts or cron jobs to automate the migration process, or perform regular rsync operations over time to create a host-based asynchronous file system replication session. File system metadata, user permissions, and timestamps are preserved when rsync is used to transfer file system data.

For more information about rsync, refer to your Linux distribution's manual. Additional documentation on configuring and using rsync can be found online.

4.6 Cloud Tiering Appliance (CTA) File Migration

With Dell EMC Unity OE version 4.2 and later, and CTA version 12 SP1 and later, the CTA file migration feature is supported with Dell EMC Unity systems. File migration moves files from one location to another while preserving stubs and without needing to rehydrate the data. File migration is a task in CTA to move data from a source File System to a target File System. The target File System needs to be large enough to hold the data being moved, but it does not need to be of the same size as the source File System. Administrators

can use CTA to move data from a legacy array to Dell EMC Unity with minimal disruption to the clients. CTA can perform multi-protocol, incremental, stub-aware, cross-vendor migrations that can greatly reduce the effort and complexity when replacing legacy arrays and implementing their NAS environment on a Dell EMC Unity.

CTA supports SMB (CIFS), NFS, and multiprotocol source File Systems. When having a Dell EMC Unity as a target, the supported source platform is VNX. Figure 27 provides a graphical representation for file migration. File Migration requires both source and destination file systems to be shared as well as exported. Hence when migrating to Dell EMC Unity, the NAS Server on which the destination file system will reside needs to be Multiprotocol Enabled.

For source SMB (CIFS) servers, CTA needs access permissions of a domain user that is part of the Backup Operators and the Local Administrators group on the source and target File Systems. For NFS servers, the NFS exports need to have root and read/write permissions for the CTA IPs.

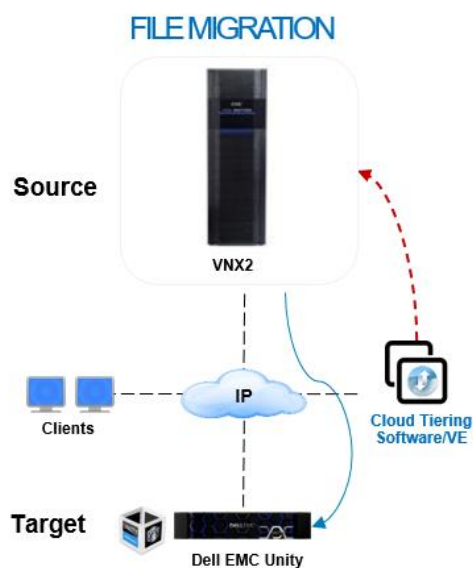


Figure 27 CTA File Migration with Dell EMC Unity

For more information about CTA's File Migration, refer to the *Dell EMC Unity: Cloud Tiering Appliance (CTA)* white paper on Dell EMC Online Support.

5 Migration Solutions Review (Other)

This section covers migration solutions for virtualized environments leveraging VMware ESXi and VMware vCenter Server. The following solutions are relevant options for partial or complete migration to Dell EMC Unity, depending on the level of virtualization in the environment.

5.1 Dell EMC RecoverPoint for VMs

Dell EMC RecoverPoint for Virtual Machines is a part of the RecoverPoint family and offers strong integration with VMware virtualized environments. Replication of data with VM granularity is achievable between ESXi servers and the underlying storage for the VMs' datastores. Utilize RecoverPoint for VMs to migrate the storage for your virtualized environment to Dell EMC Unity. Because migration occurs at the VM level, migration is storage agnostic and supports the Dell EMC storage arrays considered by this paper as well as other third-party arrays.

RecoverPoint for VMs is a virtual appliance deployed on a VMware ESXi server. A VMware vCenter plug-in adds management capabilities directly into vCenter, enabling setup and monitoring of migration sessions from a familiar interface. RecoverPoint for VMs is fully supported by Dell EMC and requires a license for use.

Deploy the virtual appliance for RecoverPoint for VMs in a clustered configuration. Depending on the size of the virtual environment and data to transfer, hardware requirements for the cluster will vary and should be considered. For more information about sizing as well as information about using RecoverPoint for VMs, refer to Dell EMC Online Support.

5.2 VMware Storage vMotion

VMware Storage vMotion is an included feature with VMware vCenter Server that provides the capability to migrate a Virtual Machine's computing power to a different ESXi host, or its backing storage to a different datastore. This functionality can be used to migrate a VM's storage to a datastore hosted by a Dell EMC Unity system. VMware Storage vMotion is packaged with VMware vCenter Server, which requires a license for use.

Migration using VMware Storage vMotion is a simple operation in vCenter Server. Ensuring that a VMware datastore has been presented from a Dell EMC Unity system to the vCenter environment, selecting a VM and choosing to migrate the VM's storage to that datastore will start a migration session (Figure 28). Migration is performed with the VM remaining online during the data transfer, with a short (sometimes imperceptible) cutover to complete the operation.

Because migration is occurring at the datastore level, there are fewer restrictions for supported storage systems. All the Dell EMC storage arrays considered by this paper are supported as migration sources, as well as other third-party arrays. For more information about VMware Storage vMotion, refer to VMware Support.

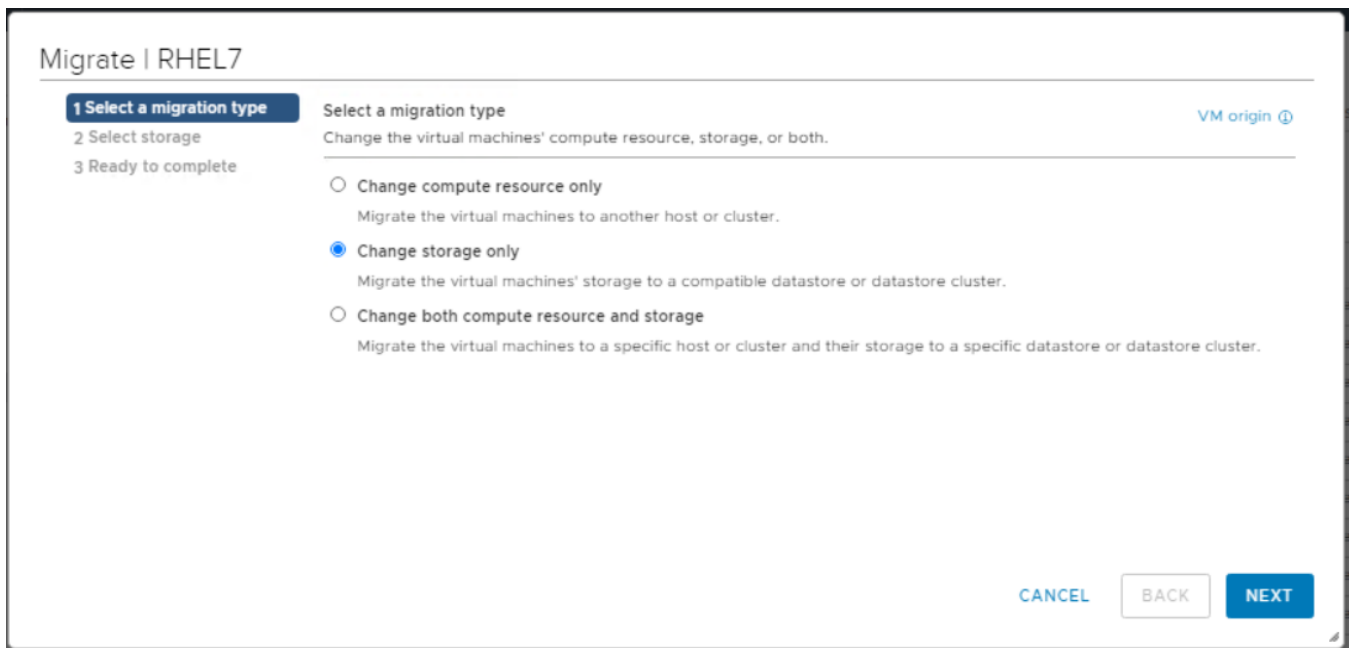


Figure 28 VMware Storage vMotion – Configuring Migration

6 Conclusion

Migration to a new storage platform has always been a daunting task. In most environments, there are many layers of technology to have to consider and interrelate to construct a migration proposal. Beyond this, working with different departments and groups to schedule for data transfer and cutover can be a painstaking ordeal. To top things off, there are many potential vulnerabilities and issues that can occur during the migration process itself. This can often lead migration operations to take longer than expected or never get started.

With Dell EMC Unity, Dell EMC aims to address some of these pain points. Multiple areas of integration with other Dell EMC and non- Dell EMC products produce a complete set of solutions for migration to Dell EMC Unity. With some offerings providing offloading capabilities over purpose-built appliances and others supporting non-disruptive migrations, Dell EMC Unity's migration technologies provide ways to work around the traditional sources of overhead and uncertainty. Finally, many of the addressed migration solutions are built and supported by Dell EMC, offering the same level of quality and support as with Dell EMC Unity in addition to guaranteed familiarity with the Dell EMC Unity storage system and how it interacts with the chosen migration solution.

A full discussion and selection of the right migration technology for a customer's needs will vary by use case and environment. It is important to consider the factors directly relevant to the migration product, such as supported storage systems, limits, and ease-of-use. It is also necessary to consider external factors, such as price, networking protocols used, and availability requirements. Armed with this resource, additional investigation into the presented solutions and discussion with a Dell EMC representative or authorized reseller will lead to arriving at the appropriate migration process to the Dell EMC Unity system.

A Technical support and resources

[Dell.com/support](https://www.dell.com/support) is focused on meeting customer needs with proven services and support.

[Storage technical documents and videos](#) provide expertise that helps to ensure customer success on Dell EMC storage platforms.

A.1 Related resources

The following references can be found on Dell EMC Online Support:

- Dell EMC Unity: Best Practices Guide
- Dell EMC Unity: Cloud Tiering Appliance (CTA)
- Dell EMC Unity: Compression for File
- Dell EMC Unity: Data at Rest Encryption
- Dell EMC Unity: Data Integrity
- Dell EMC Unity: Data Reduction
- Dell EMC Unity: DR Access and Testing
- Dell EMC Unity: Dynamic Pools
- Dell EMC Unity: FAST Technology Overview
- Dell EMC Unity: File-Level Retention (FLR)
- Dell EMC Unity: High Availability
- Dell EMC Unity: Introduction to the Platform
- Dell EMC Unity XT: Introduction to the Platform
- Dell EMC Unity: NAS Capabilities
- Dell EMC Unity: MetroSync
- Dell EMC Unity: MetroSync and Home Directories
- Dell EMC Unity: MetroSync and VMware vSphere NFS Datastores
- Dell EMC Unity: Migration Technologies
- Dell EMC Unity: OpenStack Best Practices for Ocata Release
- Dell EMC Unity: Performance Metrics
- Dell EMC Unity: Snapshots and Thin Clones
- Dell EMC Unity: Operating Environment (OE) Overview
- Dell EMC Unity: Unisphere Overview
- Dell EMC Unity: Virtualization Integration
- Dell EMC UnityVSA
- Dell EMC Unity Cloud Edition with VMware Cloud on AWS
- Dell EMC Unity Data Reduction Analysis
- Dell EMC Unity: Migrating to Dell EMC Unity with SAN Copy
- Dell EMC Unity Storage with Microsoft Hyper-V
- Dell EMC Unity Storage with Microsoft SQL Server
- Dell EMC Unity Storage with Microsoft Exchange Server
- Dell EMC Unity Storage with VMware vSphere
- Dell EMC Unity Storage with Oracle Databases
- Dell EMC Unity 350F Storage with VMware Horizon View VDI
- Dell EMC Unity: 3,000 VMware Horizon Linked Clone VDI Users
- Dell EMC Storage with VMware Cloud Foundation
- Metro node best practices

B Appendix: Block Migration Options

		Supported Source System (to Dell EMC Unity)				
Migration Solution		VNX1/ VNX2	VNXe1600/ VNXe3200	VNX3100/ VNXe3300	CLARiiON	SC/Compellent PS/EqualLogic VMAX HP EVA HPE 3PAR Hitachi HDS NetApp
	Dell EMC Unity Asynchronous Block Replication	X	✓	X	X	X
	Dell EMC SAN Copy (Push)	✓	X	X	✓	X
	Native SAN Copy Import	✓	X	X	X	X
	Dell EMC PowerPath Migration Enabler	✓	✓	X	✓	Reference the Support Matrix
	Dell EMC RecoverPoint	✓	✓	X	✓	Reference the Support Matrix
	Dell EMC VPLEX	✓	✓	X	✓	Reference the Support Matrix
	Host-Based LVM Migration	✓	✓	✓	✓	✓
	Dell EMC Unity SAN Copy Pull	X	X	X	X	✓

C Appendix: File Migration Options

		Supported Source System (to Dell EMC Unity)				
Migration Solution		VNX1/VNX2	VNXe1600/ VNXe3200	VNX3100/ VNXe3300	Celerra	NetApp
	Dell EMC Unity Native File Import	✓	✗	✗	✗	✗
	Dell EMC Select Datadobi DobiMigrate	✓	✓	✓	✓	✓
	EMCopy	✓	✓	✓	✓	✓
	Robocopy	✓	✓	✓	✓	✓
	rsync	✓	✓	✓	✓	✓
	CTA File Migration	✓ (Only VNX2)	✗	✗	✗	✗