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TECHNICAL NOTES

Best Practices for Nondisruptive Tiering using EMC® Symmetrix® Virtual LUN Technology

Technical Notes

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This technical notes document contains information on these topics:

Executive summary

Information infrastructures must continuously adapt to changing business requirements. EMC® Symmetrix® Enhanced Virtual LUN technology optimizes tiered storage strategies by easily *re-tiering* data as its value changes over time. Symmetrix Virtual LUN assists with system reconfiguration, performance improvement, and consolidation efforts while maintaining vital service levels.

Introduction

Virtual LUN technology, for the EMC Symmetrix VMAX® Family, enables transparent, nondisruptive data mobility among storage tiers within the same array and between RAID protection schemes without impacting local or remote replication. Organizations can respond more easily to changing business requirements when using tiered storage in the array.

Introduced in EMC Enginuity™ 5874, Virtual LUN technology supports the migration of disk-group provisioned (DP), non virtually provisioned, Symmetrix devices in both open system and mainframe environments, and includes support for metavolumes.

Starting with Enginuity 5875, Virtual LUN VP Mobility supports the migration of EMC Virtual Provisioning™ VP volumes in open system environments.

Virtual LUN technology for disk-group provisioned devices offers two types of data movement: migration to *unconfigured* space and migration to configured space. Virtual LUN VP Mobility migrates virtually provisioned device data from one virtually provisioned storage pool to another. In this way, data can be moved between storage pools configured on different drive technologies, and with different RAID protection types.

In each case, the migration provides users the ability to move data between high-performance drives and high-capacity drives, or to populate newly added drives, with full inter-RAID flexibility.

Audience

This technical note provides an in-depth look at the Virtual LUN technology feature for Symmetrix VMAX enterprise storage arrays. The intended audience includes system and storage administrators,

customers, EMC staff, and partners who need to understand how to implement and leverage Virtual LUN technology.

Tiered storage

Tiered storage is the practice of maintaining storage of varying performance and characteristics either among multiple arrays, or within the same array itself. Tiered storage gives administrators the flexibility to utilize their resources effectively by aligning hardware levels to appropriate information value. For example, data *hot spots* can be placed into higher performing hardware, providing better performance and user experience.

The Symmetrix architecture enables storage administrators to consolidate multiple application tiers, server platforms, and connection types—all in the same array—without compromising performance, availability, or functionality. Symmetrix arrays are the only storage arrays that can scale up to four petabytes (4 PB), enabling massive scalability and tiering within a single system, and providing significant cost savings through operational efficiencies.

Data migration should not be overlooked in complex, expensive storage environments. Tiered storage is based on properly aligning resources with the ever-changing value of information, and storage systems have to dynamically react over time. From within the array, data migration gives life to tiered storage. Without it, information remains on storage levels that do not correspond to its value. Tiered storage must also include the ability to freely move data among storage tiers to respond to rapidly changing information value and business needs.

The challenge is that migration is normally associated with system downtime, which adversely affects the ability to meet service level agreements (SLAs). This issue prevents many storage administrators from effectively moving data because of their reluctance to disturb their system or create application downtime.

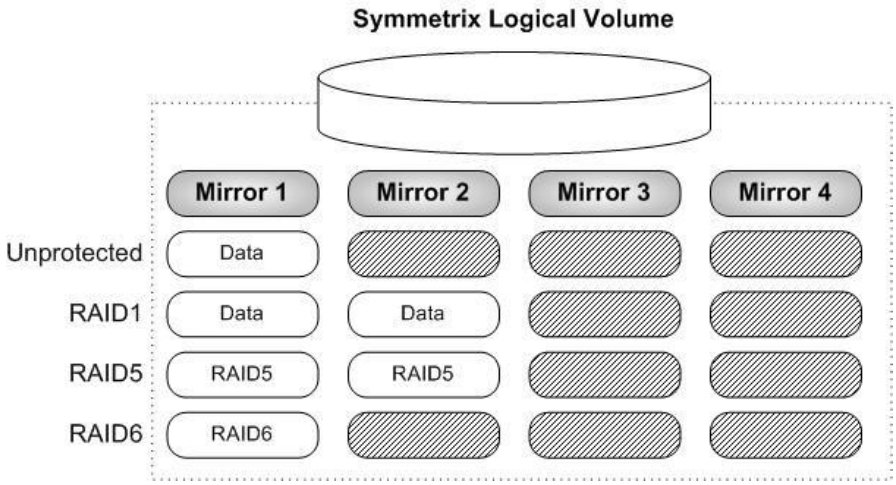
Symmetrix Virtual LUN technology is an important tool to address this requirement by providing the essential ability to migrate data throughout the array easily and without downtime, thereby effectively merging storage consolidation with tiered storage.

RAID Virtual Architecture

RAID Virtual Architecture (RVA) is the new architecture employed in Symmetrix VMAX systems to implement RAID protection. RVA extends the design of RAID 6 used in the EMC Symmetrix DMX-3™ and DMX-4™ storage arrays and in so doing provides a uniform implementation of all RAID protection schemes (unprotected, RAID 1, RAID 5, and RAID 6). The RVA design abstracts all RAID protection types to a single mirror position for a given Symmetrix logical volume, thus freeing up device-mirror positions for additional features, such as Virtual LUN migrations.

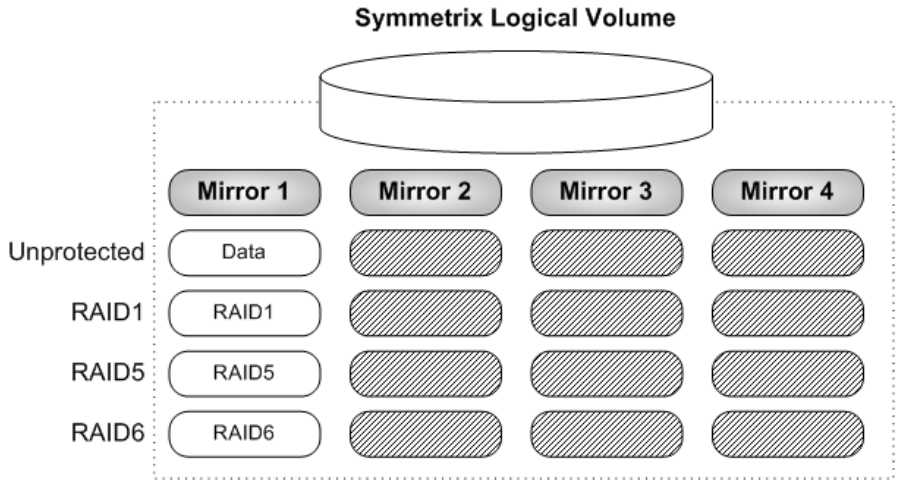
As before, each Symmetrix logical device is represented in the array by four mirror positions, M1, M2, M3, and M4. However, in Enginuity 5773 and lower, certain RAID types (RAID 1 and RAID 5) used two mirror positions, as shown in Figure 1.

Figure 1 Local RAID protection types prior to Symmetrix VMAX



Starting with Enginuity 5874 in Symmetrix VMAX arrays, however, all local RAID protection types consume only one mirror position, as shown in Figure 2.

Figure 2 Local RAID protection types for Symmetrix VMAX



RAID Virtual Architecture temporarily allows for two distinct RAID groups to be associated with a device. This feature allows for a disk-group provisioned Symmetrix logical volume to be migrated from one RAID group to another.

Virtual Provisioning

Symmetrix Virtual Provisioning, introduced in Enginuity 5773, enables administrators to increase capacity utilization by enabling more storage to be presented to a host than is physically consumed, and by allocating storage only as needed from a shared virtual pool. Symmetrix Virtual Provisioning also simplifies storage management by making data layout easier through automated wide striping, and by reducing the steps required to accommodate growth.

Virtual Provisioning introduced a new type of host-accessible device called a virtually provisioned device, also known as a thin device, that can be used in many of the same ways that regular, host-accessible Symmetrix devices have traditionally been used. Unlike regular Symmetrix devices, thin devices do not need to have physical storage completely allocated at the time the devices are created and presented to a host. The physical storage that is used to supply drive space for a thin device comes from a shared virtually provisioned pool, also known as a thin pool, that has been associated with the thin device. A thin storage pool is comprised of a new type of internal Symmetrix device called a

data device that is dedicated to the purpose of providing the actual physical storage used by thin devices. When they are first created, thin devices are not associated with any particular thin pool. An operation referred to as *binding* must be performed to associate a thin device with a thin pool.

When a write is performed to a portion of the thin device, the Symmetrix array allocates a minimum allotment of physical storage from the pool and maps that storage to a region of the thin device, including the area targeted by the write. The storage allocation operations are performed in small units of storage called thin device extents. Extents may also be called *chunks*. A round-robin mechanism is used to balance the allocation of extents across all of the data devices in the pool that are enabled and that have remaining unused capacity. The thin device extent size is 12 tracks (768 KB for FBA and 684 KB for CKD). That means that the initial bind of a thin device to a pool causes one extent, or 12 tracks, to be allocated for each thin device.

When a read is performed on a thin device, the data being read is retrieved from the appropriate data device in the storage pool to which the thin device is bound. Reads directed to an area of a thin device that has not been mapped do not trigger allocation operations. The result of reading an unmapped block is that a block in which each byte is equal to zero will be returned. When more storage is required to service existing or future thin devices, data devices can be added to existing thin storage pools. New thin devices can also be created and associated with existing thin pools.

Prior to Enginuity 5875, a thin device could only be bound to, and have tracks allocated in, a single, thin storage pool. This thin storage pool can, in turn, only contain Symmetrix data devices of a single RAID protection type, and a single-drive technology (and single-rotation speed in the case of FC and SATA drives).

With Enginuity 5875 and higher, a thin device is still only considered to be bound to a single thin pool but may have tracks allocated in multiple pools within a single Symmetrix array. A thin device may also be *re-bound* to a different thin pool, without any loss of data or data access. These new features provide Virtual LUN the ability to migrate a thin device from one thin pool to another.

> **Note:** The *Best Practices for Fast, Simple Capacity Allocation with EMC Symmetrix Virtual Provisioning* technical note available on EMC Online Support provides more information on Virtual Provisioning.

Virtual LUN technology

Virtual LUN technology enables transparent, nondisruptive data mobility for both disk-group provisioned and virtually provisioned Symmetrix volumes between storage tiers and between RAID protection schemes. Virtual LUN can be used to populate newly added drives or move devices between high-performance and high-capacity drives, thereby delivering tiered storage capabilities within a single Symmetrix array. Migrations are performed while providing constant data availability and protection.

Virtual LUN technology performs *in-the-box* tiered storage migration by migrating data from one RAID group to another, or from one virtually provisioned pool to another. It is also fully interoperable with all other Symmetrix replication technologies—EMC SRDF®, EMC TimeFinder®/Clone, EMC TimeFinder/Snap, EMC TimeFinder VP Snap, and Open Replicator.

Virtual LUN for disk-group provisioned devices

The migration of disk-group provisioned (DP) devices is facilitated by the creation and movement of RAID groups, through online configuration changes on the Symmetrix array.

RAID Virtual Architecture allows, for the purposes of migration, two distinct RAID groups of different types or on different storage tiers to be associated with a logical volume. In this way, Virtual LUN allows for the migration of data from one protection scheme to another, for example RAID 1 to RAID 5, without interruption to the host or application accessing data on the Symmetrix device.

Virtual LUN can be used to migrate standard Symmetrix devices and metadevices of any emulation—fixed block architecture (FBA), Count Key Data (CKD), and iSeries. Migrations can be performed between all drive types including high-performance Flash drives, Fibre Channel drives, and large-capacity SATA drives.

Data can be migrated to either unconfigured or configured space. In the case of migration to unconfigured space, a target RAID group is created from the free pool in the array and migrated to. When complete, the original RAID group is deleted and the storage returned to the free pool.

When migrating to configured space, an existing, but unused, Symmetrix device is specified as a target and the source device migrated to the physical storage occupied by the target device. This target device can either be specified by the user or automatically selected by the

Symmetrix array. Following the migration, the device specified as the target will occupy the storage originally associated with the device being migrated. An instant VTOC (iVTOC) is then performed on the target device, leaving its original data inaccessible.

> **Note:** In the case of migrating to configured space, the target device specified must be of the same size and configuration as the source device being migrated. If migrating a metadevice, a metadevice of the same size and configuration must be specified, or a number of individual devices equal in size and quantity of the metamembers being migrated.

For the purposes of a migration, either the protection type or the storage tier, or both, must change. Symmetrix volumes of any RAID protection can be migrated to any other supported RAID protection, with one exception: protected devices may not be migrated to space that is unprotected.

The full list of available target protections is shown in Table 1.

Table 1. Allowed RAID protection changes

Source volume protection	Available target protection
Unprotected	Unprotected*****, RAID 1 RAID 5 (3+1), RAID 5 (7+1) RAID 6 (6+2), RAID 6 (14+2)
RAID 1	RAID 1*****, RAID 5 (3+1), RAID 5 (7+1) RAID 6 (6+2), RAID (14+2)
RAID 5 (3+1)	RAID 1, RAID 5 (3+1)*****, RAID 5 (7+1) RAID 6 (6+2), RAID (14+2)
RAID 5 (7+1)	RAID 1, RAID 5 (3+1), RAID 5 (7+1)***** RAID 6 (6+2), RAID (14+2)
RAID 6 (6+2)	RAID 1, RAID 5 (3+1), RAID 5 (7+1) RAID 6 (6+2)*****, RAID (14+2)
RAID 6 (14+2)	RAID 1, RAID 5 (3+1), RAID 5 (7+1) RAID 6 (6+2), RAID (14+2)*****

** Migration to different physical disk group only*

Virtual LUN VP Mobility

There are two types of thin device migration. The first involves the migration of all extents for a given set of thin devices to a specified target pool. The second, and more advanced, type involves migrating extents belonging to a set of thin devices from a specified source pool to a specified target pool.

The migration of thin devices when only a target pool is specified is achieved by rebinding the devices to a new thin pool, and then relocating all the allocated extents, belonging to those devices, to that pool.

The migration of thin devices when both a source pool and a target pool are specified is achieved relocating all the allocated extents belonging to the devices from the source pool to the target pool. Any extents allocated in a pool other than the source pool will not be migrated.

> **Note:** During a migration in which a source pool is specified, the devices being migrated will not be rebound to the target pool.

As thin pools can be of varying RAID types, VLUN VP allows the migration of data from one protection scheme to another, or from one drive technology to another, or both. This data movement is performed without interruption to the host application accessing data on the thin device.

Virtual LUN VP can be used to migrate Symmetrix thin devices, and thin metadevices, configured as FBA in open system environments or CKD in mainframe environments. Migrations can be performed between thin pools configured on all drive types including high-performance Flash drives, Fibre Channel drives, and large-capacity SATA drives. This feature can also be a strong complement to automated tiering, as it enables administrators to *override* the EMC FAST™ VP algorithm and manually re-tier thin devices based on new or unexpected performance requirements.

Data is migrated to unallocated space in the target thin pool. As such, there must be sufficient unallocated space to accommodate all the allocated thin device extents. As the extents are relocated, they are deallocated from the source pool, leaving additional unallocated space in that pool.

The relocation mechanism used for migrations is based on the same process used for Automated Pool Rebalancing and data-device draining.

When performing a thin device migration, the thin pool that the thin device is currently bound to may be specified as the target of the migration. In this case, any tracks for the device that are allocated in pools other than the bound pool will be consolidated to the target pool.

Virtual LUN migrations

The management and monitoring of all device migrations can be

performed using either the Solutions Enabler command line interface (SYMCLI), through the **symmigrate** command, or EMC Unisphere® for VMAX.

Source criteria

The source devices for a Virtual LUN migration can be specified in one of four ways:

- A device group
- A storage group
- A source file (SYMCLI)
  - A single column of the devices to be migrated
  - Two columns of devices pairing the source and target devices
- Manual selection (Unisphere)
  - Manual selection of source devices
  - Manual selection of exact source and target device pairs

Note: The selection of target devices applies only to the migration of standard devices to configured space.

Target criteria

When migrating a disk-group provisioned device to unconfigured space, the target storage is specified by the physical disk group, along with the desired RAID protection type.

When migrating a disk-group provisioned device to configured space, the target storage can be specified by the destination disk group, along with the desired RAID protection type. As a result, Symmetrix Enginuity will automatically select appropriate target devices that fit the target criteria. The devices selected will be either unmapped or unmasked, or both, and so not in use on a host. Alternatively, user-selected target devices can be included along with the source devices in a text file. When using exact pairings, the RAID protection type and disk group are assumed.

When migrating a thin device, the target storage is specified as a single, thin pool.

Device files

When migrating to a device to unconfigured space, or a thin device, a source device file can be created listing the devices to be migrated in the

single column. For example, to migrate devices 790, 791, 792, and 793 the following file could be created:

cat devices.txt

```
790
791
792
793
```

A similar file can be created when migrating a device to configured space if a target disk group is going to be used. However, if it is required to migrate the source devices to the locations of specific target devices, then a device *pairs* file can be created. This file will consist of two columns, where the first column is the source device to be migrated, while the second column contains the target devices currently occupying the storage to be migrated to. In an example where devices 790, 791, 792, and 793 are being migrated to storage attached to devices 7A5, 7C6, 7D2, and 7D5, the device pairs file would look like this:

cat dev_pairs.txt

```
790 7A5
791 7C6
792 7D2
793 7D5
```

In this case, device 790 ise migrated to the storage currently associated with device 7A5, device 791 with device 7C6, and so on for the rest of the file.

Note: As the target criteria for the migration of disk-group provisioned and thin devices are different, the source devices specified must all be of a single type.

If migrating metadevices to configured space, the device pairs file can contain a list of target metadevices that are configured the same way as the source metadevices. Alternatively, this can be a comma-separated list of individual devices equal in size and number to the metamembers in the metadevice being migrated. In the case of the latter, the device pairs file would look like this:

cat meta_pairs.txt

```
790 7A5,7A6,7A7,7A8
794 7A9,7AA,7AB,7AC
```

Note: In all cases, when migrating a metadevice, the source column should contain only the meta head.

Sessions

Migrations are submitted and managed as sessions. A session name is specified when establishing the migration.

Disk-group provisioned device migrations

For disk-group provisioned device migrations, to configured or unconfigured space, the Symmetrix array supports up to 16 concurrent active and passive sessions. An active session is defined as a migration that has been established but has not yet completed. A passive session is a migration that has completed, but has not yet been terminated.

The Symmetrix array supports up to four concurrent active Virtual LUN migrations of disk-group provisioned devices, although only one migration can be submitted at a given time. After a migration has been established, another migration can then be submitted.

Each migration session can have up to a maximum of 128 Symmetrix devices for each Symmetrix VMAX engine. A total of 128 devices for each Symmetrix VMAX engine can be part of active migration sessions on the Symmetrix array at any given time. This means that a Symmetrix VMAX array with a single engine (two directors) can support up to 128 active device migrations, while a fully populated Symmetrix array with eight engines (16 directors) can support up to 1,024 active, concurrent device migrations.

If a migration session has been established to a Symmetrix array containing a single engine, and it contains 128 devices, the migration state must reach Migrated prior to another migration session being established. Also, if the number of devices in a session being established causes the Symmetrix to exceed 128 devices for each engine, the establish will fail with an error.

Note: When migrating metadevices, each individual metamember counts toward the 128 devices for each engine maximum.

Virtual Provisioning device migrations

For the migration of thin devices, there is no defined limit on the number of concurrent migration sessions, or the number of devices being migrated concurrently within a single Symmetrix array. However, care should be taken in scheduling a large number of migration sessions at

the same time. The larger the number of migration sessions, the larger the impact will be on the performance of the data-copy process for those migrations.

Migration states

There are six possible migration states that are reported during a Virtual LUN migration. These states have slightly different meanings depending on the type of devices being migrated.

The following are the six possible states:

- CreateInProg
  - DP—Indicates that the migration has been submitted to the Symmetrix array and the initial configuration change creating or moving the destination RAID group is in progress.
  - VP—Indicates that the rebind of the devices being migrated to the target thin pool is being performed.
- SyncInProg
  - DP—The data transfer from source RAID group to target is underway.
  - VP—The movement of thin device extents from the source pool to the target pool is in progress.
- Synchronized
  - DP and VP—The data transfer process has completed.
- MigrInProg
  - DP—The second configuration change is being performed to promote the target RAID group to primary and repurpose the original storage.
  - VP—Not applicable.
- Migrated
  - DP—The data has been migrated and all configuration changes have completed. From this state the migration can be terminated.
  - VP—All allocated extents of the thin devices being migrated have been migrated.
- Failed
  - DP—The Symmetrix array-based script responsible for managing the migration has failed and is no longer executing. In this state, customers should contact EMC

support personnel for further assistance.

- VP—The relocation of thin devices has stopped, or timed out, possibly due to the target pool filling up. In this state, the user can terminate the migration and restart it, or migrate the devices to a different thin pool.

Migration to unconfigured space

Migrating a device to unconfigured space creates new hypers from free space to be used as the target of the migration. After the data transfer has been completed, the physical space previously associated with the migrated device is returned to the free pool.

In the following illustration, Symmetrix volume BE8 is locally protected as RAID 1 on Fibre Channel drives. It is also remotely protected through SRDF, as shown in Figure 3.

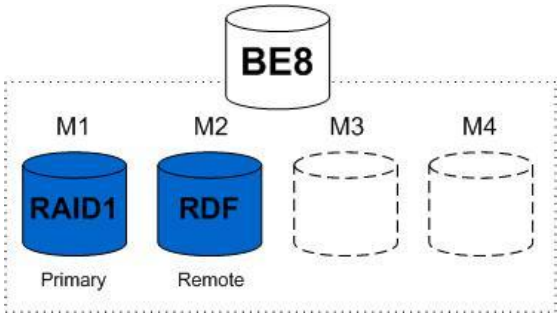
The volume is being migrated to currently unconfigured storage on SATA drives and is locally protected as RAID 5.

In performing the migration to unconfigured space, the five distinct stages are seen.

Stage 1

Figure 3 shows the device to be migrated prior to the migration being established.

Figure 3 Migration to unconfigured space: Stage 1



To establish the migration, the volumes to be migrated are submitted to the Symmetrix array through Solutions Enabler SYMCLI or Unisphere.

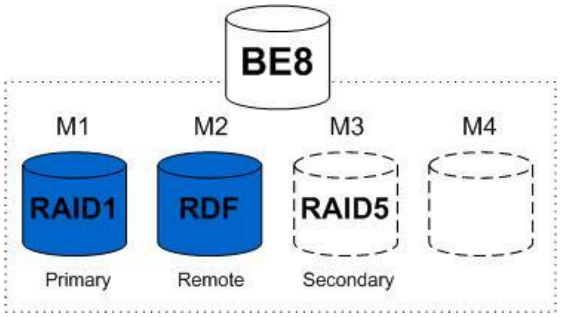
Stage 2

Upon submission, the external Symmetrix configuration lock (lock15) is placed on the array in order to perform the first of two configuration changes during the migration.

After the Symmetrix array is locked, the target RAID 5 group is created on the destination storage and attached as a secondary mirror to the device being migrated.

The RAID group is added in the first available mirror position, in this case the third mirror (M3) position, as shown in Figure 4.

Figure 4 Migration to unconfigured space: Stage 2



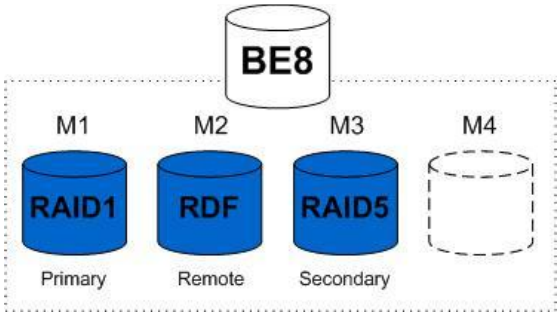
When attached, the RAID group is completely invalidated to be synchronized from the primary mirror, and the configuration lock is released.

The release of the configuration lock allows other migrations, or configuration changes, to be run concurrently with the existing migration.

Stage 3

As the secondary mirror was invalidated when it was associated with the volume, it is then synchronized from the primary mirror of the volume. Figure 5 shows the secondary mirror now synchronized with the primary mirror.

Figure 5 Migration to unconfigured space: Stage 3

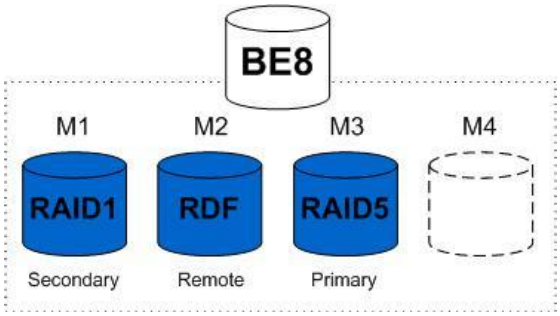


Stage 4

Following the completion of the synchronization, the Symmetrix configuration lock is acquired once again.

When locked, the volume configuration is updated to swap the primary and secondary roles of the attached RAID groups. In this case, the original RAID 1 mirror is demoted to secondary, while the new RAID 5 mirror is promoted to be the primary mirror. This change is shown in Figure 6.

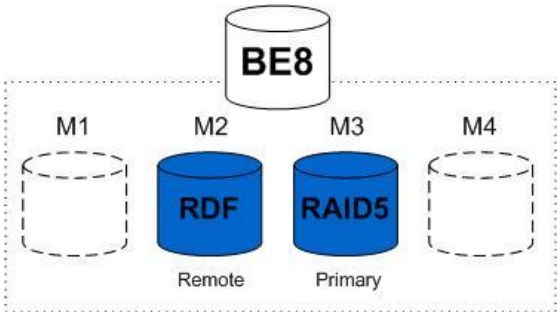
Figure 6 Migration to unconfigured space: Stage 4



Stage 5

When the primary and secondary mirror roles are switched, the now secondary mirror is detached from the volume, and the RAID group deleted. The space previously occupied by the RAID 1 group on the Fibre Channel storage is returned to the free pool, as illustrated in Figure 7.

Figure 7 Migration to unconfigured space: Stage 5



At this time, the configuration lock is released, and the migration is considered to be complete and can be terminated.

Note: Following a migration, while the primary mirror may actually reside in a mirror position other than the M1 position for the device, the SYMCLI output will always display the primary mirror as being in the M1 position.

Migration to configured space

When migrating a device to configured space, the Symmetrix array will choose from existing RAID groups associated with other logical devices to migrate the data to. These target devices may not be in use, that is, unmapped or unmasked, or both, on the array prior to or during the migration. Following the migration, data that may have existed on the target devices will no longer be accessible.

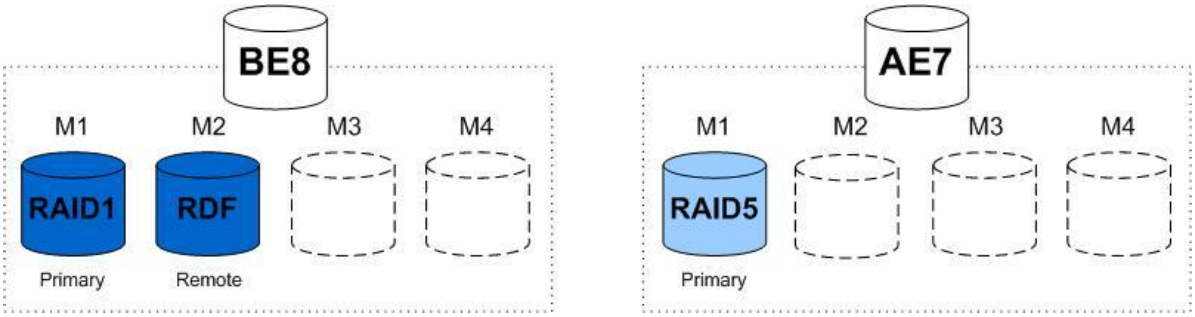
In the following illustration, Symmetrix volume BE8 is locally protected as RAID 1 on Fibre Channel drives. It is also remotely protected through SRDF. The volume will be migrated to storage on SATA drives currently occupied by the RAID 5 protected volume AE7.

As with the migration to unconfigured space, there are six distinct stages when performing a migration to configured space.

Stage 1

Figure 8 shows the volume to be migrated and the volume being migrated to prior to the migration being established.

Figure 8 Migration to configured space: Stage 1



To establish the migration, the volumes to be migrated are submitted to the Symmetrix array through Solutions Enabler SYMCLI or Unisphere.

Stage 2

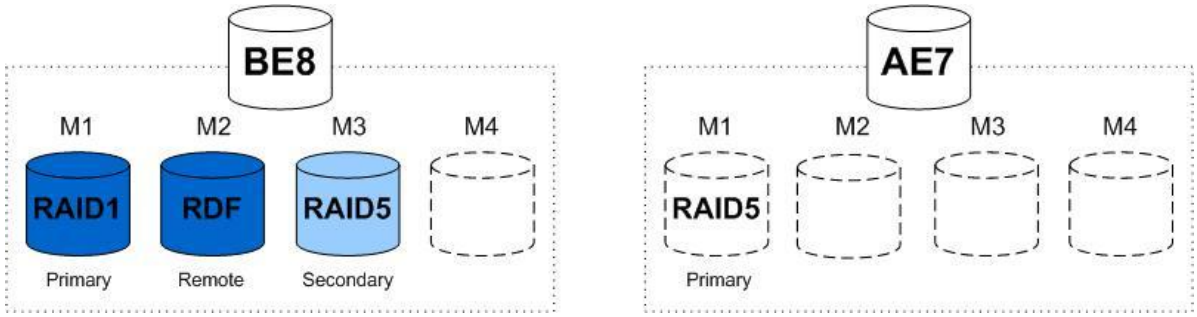
Upon submission, the external Symmetrix configuration lock (lock15) is placed on the array in order to perform the first of two configuration changes during the migration.

After the Symmetrix array is locked, the RAID 5 group associated with the target volume is made not ready (detached from the target volume)

and attached to the device being migrated.

The target RAID group is added in the first available mirror position, in this case the third mirror (M3) position, as shown in Figure 9.

Figure 9 Migration to configured space: Stage 2



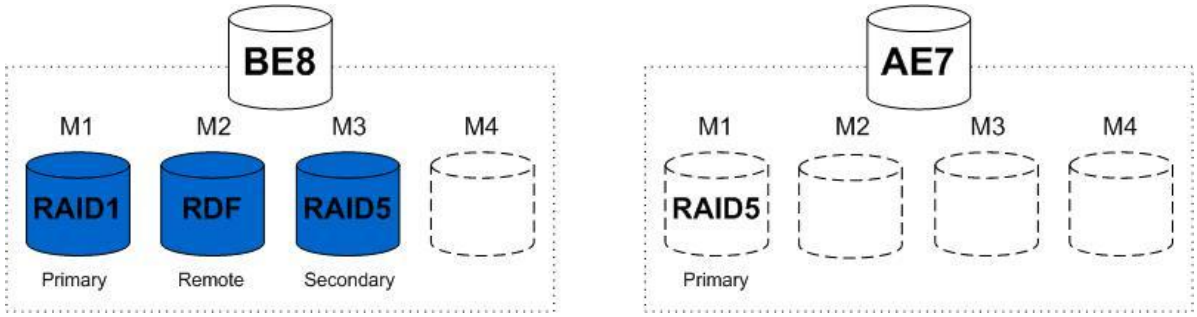
When attached, the RAID group is completely invalidated to be synchronized from the primary mirror, and the configuration lock is released.

The release of the configuration lock allows other migrations, or configuration changes, to be run concurrently with the existing migration.

Stage 3

As the secondary mirror was invalidated when it was associated with the volume, it is then synchronized from the primary mirror of the volume. Figure 10 shows the secondary mirror now synchronized with the primary mirror.

Figure 10 Migration to configured space: Stage 3

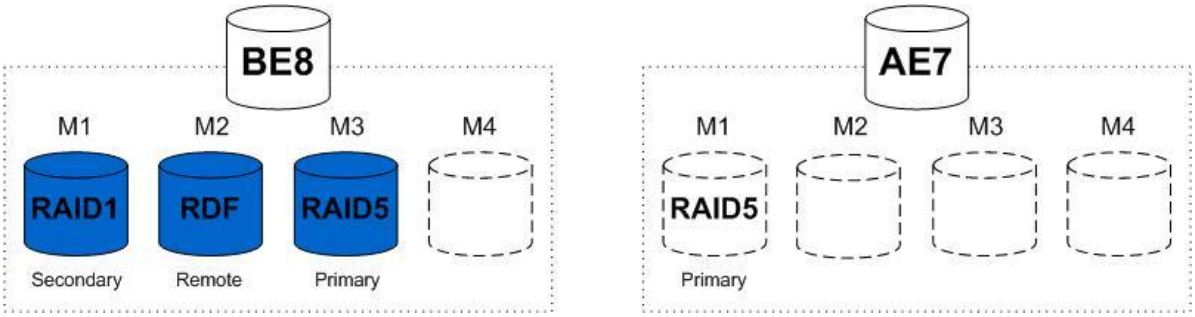


Stage 4

Following the completion of the synchronization, the Symmetrix configuration lock is acquired once again.

When locked, the volume configuration is updated to swap the primary and secondary roles of the attached RAID groups. In this case, the original RAID 1 mirror is demoted to secondary, while the new RAID 5 mirror is promoted to be the primary mirror. This change is shown in Figure 11.

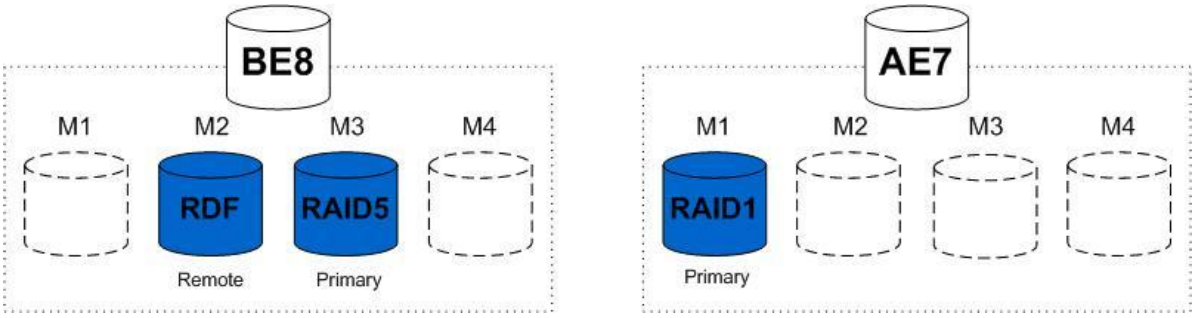
Figure 11 Migration to configured space: Stage 4



Stage 5

When the primary and secondary mirror roles are switched, the now secondary mirror is detached from the volume and attached to the target device as its primary mirror, as illustrated in Figure 12.

Figure 12 Migration to configured space: Stage 5

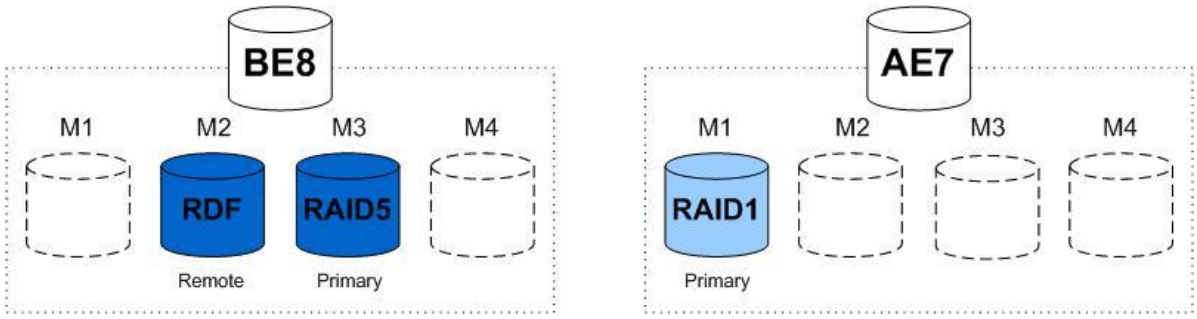


At this point, the RAID 1 group now associated with volume AE7 still has the original data that was available through volume BE8.

Stage 6

Prior to completing the migration, the RAID group now associated with the target volume has an instant VTOC performed, thereby making the data contained inaccessible, as illustrated in Figure 13.

Figure 13 Migration to configured space: Stage 6



At this time, the configuration lock is released, and the migration is considered to be complete and can be terminated.

Note: Following a migration, while the primary mirror may actually reside in a mirror position other than the M1 position for the device, the SYMCLI output will always display the primary mirror as being in the M1 position.

Migration to a target thin pool

Migrating a thin device to a thin pool utilizes the currently unallocated space in the target pool. The devices being migrated are bound to the target pool, and individual thin device extents are moved. As these extents are transferred, they are deallocated in the source pool.

In the following illustration, Symmetrix thin device D10 is bound to thin pool SATA_R614_VP, containing RAID 6 (14+2) protected data devices configured on SATA drives, as shown in Figure 14.

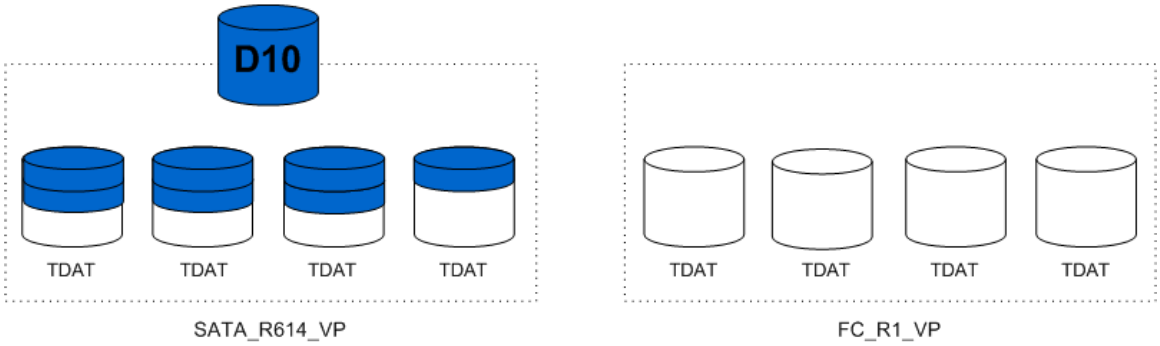
The volume will be migrated to a RAID 1 thin pool configured on Fibre Channel drives, FC_R1_VP.

In performing the migration of a thin device to a different thin pool, four distinct stages are seen.

Stage 1

Figure 14 shows the device to be migrated prior to the migration being established.

Figure 14 Thin device migration: Stage 1

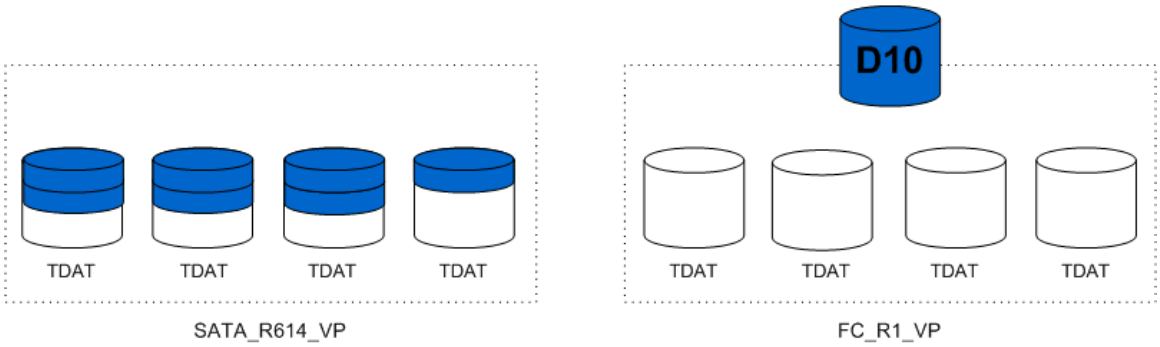


To establish the migration, the volumes to be migrated are submitted to the Symmetrix array through Solutions Enabler SYMCLI or Unisphere.

Stage 2

Upon submission, the Symmetrix performs a rebind operation on the thin device, binding it to the target pool. This is shown in Figure 15.

Figure 15 Thin device migration: Stage 2



After the thin device rebind has completed, any new thin device allocations that are the result of a host writes come from the target pool.

Stage 3

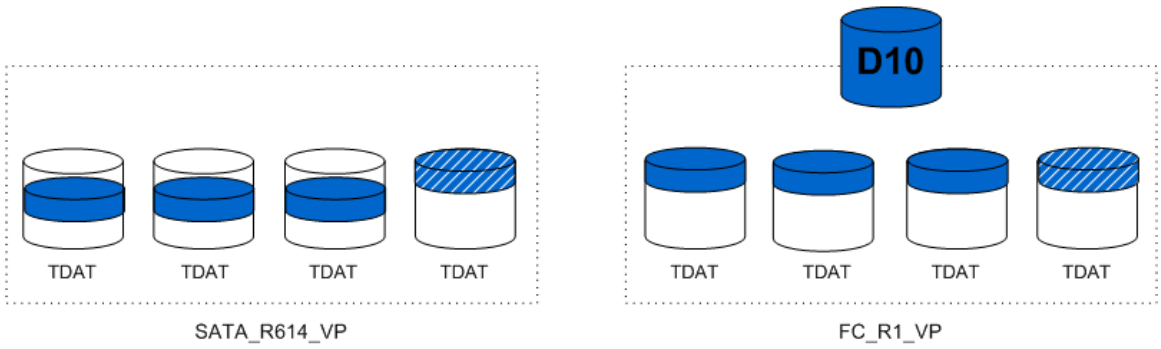
Using a process similar to that of the Virtual Provisioning Automatic Pool Rebalancing feature, thin device extents allocated in the source pool are moved to the target pool.

As each thin device extent is moved, the space previously occupied by the extent is deallocated, and becomes available for use within the pool.

Figure 16 shows the new allocations made in the target pool and the

deallocations in the source pool.

Figure 16 Thin device migration: Stage 3

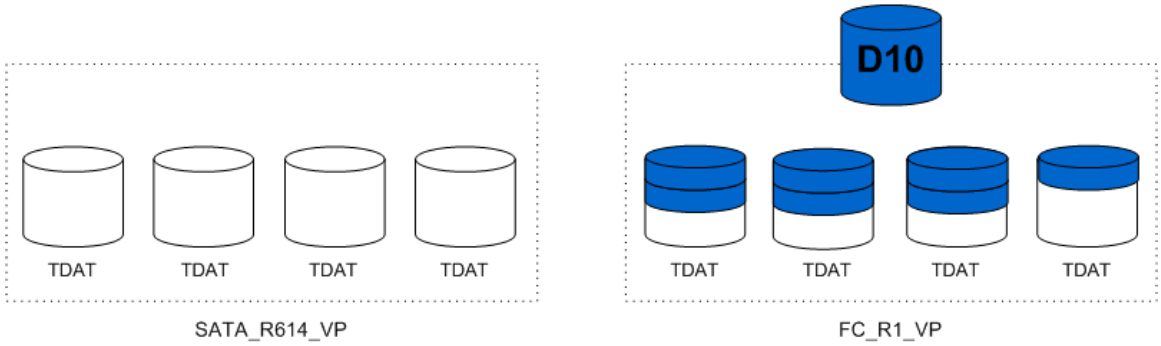


The striped extents shown in Figure 16 indicate that the extent is not deallocated from the source pool until the allocation in the target pool has been completed successfully.

Stage 4

Following the migration of all the allocated thin device extents of the thin device being migrated, there is no longer any association between the device and the source pool, as shown in Figure 17.

Figure 17 Thin device migration: Stage 4



At this point, the migration is considered to be complete and can be terminated.

Migration from a source thin pool

When performing a source pool migration, only the thin device extents allocated in the source pool specified are relocated for the devices involved in the migration. Binding information for the devices being

migrated does not change when a source pool is specified. As these extents are moved from the source pool to the target pool, they are deallocated from the source pool. Any extents allocated in pools other than the source pool remain untouched.

As shown in Figure 18, Symmetrix thin volume D10 is bound to thin pool FC_R1_VP, containing RAID 1 protected data devices configured on FC drives. Extents for the device, however, are also allocated in a RAID 6 protected pool configured on SATA and a RAID 5 protected pool configured on Flash drives. The likely reason for such a distribution is movement related to FAST VP.

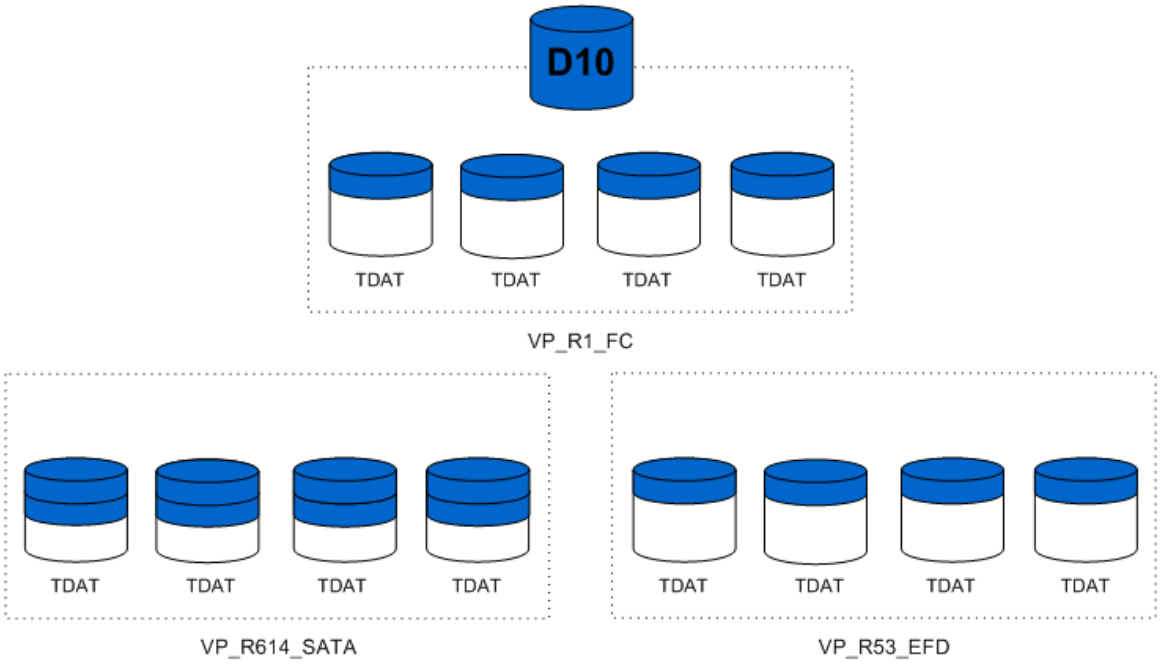
The volume will have all the extents currently allocated in the SATA pool migrated to the FC thin pool.

In performing a source pool migration of a thin device, three distinct stages are seen.

Stage 1

Figure 18 shows the device to be migrated prior to the migration being established.

Figure 18 Thin device source pool migration: Stage 1



To establish the migration, the volumes to be migrated are submitted to

the Symmetrix array through Solutions Enabler SYMCLI or Unisphere.

Stage 2

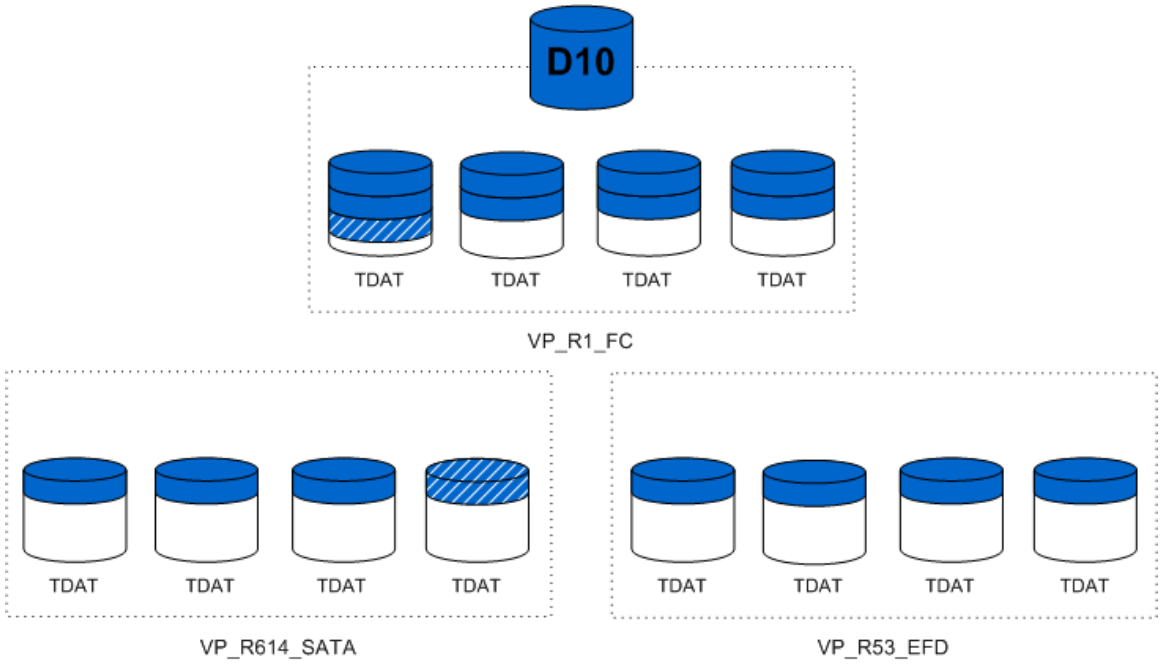
Upon submission, the Symmetrix array begins relocating extents allocated in the SATA pool to the FC pool using a process similar to that of the Virtual Provisioning Automatic Pool Rebalancing feature.

> **Note:** When a source pool is specified as part of the migration, no rebinding is performed.

As each thin device extent is moved, the space previously occupied by the extent is deallocated and becomes available for use within the pool.

Figure 19 shows the new allocations made in the target pool and the deallocations in the source pool.

Figure 19 Thin device source pool migration: Stage 2



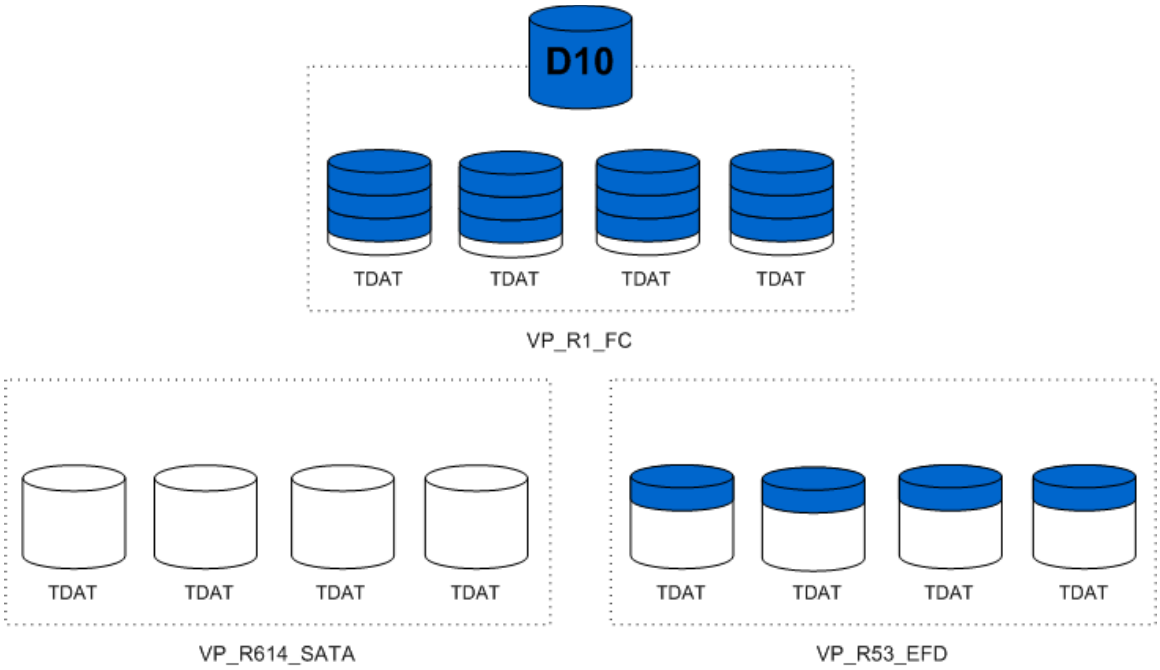
The striped extents shown in Figure 19 indicate that the extent is not deallocated from the source pool until the allocation in the target pool has been completed successfully.

Stage 3

Following the migration of all the allocated thin device extents from the source pool to the target pool, there is no longer any association between

the device and the source pool. Also, all the extents allocated in the Flash drive pool remain untouched. This is shown in Figure 20.

Figure 20 Thin device source pool migration: Stage 3



At this point, the migration is considered to be complete and can be terminated.

Canceling a migration session

It is not possible to terminate the migration of disk-group provisioned devices until the migration session has reached the Migrated state.

However, it is possible to terminate, or cancel, the migration of virtual provisioned devices while data is still being migrated (while the session state is SyncInProg).

When a VP migration is terminated prior to completion, no rollback is performed. This means that any data that had been migrated remains in the target pool. The devices that were being migrated also remain bound to the target pool specified in the migration.

To return all data to the source pool, a new migration session should be created. The original source pool will need to be specified as the target for this new migration.

Replication technology interaction

As previously stated, Virtual LUN technology is fully interoperable with all other Symmetrix replication technologies (SRDF, TimeFinder/Clone, TimeFinder/Snap, and Open Replicator). Any active replication on a Symmetrix volume remains intact while the device is being migrated. Similarly, all incremental relationships are maintained for the migrated devices. What must be kept in mind, however, is that the Symmetrix array will allow only one control operation to be executed against any given device at one time. This means that SRDF or TimeFinder control commands cannot be run against a device while the migration request is being submitted. Conversely, migration requests cannot be run while SRDF or TimeFinder control commands are being submitted.

SRDF

An RDF1 volume can be migrated while also actively replicating to an RDF2 volume, in either synchronous or asynchronous mode. Similarly, an RDF2 volume can be migrated while being replicated to by an RDF1 volume. However, an SRDF volume (R1 or R2) cannot be specified as the target volume in a Virtual LUN migration, regardless of SRDF pair state or mode of operation.

TimeFinder/Clone

The source volume of a TimeFinder/Clone session, or TimeFinder/Clone emulation session, can be migrated by using Virtual LUN. A volume that is a target device of a TimeFinder/Clone session, or a TimeFinder/Clone emulation session, can also be migrated, provided that the target has been split or activated.

A volume that is a source device of a native TimeFinder/Clone session, or TimeFinder/Clone emulation, cannot be specified as the target volume in a migration. Similarly, a target volume of a TimeFinder/Clone session, in native or emulation mode, cannot be specified as the target volume in a Virtual LUN migration. In both cases, the TimeFinder/Clone session would first need to be terminated.

TimeFinder/Snap

The source volume in a TimeFinder/Snap session can be migrated by using Virtual LUN.

A TimeFinder/Snap source volume cannot be specified as the target device in a Virtual LUN migration. The session must first be terminated.

TimeFinder VP Snap

The source volume in a TimeFinder VP Snap session can be migrated using Virtual LUN.

Target volumes in a VP Snap session may not be migrated if they are sharing allocations with other target volumes.

Open Replicator for Symmetrix

The control volume in an Open Replicator session, either push or pull, can be migrated by using Virtual LUN.

The Open Replicator control volume cannot be specified as the target volume in a migration.

Interaction with FAST and FAST VP

EMC Symmetrix VMAX FAST and FAST VP automate the identification of data volumes for the purposes of relocating application data across different performance/capacity tiers within an array.

Both FAST and FAST VP monitor workload within the Symmetrix array in order to identify highly active data that would benefit from being moved to higher performing drives. They also identify less active data that could be relocated to higher capacity drives, without existing performance being affected. Data movement executed during this activity is performed nondisruptively, without affecting business continuity and data availability.

FAST

First introduced in Enginuity 5874.207 and Solutions Enabler V7.1, FAST operates on disk-group provisioned Symmetrix devices. Data movements executed between tiers are performed at the full-volume level.

Devices under the control of FAST may be migrated manually by using Virtual LUN. However, if FAST is currently promoting or demoting the device, the FAST movement needs to complete prior to the VLUN migration being submitted.

FAST VP

Introduced in Enginuity 5875, and Solutions Enabler V7.2, FAST VP operates on thin devices. As such, data movements executed can be performed at the sub-LUN level, and a single thin device may have extents allocated across multiple thin pools within the array.

Thin devices under the control of FAST VP may be migrated manually by using VLUN VP Mobility. If a thin device migration is submitted, any pending movements for that device related to FAST VP will be cancelled, and the VLUN movement will be executed in its place.

In the case where a thin device has allocations across multiple pools, as the result of FAST VP related activity, VLUN VP can be used to

consolidate all allocated extents back to a single thin pool. This thin pool can be the one that the thin device is currently bound to or it can be a separate thin pool.

Device pinning

Enginuity 5875 and Solutions Enabler V7.2 introduce a new concept called device pinning, which can be used to prevent FAST or FAST VP from moving a device from its current location, even while the device remains under FAST control. Both disk-group provisioning and virtual provisioning devices may be pinned.

Virtual LUN migrations can be performed on devices that are currently pinned. If the pin is not removed, then the device remains in its new location following the migration.

If a migration is performed on thin devices under FAST VP control, FAST VP related movement can occur as soon the data movement related to the migration has completed for an individual device. To prevent this, the devices being migrated should first be pinned. When the user is ready to allow FAST VP to resume management of the devices, the devices will then need to be unpinned.

> **Note:** The *Implementing Fully Automated Storage Tiering VP (FAST VP) for EMC Symmetrix VMAX Series Arrays* technical note available on EMC Online Support provides more information on FAST, FAST VP, and device pinning.

Limitations

The following considerations apply to Virtual LUN migrations:

- When submitted, a VLUN migration of a disk-group provisioned device cannot be canceled or aborted. However, the migration can be effectively paused. *Performance* on page 28 provides more information.
- Migration of TimeFinder/Snap devices (VDEV or SAVE devices) is not supported.
- Migration of SAVE devices for SRDF/A Delta Set Extension is not supported.
- Migration of internal devices, such as SFS and Vault devices, is not supported.
- The control host for the migration must be locally connected to the Symmetrix array on which the migration is being performed.
- When migrating a device to configured space, there must be sufficient unmapped or unmasked devices of the desired RAID protection type to complete the migration.

- When migrating a device to unconfigured space, there must be sufficient unallocated space available to create the hypers of the desired RAID protection type.
- When migrating a thin device, there must be sufficient unallocated space in the target thin pool to relocate all allocated extents of the device.
- CKD striped metadevices can migrate only to other CKD striped metadevices. The target protection type is restricted to RAID 1.

Performance

The data transfer process that occurs for the migration of devices is performed as a background copy process on the back-end disk directors (DA) in the Symmetrix array. Because of this, other copy processes running on the array, such as a TimeFinder/Clone copy session, may be impacted by the additional traffic. In this situation the copy process used by Virtual LUN can be slowed down to allow other tasks to complete in more quickly.

The ability to manage the pace at which Virtual LUN migrates data from source to target is available through the Symmetrix Quality of Service (QoS) tools. Using the **symqos** command, a copy pace can be placed on the Virtual LUN copy process.

In Enginuity 5874, the Virtual LUN data transfer is considered a mirror copy (MIR) operation. Therefore, the following command sets or changes the copy pace, in this case to 8, on all devices contained in storage group TEST_DP_App:

```
symqos –sid 0398 –sg TEST_DP_App set MIR pace 8
```

The mirror copy pace value can be set as integer values between 0 and 16 inclusively, with 0 being the fastest and 16 being the slowest. The default QoS value is 0.

In Enginuity 5875 and higher, the QoS category utilized for migrations is called VLUN, which applies to both disk group and Virtual Provisioning migrations. In this case, the following command sets or changes the copy pace on all devices contained in a storage group:

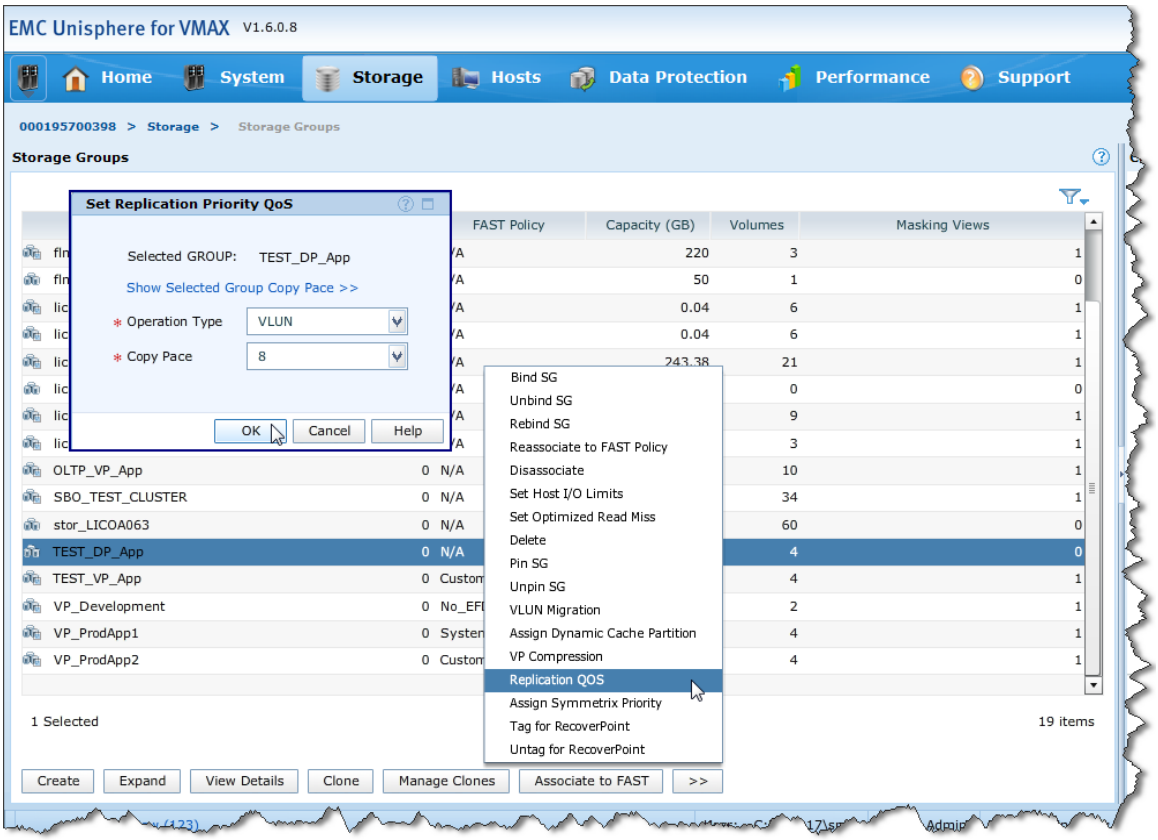
```
symqos –sid 0398 –sg TEST_DP_App set VLUN pace 8
```

Here, the pace value serves as a priority, and the actual pace will depend on other higher priority tasks that are currently active.

Two other pace values that can be used are URGENT and STOP. Setting the pace to URGENT raises the priority of the copy tasks associated with the migration and attempts to complete the migration at the expense of

other copy tasks within the array. Setting the pace to STOP suspends copy tasks for the migration. To restart the migration, the pace needs to be reset to a value between 0 and 16.

The QoS values can also be set using Unisphere. This can be done by selecting the storage group containing the devices to change QoS on and clicking the >> button. From the resulting menu, select Replication QoS, followed by QoS, as shown in the following illustration.



In the resulting pop-up window, the Operation Type is set to Mirror Copy for a Symmetrix array running 5874, or is set to VLUN for a Symmetrix array running 5875, and a copy pace value is set with the drop-down list.

Selecting target storage

Before migrating DP devices to a different storage tier, or to a different RAID protection type, it should first be determined if there is sufficient

storage in the destination disk group. In the case of migrating to unconfigured space, this entails looking at the free space available in each disk group configured on the Symmetrix array.

For a migration to configured space, it must be determined if there are sufficient unallocated devices of the desired protection type and capacity in the destination disk group.

When migrating thin devices, the target thin pool needs sufficient unallocated space to receive all the allocated tracks being relocated.

Both Solutions Enabler SYMCLI and SMC provide tools to assist in providing target storage information.

Unconfigured space

Run the following command to list all the physical disk groups in the array:

```
symdisk -sid 0398 list -dskgrp_summary

Symmetrix ID: 000195700398

      Disk Group                 Disk                      Capacity
---------------------- ---------------------- --------------------------------
                           Flgs Speed  Size      Total      Free      Actual
Num  Name                Cnt LT  (RPM)  (MB)      (MB)       (MB)       (MB)
---------------------- ---------------------- --------------------------------

  10 EFD_R53_DG10         16 IE      0  381470    6103515       8865    6103515
  20 FC_R57_DG20          96 IF  15000  558281   53594939   39568347   53594939
  21 FC_R1_DG21           80 IF  15000  558281   44662450   20298953   44662450
  30 ATA_R614_DG30        32 IS   7200 1823565   58354066   42865297   58354066
 513 FTS_FASTVP           16 X-    N/A     N/A    1104840        480    1104840
                                                ---------- ---------- ----------
Total                                          163819810  102741942  163819810

Legend:
  Disk (L)ocation:
    I = Internal, X = External, - = N/A
  (T)echnology:
                      S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, - = N/
```

Run the following command to list all physical drives, and the free space on each drive, grouped by physical disk group, in the array:

```
symdisk -sid 0398 list -by_diskgroup

Symmetrix ID                : 000195700398
Disks Selected              : 256

Disk Group                  : 10
Disk Group Name             : EFD_R53_DG10
Disk Location               : Internal
Technology                  : EFD
Speed (RPM)                 : 0
Form Factor                 : N/A
```

```
                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type       Hypr   Total       Free      Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DF-7A  07A    C   E STEC       G3F0040       9     381470        506     381470
DF-8A  08A    D   E STEC       G3F0040       8     381470        602     381470
DF-9A  09A    C   E STEC       G3F0040       9     381470        506     381470
...
DF-9D  09D    D   E STEC       G3F0040       9     381470        506     381470
DF-10D 10D    C   E STEC       G3F0040       8     381470        602     381470
DF-10D 10D    D   B STEC       G3F0040       0          0          0     381470
                                                ---------- ---------- ----------
Total                                           6103515       8865    6484985

Disk Group                  : 20
Disk Group Name             : FC_R57_DG20
Disk Location               : Internal
Technology                  : FC
Speed (RPM)                 : 15000
Form Factor                 : 3.5

                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type       Hypr   Total       Free      Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DF-7A  07A    C   0 HITACHI    VCFE060       0          0          0     558281
DF-7A  07A    C   2 SEAGATE    EGFE060      19     558281     405110     558281
DF-7A  07A    C   4 SEAGATE    EGFE060      19     558281     396078     558281
...
DF-10D 10D    D   1 SEAGATE    EGFE060      19     558281     406027     558281
DF-10D 10D    D   3 SEAGATE    EGFE060      19     558281     407921     558281
DF-10D 10D    D   5 SEAGATE    EGFE060      18     558281     408897     558281
                                                ---------- ---------- ----------
Total                                          53594939   39568347   60852588

Disk Group                  : 21
Disk Group Name             : FC_R1_DG21
Disk Location               : Internal
Technology                  : FC
Speed (RPM)                 : 15000
Form Factor                 : 3.5

                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type       Hypr   Total       Free      Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DF-7A  07A    C   6 SEAGATE    EGFE060       6     558281     192245     558281
DF-7A  07A    C   8 SEAGATE    EGFE060       7     558281     255055     558281
DF-7A  07A    C   A SEAGATE    EGFE060       6     558281     272591     558281
...
DF-10D 10D    C   A SEAGATE    EGFE060       6     558281     272591     558281
DF-10D 10D    D   7 SEAGATE    EGFE060       7     558281     255055     558281
DF-10D 10D    D   9 SEAGATE    EGFE060       6     558281     272591     558281
                                                ---------- ---------- ----------
Total                                          44662450   20298953   44662450

Disk Group                  : 30
Disk Group Name             : ATA_R614_DG30
Disk Location               : Internal
Technology                  : SATA
Speed (RPM)                 : 7200
Form Factor                 : 3.5
```

```
                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type        Hypr   Total       Free       Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DF-7A  07A    C   C SATAHGST   JKC7200       0          0          0    1823565
DF-7A  07A    D   B SATAHGST   JKC7200      35    1823565    1361175    1823565
DF-7A  07A    D   D SATAHGST   JKC7200      37    1823565    1318458    1823565
...
DF-9D  09D    D   C SATAHGST   JKC7200      35    1823565    1361175    1823565
DF-10D 10D    C   C SATAHGST   JKC7200       0          0          0    1823565
DF-10D 10D    D   D SATAHGST   JKC7200      38    1823565    1318449    1823565
                                                ---------- ---------- ----------
Total                                           58354066   42865297   62001195

Disk Group                  : 513
Disk Group Name             : FTS_FASTVP
Disk Location               : External
Technology                  : N/A
Speed (RPM)                 : N/A
Form Factor                 : N/A

                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type        Hypr   Total       Free       Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DX-10F 10F    -   - EMC        N/A           8      69053         30      69053
DX-9F  09F    -   - EMC        N/A           8      69053         30      69053
DX-10F 10F    -   - EMC        N/A           8      69053         30      69053
...
DX-9F  09F    -   - EMC        N/A           8      69053         30      69053
DX-10F 10F    -   - EMC        N/A           8      69053         30      69053
DX-9F  09F    -   - EMC        N/A           8      69053         30      69053
                                              ---------- ---------- ----------
Total                                           1104840        480    1104840
```

Run the following command to list all physical drives in a particular disk group on the array:

```
symdisk –sid 0398 list –disk_group 10

Symmetrix ID                : 000195700398
Disks Selected              : 16
Disk Group                  : 10
Disk Group Name             : EFD_R53_DG10
Disk Location               : Internal
Technology                  : EFD
Speed (RPM)                 : 0
Form Factor                 : N/A

                                                                  Capacity(MB)
Ident  Symb Int TID Vendor     Type        Hypr   Total       Free       Actual
------ ---- --- --- ---------- ---------- ---- ---------- ---------- ----------
DF-7A  07A    C   E STEC       G3F0040       9     381470        506     381470
DF-8A  08A    D   E STEC       G3F0040       8     381470        602     381470
DF-9A  09A    C   E STEC       G3F0040       9     381470        506     381470
DF-10A 10A    D   E STEC       G3F0040       8     381470        602     381470
DF-7B  07B    D   E STEC       G3F0040       8     381470        602     381470
DF-8B  08B    C   E STEC       G3F0040       9     381470        506     381470
DF-9B  09B    D   E STEC       G3F0040       8     381470        602     381470
DF-10B 10B    C   E STEC       G3F0040       9     381470        506     381470
```

```
DF-7C  07C    C   E STEC       G3F0040       8     381470        602     381470
DF-8C  08C    D   E STEC       G3F0040       9     381470        506     381470
DF-9C  09C    C   E STEC       G3F0040       8     381470        602     381470
DF-10C 10C    D   E STEC       G3F0040       9     381470        506     381470
DF-7D  07D    D   E STEC       G3F0040       9     381470        506     381470
DF-8D  08D    C   E STEC       G3F0040       8     381470        602     381470
DF-9D  09D    D   E STEC       G3F0040       9     381470        506     381470
DF-10D 10D    C   E STEC       G3F0040       8     381470        602     381470
                                                ---------- ---------- ----------
Total                                          6103515       8865    6103515
```

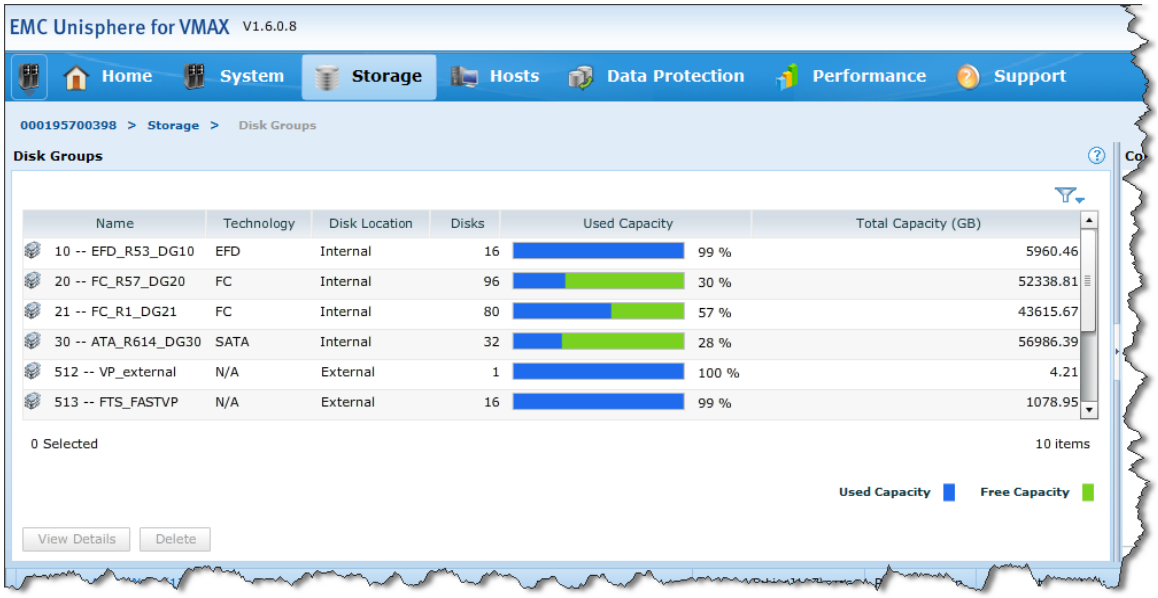
Run the following command to list the available gaps (contiguous blocks of free space) on all drives in a specified disk group:

symdisk –sid 1849 list –disk_group 10 –v –hypers –gaps

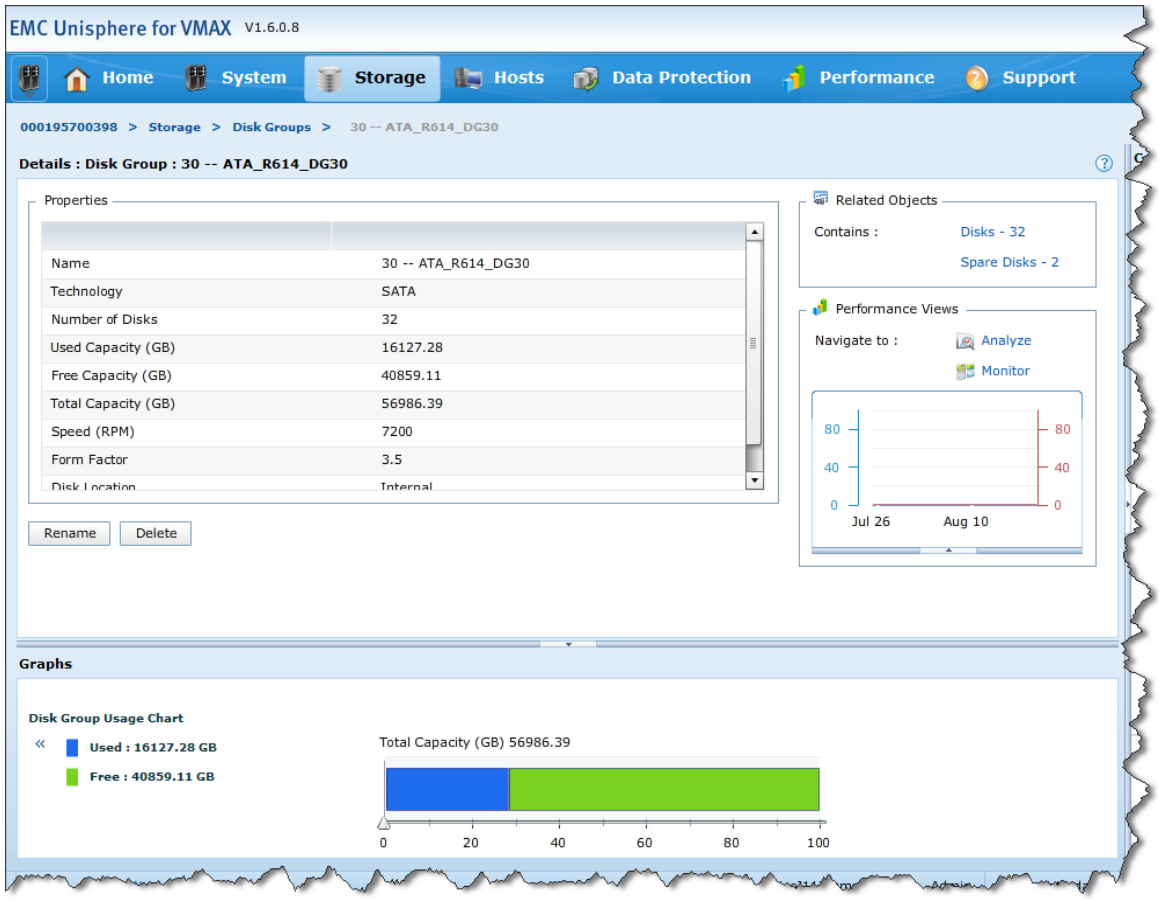
```
Symmetrix ID                : 000195700398
Disks Selected              : 16
Disk Group                  : 10
Disk Group Name             : EFD_R53_DG10
Disk Location               : Internal
Technology                  : EFD
Speed (RPM)                 : 0
Form Factor                 : N/A

  Director                  : DF-7A
  Interface                 : C
  Target ID                 : E
  Spindle ID                : 2D7
  External WWN              : N/A
  External Array ID         : N/A
  External Device Name      : N/A
  Disk Group Number         : 10
  Disk Group Name           : EFD_R53_DG10
  Disk Location             : Internal
  Technology                : EFD
  Speed (RPM)               : N/A
  Form Factor               : N/A

  Vendor ID                 : STEC
  Product ID                : ZIV3A406 CLAR400
  Product Revision          : G3F0040
  Serial ID                 : STM00011B59E

  Disk Blocks               : 769230719
  Block Size                : 520
  Actual Disk Blocks        : 769230719
  Total Disk Capacity (MB)  : 381470
  Free Disk Capacity (MB)   : 506
  Actual Disk Capacity (MB) : 381470
  Rated Disk Capacity (GB)  : 400

  Spare Disk                : False
  Spare Coverage            : True
  Encapsulated              : False
  Disk Service State        : Normal


  Hypers (9):
```

```
{
#    Vol    Emulation         Dev   Type          Mir Mbr Status          Cap(MB)
---  -----  ----------------  ----  ------------  --- --- --------------  --------
  -      -  N/A                  -  GAP           -   -  N/A                    0
  1     58  FBA                00D0  RAID-5        1   1  Ready              47608
  2     59  FBA                00D4  RAID-5        1   2  Ready              47608
  3     60  FBA                00D8  RAID-5        1   3  Ready              47608
  4     61  FBA                00DC  RAID-5        1   4  Ready              47608
  5     62  FBA                00E0  RAID-5        1   1  Ready              47608
  6     63  FBA                00E4  RAID-5        1   2  Ready              47608
  7     64  FBA                00E8  RAID-5        1   3  Ready              47608
  8     65  FBA                00EC  RAID-5        1   4  Ready              47608
  9     66  FBA                04A6  RAID-5        1   1  Ready                 96
  -      -  N/A                  -  GAP           -   -  N/A                  505
}
...
```

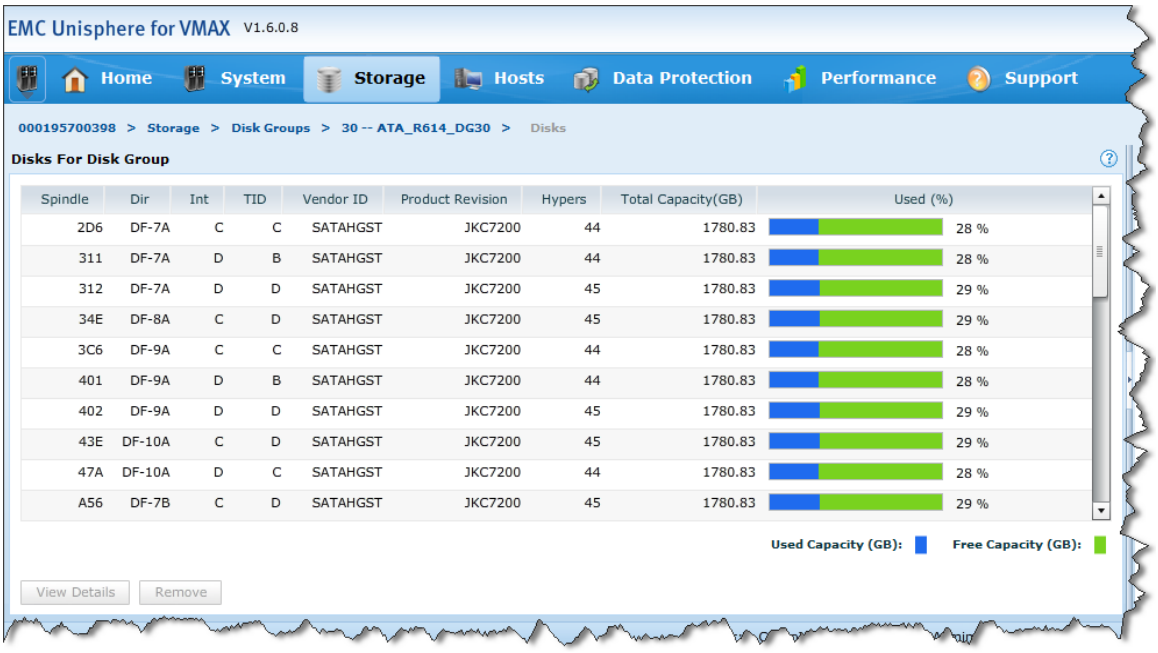
The disk group information can also be viewed using Unisphere. In the following illustration, each disk group is displayed, showing the technology type, number of drives, total capacity, and used capacity.



More details can be seen by selecting a particular disk group and clicking View Details.



Clicking Disks, under Related Objects, shows each individual drive in the disk group, displaying the total and used capacity of each drive.



Configured space

When migrating to configured space, the target devices used in the migration must be unallocated. The devices must not be accessible by any host, that is, unmapped or unmasked, or both.

Solutions Enabler contains a filtering option, **-migr_tgt**, for the **symdev list** command to display all potential target devices of the required RAID protection type, capacity, and in the correct disk group.

Run this command to display all unmapped and unmasked devices in a particular disk group:

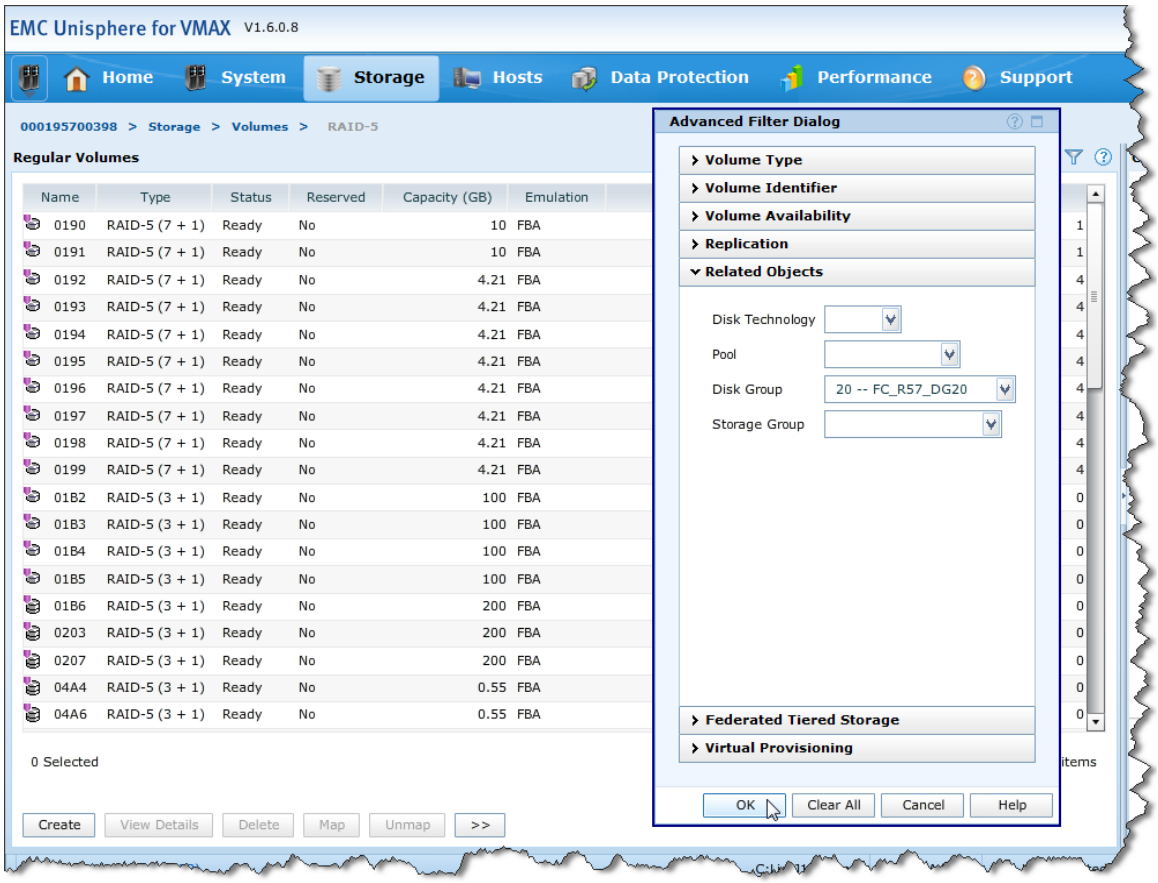
```
symdev -sid 0398 list -disk_group 20 -migr_tgt

Symmetrix ID: 000195700398

        Device Name           Directors                  Device
--------------------------- ------------- ----------------------------------------
                                                                            Cap
Sym  Physical               SA :P DA :IT  Config        Attribute     Sts    (MB)
--------------------------- ------------- ----------------------------------------

00CA Not Visible            ???:? 09B:C1  2-Way Mir     N/Grp'd       RW        6
00CB Not Visible            ???:? 10C:C1  2-Way Mir     N/Grp'd       RW        6
00CC Not Visible            ???:? 09D:C1  2-Way Mir     N/Grp'd       RW        6
00CD Not Visible            ???:? 09A:C2  2-Way Mir     N/Grp'd       RW        6
00CE Not Visible            ???:? 10B:C2  2-Way Mir     N/Grp'd       RW        6
```

```
00CF Not Visible            ???:? 09C:C2  2-Way Mir     N/Grp'd      RW       6
...
0680 Not Visible            ???:? 10B:C4  RAID-5        N/Grp'd      RW   17263
0681 Not Visible            ???:? 09D:D0  RAID-5        N/Grp'd      RW   17263
0682 Not Visible            ???:? 07A:D3  RAID-5        N/Grp'd      RW   17263
0683 Not Visible            ???:? 09C:C4  RAID-5        N/Grp'd      RW   17263
0684 Not Visible            ???:? 08C:C1  RAID-5        N/Grp'd      RW   17263
```

Run this command to display all unallocated devices of a particular RAID protection type in the same disk group and that are 17263 MB in size:

```
symdev -sid 0398 list -disk_group 20 -raid5 -protection 7+1 -cap 17263
-migr_tgt

Symmetrix ID: 000195700398

        Device Name           Directors                  Device
--------------------------- ------------ ------------------------------------
                                                                        Cap
Sym  Physical               SA :P DA :IT  Config        Attribute    Sts   (MB)
--------------------------- ------------ ------------------------------------

04AC Not Visible            ???:? 10B:D3  RAID-5        N/Grp'd      RW   17263
0665 Not Visible            ???:? 09B:D4  RAID-5        N/Grp'd      RW   17263
0666 Not Visible            ???:? 10B:C0  RAID-5        N/Grp'd      RW   17263
0667 Not Visible            ???:? 08D:D5  RAID-5        N/Grp'd      RW   17263
0668 Not Visible            ???:? 07B:D2  RAID-5        N/Grp'd      RW   17263
...
0681 Not Visible            ???:? 09D:D0  RAID-5        N/Grp'd      RW   17263
0682 Not Visible            ???:? 07A:D3  RAID-5        N/Grp'd      RW   17263
0683 Not Visible            ???:? 09C:C4  RAID-5        N/Grp'd      RW   17263
0684 Not Visible            ???:? 08C:C1  RAID-5        N/Grp'd      RW   17263
```

Configured space can also be viewed in Unisphere, by selecting Storage, then Volumes, and then selecting the appropriate protection, as shown in the following illustration. By using the **Advance Filter** option (shown as inset), filters can be added to display only devices for a particular disk group and size.



Target thin pool

When migrating a thin device, the target pool needs at least the same amount of free space available as is allocated to the thin device, or devices, being migrated.

Run the **symcfg** command to see the amount of tracks allocated to the devices to be migrated:

```
symcfg -sid 1849 list -tdev -bound -sg TEST_VP_App


Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  635295810
Bound   Capacity (Tracks) :    4419360

                S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                          Total          Total       Compressed
```

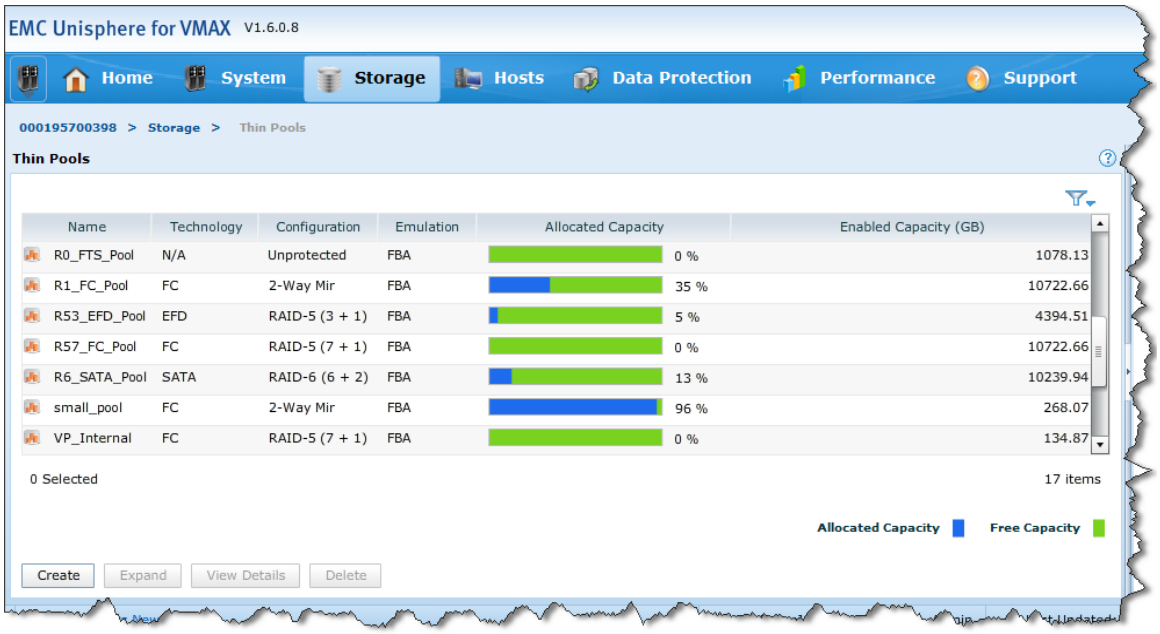
```
       Bound      Flgs      Total      Allocated       Written      Size/Ratio
Sym  Pool Name    EMPT     Tracks     Tracks (%)     Tracks (%)     Tracks (%)
---- ------------ ---- ---------- ---------- --- ---------- --- ---------- ---
019C R1_FC_Pool   F..B    1104840     780564  71     354343  32     780564   0
01A0 R1_FC_Pool   F..B    1104840     499668  45     136940  12     499668   0
01A4 R1_FC_Pool   F..B    1104840    1097028  99     386300  35    1097028   0
01A8 R1_FC_Pool   F..B    1104840     718080  65     339152  31     718080   0

Total                  ---------- ---------- --- ---------- --- ---------- ---
Tracks                    4419360    3095340   0    1216735   0    3095340   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (M)ultipool : X = multi-pool allocations, . = single pool allocation
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

Run this command to display all thin pools, along with the RAID protection of the pool and the current number of free tracks:

symcfg –sid 0398 list –pool -thin

```
Symmetrix ID: 000195700398

                        S Y M M E T R I X   P O O L S
-------------------------------------------------------------------------------
Pool          Flags  Dev             Usable       Free       Used Full Comp
Name          PTECSL Config          Tracks     Tracks     Tracks  (%)  (%)
------------ ------ ------------ ---------- ---------- ---------- ---- ----
R53_EFD_Pool TEFDEI RAID-5(3+1)    71999616   69006084    2993532    4    0
R1_FC_Pool   TFFDEI 2-Way Mir     175680000  161380608   14299392    8    0
R57_FC_Pool  TFFDEI RAID-5(7+1)   175680000  175680000          0    0    0
R0_FTS_Pool  T-FDEX Unprotected    17664000   15009312    2654688   15    0
R6_SATA_Pool TSFEEI RAID-6(6+2)   167771136  151517688   16253448    9    1

Total                            ---------- ---------- ---------- ---- ----
Tracks                            608794752  572593692   36201060    6    0

Legend:
  (P)ool Type:
    S = Snap,  R = Rdfa DSE  T = Thin
  (T)echnology:
    S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, M = Mixed, - = N/A
  Dev (E)mulation:
    F = FBA, A = AS400, 8 = CKD3380, 9 = CKD3390, - = N/A
  (C)ompression:
    E = Enabled, D = Disabled, N = Enabling, S = Disabling, - = N/A
  (S)tate:
    E = Enabled, D = Disabled, B = Balancing
  Disk (L)ocation:
    I = Internal, X = External, M = Mixed, - = N/A
```

Thin pool information can also be viewed in Unisphere, by going to the Thin Pools subsection page under Storage.


EMC Unisphere for VMAX V1.6.0.8
Home
System
Storage
Hosts
Data Protection
Performance
Support
000195700398 > Storage > Thin Pools
Thin Pools
Name
Technology
Configuration
Emulation
Allocated Capacity
Enabled Capacity (GB)
R0_FTS_Pool N/A Unprotected FBA 0 % 1078.13
R1_FC_Pool FC 2-Way Mir FBA 35 % 10722.66
R53_EFD_Pool EFD RAID-5 (3 + 1) FBA 5 % 4394.51
R57_FC_Pool FC RAID-5 (7 + 1) FBA 0 % 10722.66
R6_SATA_Pool SATA RAID-6 (6 + 2) FBA 13 % 10239.94
small_pool FC 2-Way Mir FBA 96 % 268.07
VP_Internal FC RAID-5 (7 + 1) FBA 0 % 134.87
0 Selected
17 items
Allocated Capacity
Free Capacity
Create
Expand
View Details
Delete

Management interface: SYMCLI

To perform Virtual LUN migrations by using Solutions Enabler SYMCLI, the **symmigrate** command is used. The **symmigrate** command has three control actions and three monitor actions.

The following are control actions:

- validate—Tests the user input to see if the migration will succeed at the current point in time. For migrations to configured space, it can also, optionally, generate a device pair file.
- establish—Creates the migration session and starts the synchronization process.
- terminate—Removes a specific, completed, migration session.

The following are monitor actions:

- query—Provides status about a specific migration session.
- list—Shows all migration sessions for a given Symmetrix array or all local Symmetrix arrays.
- verify—Determines if a specific migration session is in a specified state.

Validate

There are two uses for the **symmigrate validate** command. The first use is the ability to perform a positive/negative test to determine whether a migration will succeed.

Second, the command can be used to generate a device file containing exact pairings of source and target devices that can be used with the **symmigrate establish** command when performing a migration to configured space. The target volumes included in the output file are automatically selected by Enginuity as being the most suitable targets for the source volumes to be migrated to.

The following are examples of performing a **symmigrate validate**:

- Migrating a device group to unconfigured space:

```
symmigrate –g TEST_DP_app –tgt_unconfig –tgt_dsk_grp 21 –tgt_raid5
–tgt_prot 7+1 –name mig_01 validate
```

- Migrating a device group to configured space, generating a device pairs file:

```
symmigrate –g TEST_DP_app –tgt_configured –tgt_dsk_grp 21 –tgt_raid5
–tgt_prot 7+1 –name mig_01 validate –outfile dev_pairs.txt
```

> **Note:** The file output is only a listing of what the system chose to do at the time the **validate** command was run. To guarantee that the exact pairs that were returned are used, run the **symmigrate establish** command with the file that was output by the **validate** command.

- Migrating devices to configured space by using a device pairs file:

```
symmigrate –sid 0398 –f dev_pairs.txt –name mig_01 validate
```

- Migrating a storage group of thin devices to a thin pool:

```
symmigrate –sid 0398 -sg TEST_VP_app –tgt_pool –pool R1_FC_Pool
–name vp_mig_01 validate
```

- Migrating data for a storage group of thin devices from a source thin pool to another thin pool:

```
symmigrate –sid 0398 -sg TEST_VP_app –src_pool R6_SATA_Pool –tgt_pool –pool
R1_FC_Pool –name vp_mig_01 validate
```

Establish

The **symmigrate establish** command creates the migration session and begins the migration of the source devices to the new target location.

For disk-group provisioned device migrations, the target protection type and disk-group number must be provided by the user, unless a device pair file is used. This is the point in the migration process that the mirrors are moved to the source device from the target, if using configured space or are created if using unconfigured space.

The **establish** command returns control to the command prompt after the first configuration change to attach the secondary RAID group to the source has completed. An In Progress status will be reported on the screen every 60 seconds to indicate that the command is still running and that the session status is CreateInProg. When completed, the migration session status is SyncInProg.

For thin device migrations, the target thin pool name must be provided by the user. This is the point in the migration where the session is created and the rebind of the devices to the target pool will be performed.

> **Note:** For thin device migrations where a source pool is specified, no rebind

operation is performed.

The **establish** command returns control to the command prompt after the creation of the session is successful. When completed, the migration session status is SyncInProg.

The following are examples of a performing a symmigrate establish:

- Migrating a device group to unconfigured space:

```
symmigrate –g TEST_DP_app –tgt_unconfig –tgt_dsk_grp 21 –tgt_raid5
–tgt_prot 7+1 –name mig_01 establish
```

- Migrating a device group to configured space:

```
symmigrate –g TEST_DP_app –tgt_configured –tgt_dsk_grp 21 –tgt_raid5
–tgt_prot 7+1 –name mig_01 establish
```

- Migrating devices to configured space by using a device pairs file:

```
symmigrate –sid 0398 –f dev_pairs.txt –name mig_01 establish
```

- Migrating a storage group of thin devices to a thin pool:

```
symmigrate –sid 0398 -sg TEST_VP_App –tgt_pool –pool R1_FC_Pool
–name vp_mig_01 establish
```

- Migrating data for a storage group of thin devices from a source thin pool to another thin pool:

```
symmigrate –sid 0398 -sg TEST_VP_App –src_pool R6_SATA_Pool –tgt_pool –pool
R1_FC_Pool –name vp_mig_01 establish
```

Terminate

The **symmigrate terminate** command is used to acknowledge the successful completion of the migration and to clear the session information from the Symmetrix array. The terminate action can only be performed when all devices in the session are in a Migrated state.

Example:

```
symmigrate –sid 0398 –name mig_01 terminate
```

Query

The **symmigrate query** command returns information on all the devices being migrated within a specified migration session.

The command can also be used with the optional –i (interval) flag to specify a repeat interval, in seconds, at which to run the query automatically. Following the second iteration of the query, the output returned includes an estimated time to completion for the data

synchronization portion of the migration, along with the data-transfer rate for the previous interval.

The command can be run with the **-detail** option to provide more information about the migration, including target disk group and target RAID protection.

Example:

```
symmigrate -sid 0398 -name mig_01 query -detail -i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp  TGT Description Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- --------------- ------------
01DA 066D   970896 SyncInProg     56   C   N/A        20   RAID-5(7+1)     mig_01
01DE 066C   587396 SyncInProg     73   C   N/A        20   RAID-5(7+1)     mig_01
01E2 0667   558602 SyncInProg     74   C   N/A        20   RAID-5(7+1)     mig_01
01E6 04AC   381556 SyncInProg     82   C   N/A        20   RAID-5(7+1)     mig_01

Total     --------
 Tracks    2498450
 MB(s)      156153
 Done(%)        71

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp  TGT Description Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- --------------- ------------
01DA 066D   758604 SyncInProg     65   C   N/A        21   RAID-1          mig_01
01DE 066C   253100 SyncInProg     88   C   N/A        21   RAID-1          mig_01
01E2 0667   235586 SyncInProg     89   C   N/A        21   RAID-1          mig_01
01E6 04AC    63340 SyncInProg     97   C   N/A        21   RAID-1          mig_01

Total     --------
 Tracks    1310630
 MB(s)     81914.4
 Done(%)        85


Copy Rate                      :   2249.7 MB/S
Estimated time to completion   : 00:00:36

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

List

The **symmigrate list** command lists all migration sessions for a given Symmetrix array, or for all locally attached Symmetrix storage arrays. Used with the optional –detail flag, information on the status of the session and percent complete for each device being migrated, as well as the target disk group and target protection, is displayed.

Alternatively, the **–names** options can be added to display a single-line summary for each migration session in the Symmetrix array.

Examples:

```
symmigrate –sid 0398 list -detail

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -----------
019C  N/A   780636 SyncInProg     29   V   N/A        20   R57_FC_Pool         vp_mig_01
01A0  N/A   499668 SyncInProg     54   V   N/A        20   R57_FC_Pool         vp_mig_01
01A4  N/A  1097304 SyncInProg      0   V   N/A        20   R57_FC_Pool         vp_mig_01
01A8  N/A   718080 SyncInProg     35   V   N/A        20   R57_FC_Pool         vp_mig_01
01DA 066F  1615346 SyncInProg     26   C   N/A        20   RAID-5(7+1)         mig_01
     0671        - SyncInProg     26   C   N/A        20   RAID-5(7+1)         mig_01
     0675        - SyncInProg     26   C   N/A        20   RAID-5(7+1)         mig_01
     0670        - SyncInProg     26   C   N/A        20   RAID-5(7+1)         mig_01
01DE 066B  1274706 SyncInProg     42   C   N/A        20   RAID-5(7+1)         mig_01
     0672        - SyncInProg     42   C   N/A        20   RAID-5(7+1)         mig_01
     066C        - SyncInProg     42   C   N/A        20   RAID-5(7+1)         mig_01
     066E        - SyncInProg     42   C   N/A        20   RAID-5(7+1)         mig_01
01E2 0667  1445378 SyncInProg     34   C   N/A        20   RAID-5(7+1)         mig_01
     066D        - SyncInProg     34   C   N/A        20   RAID-5(7+1)         mig_01
     0668        - SyncInProg     34   C   N/A        20   RAID-5(7+1)         mig_01
     066A        - SyncInProg     34   C   N/A        20   RAID-5(7+1)         mig_01
01E6 04AC  1316686 SyncInProg     40   C   N/A        20   RAID-5(7+1)         mig_01
     0665        - SyncInProg     40   C   N/A        20   RAID-5(7+1)         mig_01
     0669        - SyncInProg     40   C   N/A        20   RAID-5(7+1)         mig_01
     0666        - SyncInProg     40   C   N/A        20   RAID-5(7+1)         mig_01

Total     --------
 Tracks    8747804
 MB(s)      546738
 Done(%)        34

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

```
symmigrate –sid 0398 list -detail -names

Symmetrix ID: 000195700398

                                Invalid    Status    Done
```

```
          Session Name              Tracks  SRC => TGT   ()
------------------------------ -------- ------------ ----
mig_01                          1310630 SyncInProg     85
vp_mig_01                       3095688 SyncInProg     29

Total     --------
 Tracks    4406318
 MB(s)      275395
 Done(%)        52

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

> **Note:** A Tgt value of N/A in the symmigrate query or list outputs indicates that the migration being performed is targeting unconfigured space or a target thin pool.

Verify

The **symmigrate verify** command verifies whether all the devices in a specified migration session are in the CreateinProg, SyncinProg, Synchronized, MigrateinProg, or Migrated states.

Similarly to the **query** command, **verify** can be run with the optional –i (interval) flag to rerun the command at an interval specified in seconds. When all the devices in the session are in the requested state, the command will cease executing.

Example:

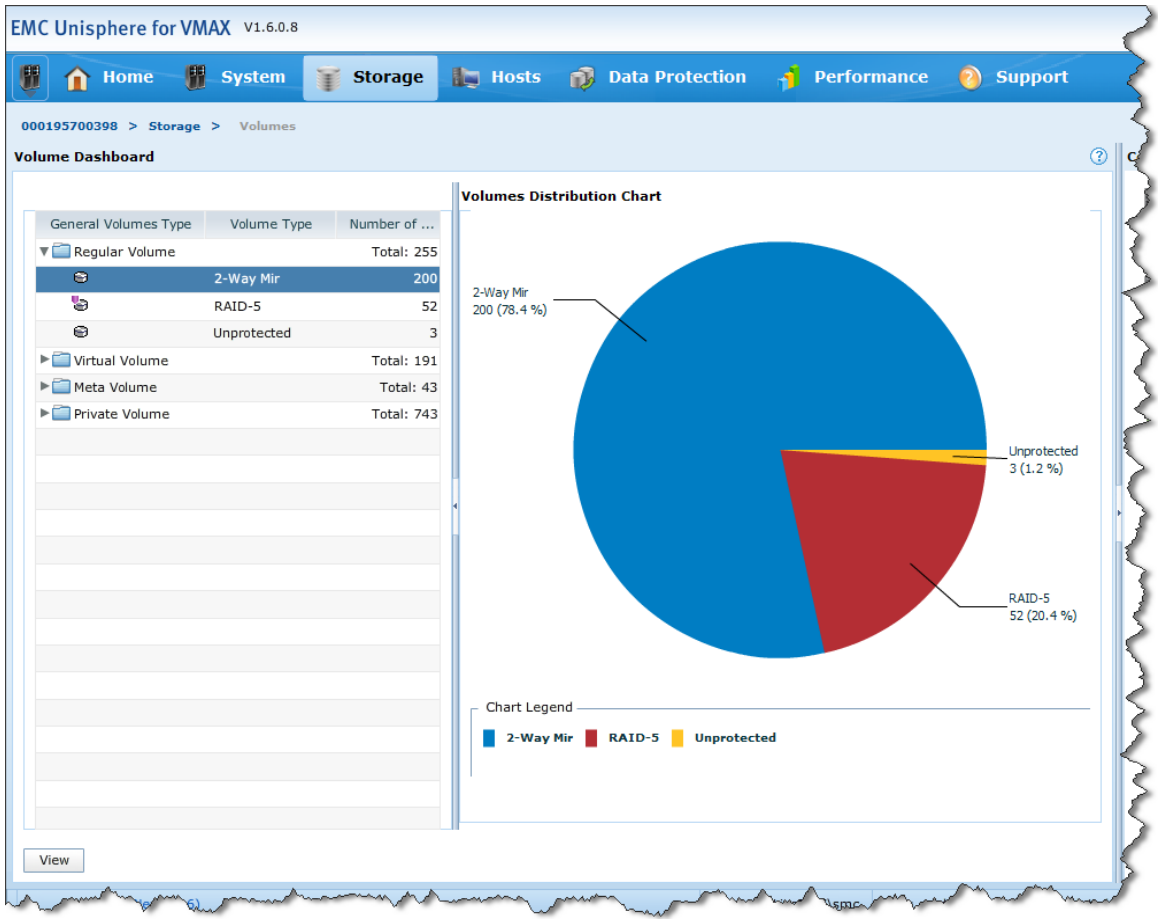
```
symmigrate –sid 0398 –name mig_01 verify -migrated

All session(s) with name 'mig_01' are in 'Migrated' state.
```

Management interface: Unisphere for VMAX

Unisphere for VMAX provides two interfaces for migrating devices using VLUN migration. Devices to be migrated can be specified manually or by way of storage group.

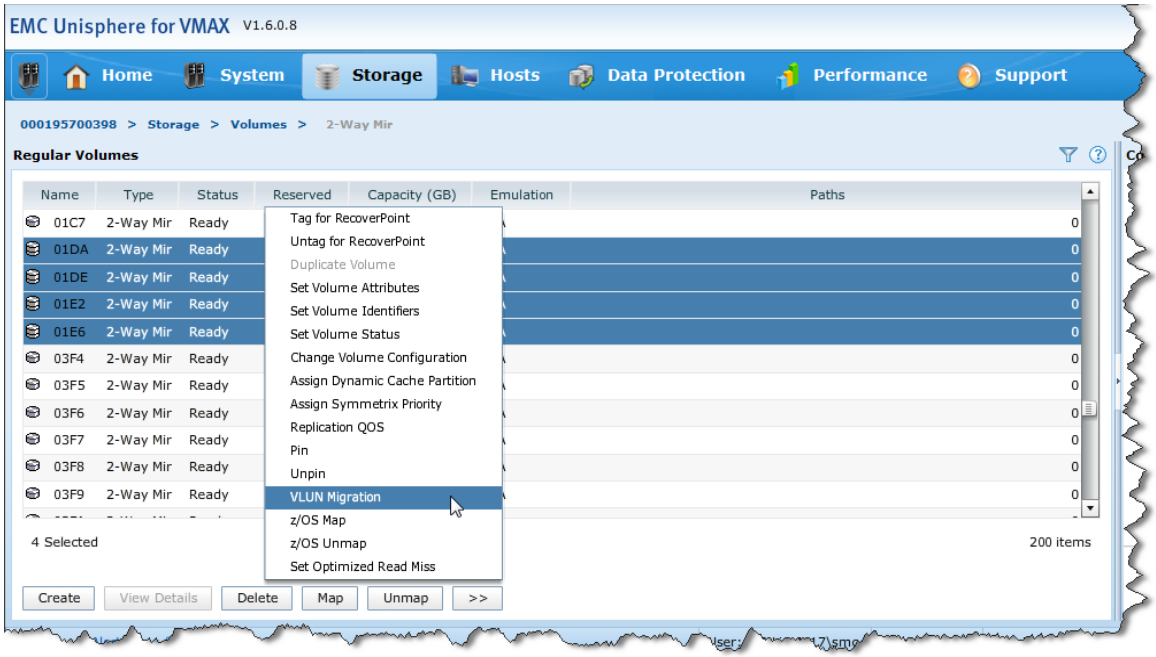
To manually select the device or devices to be migrated, navigate to the Volumes subsection page under Storage.

Expand the appropriate folder on the left-most side, select the volume type (by RAID protection) and click View.

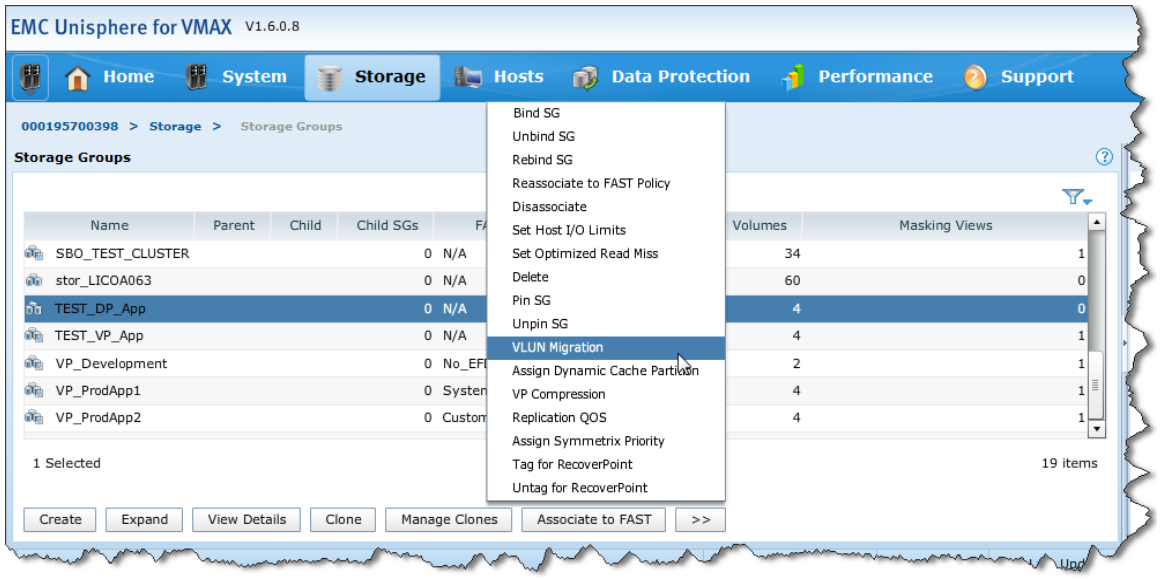


From the device list, one or more devices may be selected to be migrated. Once selected, click the >> button and choose VLUN Migration.

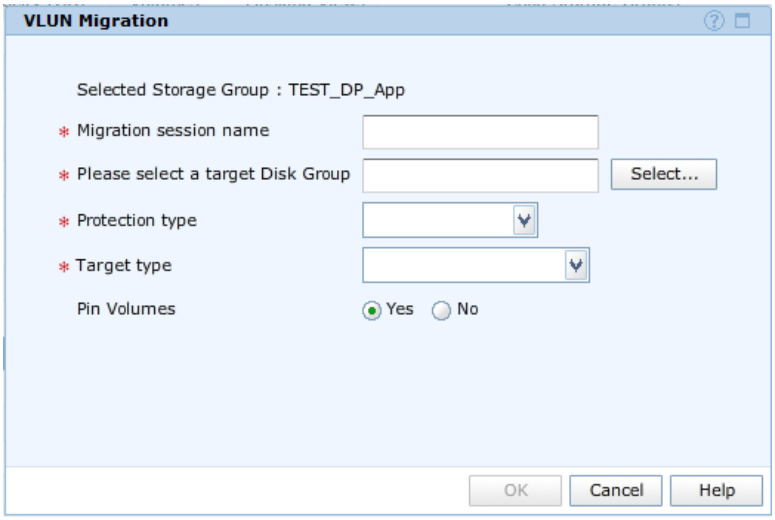
The resulting dialog box will request additional information to complete the migration.



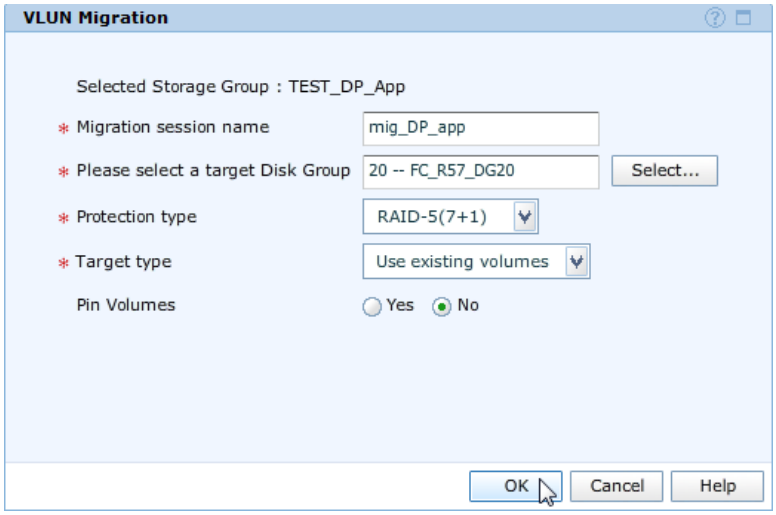
To select a storage group to migrate, navigate to the Storage Group subsection page under Storage. Select the appropriate storage group, click the >> button, and choose VLUN Migration.



In the case of disk-group provisioned devices being migrated, the following dialog is displayed.

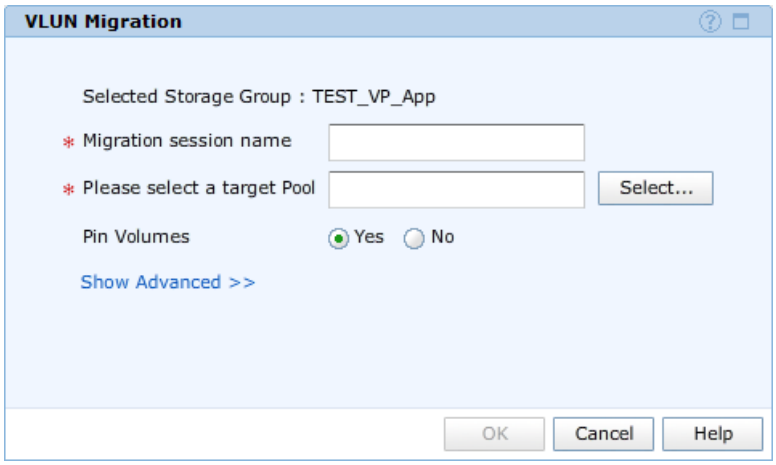


To submit the migration, provide a session name, a target disk group and a target protection type. To perform a migration to unconfigured space, choose *Create new volumes* as the target type. To perform a migration to configured space, choose Use existing volumes as the target type.

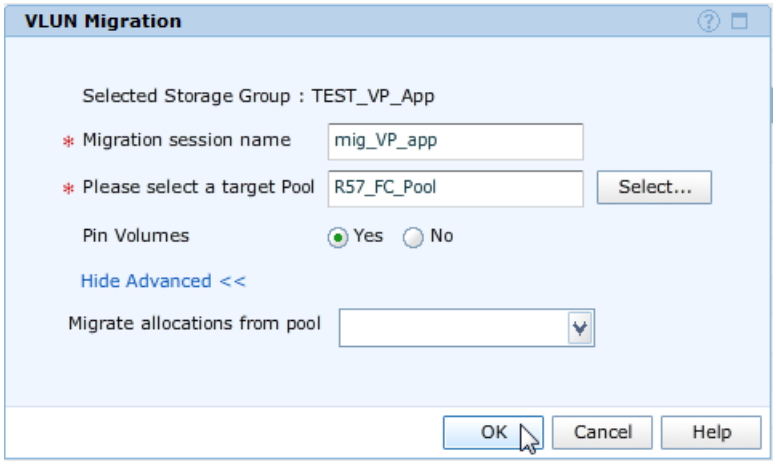


When all information has been supplied, click OK. The migration request will be submitted and executed.

In the case of thin devices being migrated, the following dialog is displayed.

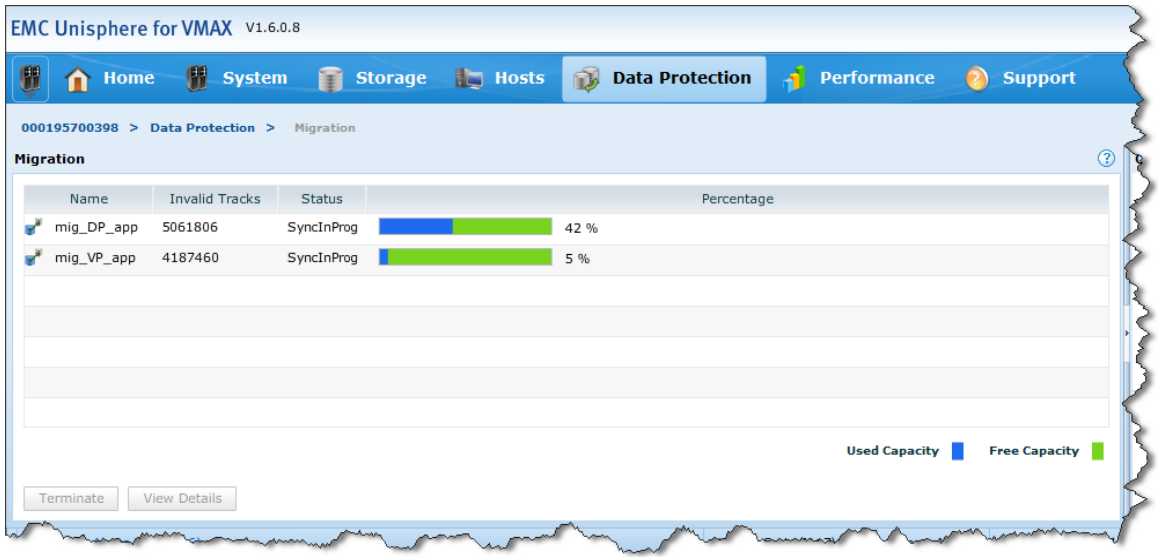


To submit the migration, provide a session name and a target thin pool. To also provide an optional source pool, click on Show Advanced and specify the appropriate pool.

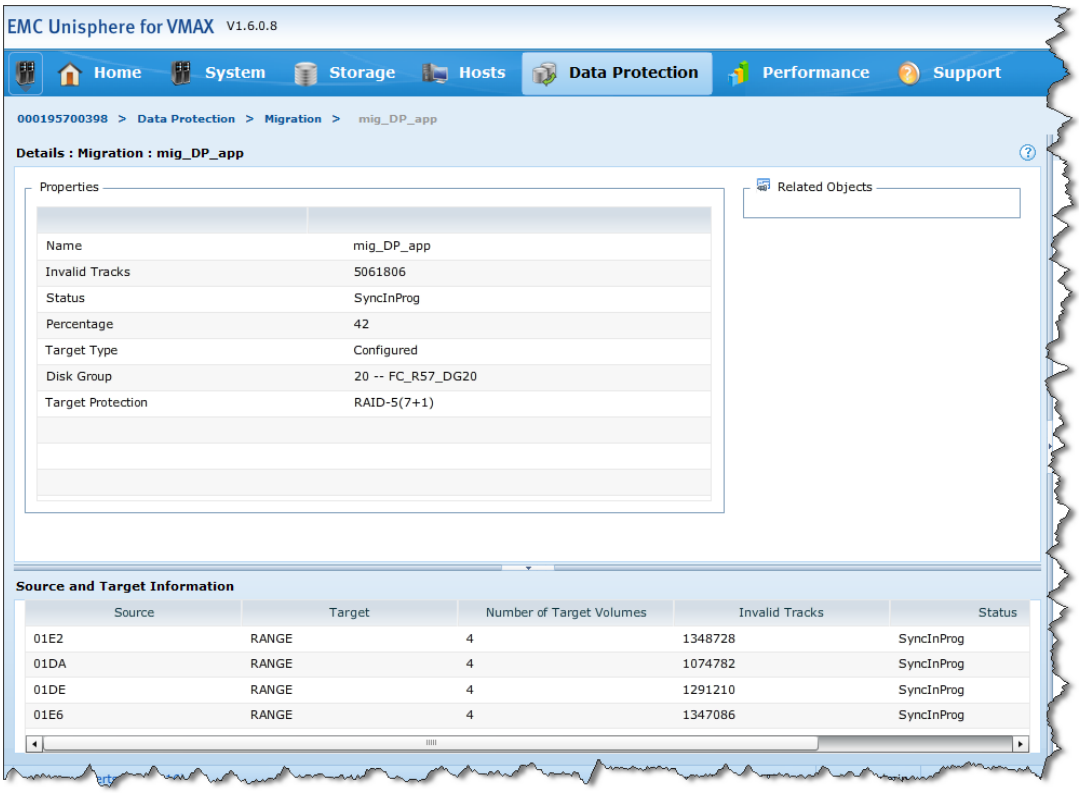


When all information has been supplied, click OK and the migration request will be submitted and executed.

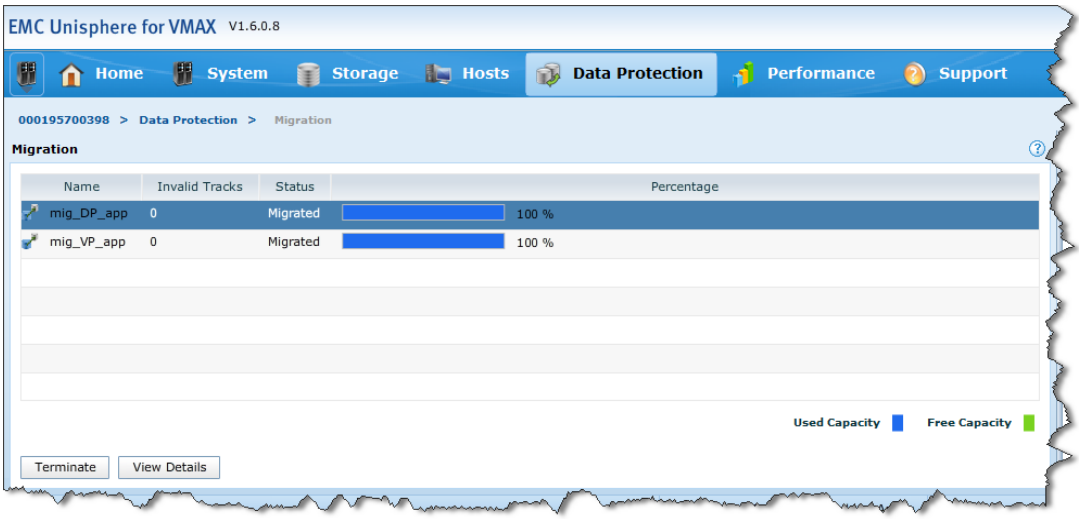
After the migration has been submitted to the Symmetrix array, its progress can be tracked through the Migration subsection page under Data Protection.



Additional detail of the migration can be seen by selecting the session name and clicking View Details.



When the migration session has reached the Migrated state, it can then be terminated. To do this, select the migration session and click Terminate.



Logging

The **validate**, **establish**, and **terminate** actions are all logged to both the Symmetrix audit log, as well as the symapi-<date>.log file on the host the **symmigrate** commands were run from.

Symmetrix audit log

The Symmetrix audit log is available from any locally or remotely connected Solutions Enabler host. The function class, Migrate, and the application ID, SYMMIGRATE, allow for filtering of Virtual LUN migration entries within the audit log.

Run the following command to view the contents of the audit log, relating to VLUN migrations:

```
symaudit -sid 0398 list -function_class Migrate -start_date 01/23/2013

            A U D I T   L O G   D A T A

Symmetrix ID            : 000195700398

 Record                                                  Function Action
 Number  Date     Time      Application      Host         Class    Code
 ------  -------- --------  ---------------- ------------ -------- ---------

  40642  01/23/13 11:29:36  UNIVMAX          LICOJ048     Migrate  FullEsta
  40643  01/23/13 11:29:36  UNIVMAX          LICOJ048     Migrate  FullEsta
  40644  01/23/13 11:29:36  UNIVMAX          LICOJ048     Migrate  FullEsta
  40645  01/23/13 11:29:36  UNIVMAX          LICOJ048     Migrate  FullEsta
  40646  01/23/13 11:30:10  Enginuity        Symmetrix    Migrate  Start
  40647  01/23/13 11:30:15  UNIVMAX          LICOJ048     Migrate  FullEsta
  40648  01/23/13 11:30:15  UNIVMAX          LICOJ048     Migrate  FullEsta
  40649  01/23/13 11:30:15  UNIVMAX          LICOJ048     Migrate  FullEsta
  40650  01/23/13 11:37:54  SWPROC           HK195700398  Migrate  Migrate
  40651  01/23/13 11:37:54  SWPROC           HK195700398  Migrate  Migrate
  40652  01/23/13 11:38:16  Enginuity        Symmetrix    Migrate  Stop
  40653  01/23/13 11:42:02  UNIVMAX          LICOJ048     Migrate  Terminat
  40654  01/23/13 11:42:02  UNIVMAX          LICOJ048     Migrate  Terminat
  40655  01/23/13 11:42:24  UNIVMAX          LICOJ048     Migrate  Terminat
  40656  01/23/13 11:42:24  UNIVMAX          LICOJ048     Migrate  Terminat
  40658  01/23/13 11:49:35  SYMMIGRATE       LICOA065     Migrate  Validate
  40659  01/23/13 11:49:35  SYMMIGRATE       LICOA065     Migrate  Validate
  40660  01/23/13 11:49:35  SYMMIGRATE       LICOA065     Migrate  Validate
  40662  01/23/13 12:10:31  SWPROC           HK195700398  Migrate  Migrate
  40663  01/23/13 12:10:31  SWPROC           HK195700398  Migrate  Migrate
  40664  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
  40665  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
  40666  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
  40668  01/23/13 12:19:24  SWPROC           HK195700398  Migrate  Migrate
  40669  01/23/13 12:19:24  SWPROC           HK195700398  Migrate  Migrate
  40674  01/23/13 13:20:49  SYMMIGRATE       LICOA065     Migrate  Terminat
```

```
  40675  01/23/13 13:20:49  SYMMIGRATE       LICOA065     Migrate  Terminat
```

Run the following command to view more detailed information on the audit log records detailing the **symmigrate establish**:

```
symaudit -sid 0398 list -record_num 40664 -n 1 -v

             A U D I T   L O G   D A T A

Symmetrix ID            : 000195700398

  Record Number         :    40664
    Records in Seq      :        3
    Offset in Seq       :        1
    Time                : 01/23/13 12:10:54
    Vendor ID           : EMC Corp
    Application ID      : SYMMIGRATE
    Application Version : 7.5.0.0
    API Library         : SEK
    API Version         : V7.5.0.0 (Edit Level: 1604)
    Host Name           : LICOA065
    OS Name             : SunOS
    OS Revision         : 5.10Generi
    Client Host         :
    Process ID          : 00010085
    Task ID             : 00000001
    Function Class      : Migrate
    Action Code         : FullEstablish
    Text                : STARTING a Migrate 'ESTABLISH' operation for session named
"mig_DP_app" (client 42EC00). Options=(RAID5_7+1, DiskGroup 20, Unconfigured Space, NONE)
    Username            : H:LICOA065\root
    Activity ID         : SEf34d760cc6
```

The detailed audit log entries indicate the target disk group, target protection type, and whether the migration was to configured space, unconfigured space, or a thin pool.

Using the Activity ID from the audit log record for the establish, the **symaudit** command can provide the start and end timestamp for the migration, thereby providing the duration of the migration:

```
symaudit -sid 0398 list -activity_id SEc26bbf30f0

             A U D I T   L O G   D A T A

Symmetrix ID            : 000195700398

 Record                                                 Function Action
 Number  Date     Time      Application      Host         Class    Code
 ------  -------- --------  ---------------- ------------ -------- ---------

  40662  01/23/13 12:10:31  SWPROC           HK195700398  Migrate  Migrate
  40663  01/23/13 12:10:31  SWPROC           HK195700398  Migrate  Migrate
  40664  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
  40665  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
  40666  01/23/13 12:10:54  SYMMIGRATE       LICOA065     Migrate  FullEsta
```

```
40668  01/23/13 12:19:24  SWPROC          HK195700398  Migrate  Migrate
40669  01/23/13 12:19:24  SWPROC          HK195700398  Migrate  Migrate
```

The entries showing an Application of SWPROC log the configuration changes made to create or move the RAID groups during the migration of standard devices.

SYMAPI log

The following is shown when viewing the symapi-<date>.log file for the same date:

```
more symapi-20130123.log

01/23/2013 11:49:30.713 10060 STARTING a Migrate 'VALIDATE' operation for session named
"mig_DP_app" (client 42D900). Options=(RAID5_7+1, DiskGroup 20, Unconfigured Space,
NONE)
01/23/2013 11:49:30.714 10060   1 EMC:SYMMIGRATE  SymMigrateControl() Symm 000195700398
SRC_DEV: [01DA 01DB 01DC 01DD 01DE 01DF 01E0 01E1 01E2 01E3 01E4 01E5 01E6 01E7 01E8
01E9]
01/23/2013 11:49:36.854 10060 The Migrate 'VALIDATE' operation SUCCESSFULLY COMPLETED
(client 42D900).
01/23/2013 12:10:08.767 10085 STARTING a Migrate 'ESTABLISH' operation for session named
"mig_DP_app" (client 42EC00).
Options=(RAID5_7+1, DiskGroup 20, Unconfigured Space, NONE)
01/23/2013 12:10:08.770 10085   1 EMC:SYMMIGRATE  SymMigrateControl() Symm 000195700398
SRC_DEV: [01DA 01DB 01DC 01DD 01DE 01DF 01E0 01E1 01E2 01E3 01E4 01E5 01E6 01E7 01E8
01E9]
01/23/2013 12:10:33.448 10085   1 EMC:SYMMIGRATE  process_load_request  Switching to
FULL load for 000195700398 because the configuration changed (new chksum: D00B64D2 old:
5B564937)
01/23/2013 12:10:40.033  1094   6 EMC:EVTdaemon   process_load_request  Switching to
FULL load for 000195700398 because the configuration changed (new chksum: D00B64D2 old:
5B564937)
01/23/2013 12:10:41.465  1003   97 EMC:SMBASE    process_load_request  Switching to FULL
load for 000195700398 because the configuration changed (new chksum: D00B64D2 old:
5B564937)
01/23/2013 12:10:55.947 10085 The Migrate 'ESTABLISH' operation SUCCESSFULLY COMPLETED
(client 42EC00).
01/23/2013 12:10:56.525 10091   1 EMC:SYMMIGRATE  process_load_request  Switching to
FULL load for 000195700398 because the configuration changed (new chksum: D00B64D2 old:
5B564937)
01/23/2013 12:24:12.076  1094   6 EMC:EVTdaemon   process_load_request  Switching to
FULL load for 000195700398 because the configuration changed (new chksum: E9841D82 old:
EE180656)
01/23/2013 13:20:47.815 10129 STARTING a Migrate 'TERMINATE' operation for session named
"mig_DP_app" (client 43D101). Options=(No target information available, NONE)
01/23/2013 13:20:50.488 10129 The Migrate 'TERMINATE' operation SUCCESSFULLY COMPLETED
(client 43D101).
```

Note: The *symapi-<date>.log* file is typically located in the */var/symapi/log* directory on UNIX systems, and in *\Program Files\EMC\symapi\log* on Microsoft Windows.

Operational examples

The examples in this technical note include the latest Virtual LUN technology at the time of publication, including features new in Enginuity 5876, Solutions Enabler V7.6 and Unisphere 1.6.

> **Note:** In the following examples, outputs containing an ellipsis (…) indicate that output, not affecting the example, has been removed.

Migration to unconfigured space using SYMCLI

In this example, four metadevices, currently configured as RAID 1 on FC drives, will be migrated to unconfigured space on SATA drives, as RAID 6 (6+2).

The devices being migrated are grouped together in a storage group, TEST_DP_App:

```
symsg -sid 0398 show TEST_DP_App

Name: TEST_DP_App

   Symmetrix ID             : 000195700398
   Last updated at          : Wed Jan 09 16:21:46 2013
   Masking Views            : No
   FAST Policy              : No
   Host I/O Limit           : None
   Host I/O Limit MB/Sec    : N/A
   Host I/O Limit IO/Sec    : N/A
   Number of Storage Groups : 0
   Storage Group Names      : N/A

   Devices (4):
    {
    ----------------------------------------------------------
    Sym                               Device               Cap
    Dev    Pdev Name                  Config        Sts    (MB)
    ----------------------------------------------------------
    01DA   N/A                        2-Way Mir      RW   69053
    01DE   N/A                        2-Way Mir      RW   69053
    01E2   N/A                        2-Way Mir      RW   69053
    01E6   N/A                        2-Way Mir      RW   69053
    }
```

To determine which disk group to perform the migration to, the **symdisk** command can be used to list all physical disk groups in the array, showing the drive technology, the drive count, and the amount of free space in each of the disk groups:

symdisk –sid 0398 list –dskgrp_summary

```
Symmetrix ID: 000195700398

      Disk Group                 Disk                      Capacity
---------------------- ---------------------- ---------------------------------
                           Flgs Speed  Size      Total      Free      Actual
Num  Name                Cnt LT  (RPM)  (MB)      (MB)       (MB)       (MB)
---------------------- ---------------------- ---------------------------------

  10 EFD_R53_DG10         16 IE      0  381470    6103515       8865    6103515
  20 FC_R57_DG20          96 IF  15000  558281   53594939   38926992   53594939
  21 FC_R1_DG21           80 IF  15000  558281   44662450   20298953   44662450
  30 ATA_R614_DG30        32 IS   7200 1823565   58354066   42865297   58354066
 513 FTS_FASTVP           16 X-    N/A     N/A    1104840        480    1104840
                                                ---------- ---------- ----------
Total                                          163819810  102100587  163819810

Legend:
  Disk (L)ocation:
    I = Internal, X = External, - = N/A
  (T)echnology:
    S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, - = N/A
```

This information can be used to determine if there is sufficient free space and drives to support the desired target protection for the migration.

Prior to migrating the device, the output of the **symdev show** command of one of the devices shows that the device is locally protected by a single RAID 1 primary RAID group, configured in disk group 21:

symdev –sid 0398 show 1DA

```
    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Number of RAID Groups    : 1
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030314441
    Device Emulation Type    : FBA
...
    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      73656
        Tracks               :    1104840
        512-byte Blocks      :  141419520
        MegaBytes            :      69053
        KiloBytes            :   70709760
```

```
        Geometry Limited     : No
        }
...
    Device Configuration     : 2-Way Mir       (Meta Head)
...
    Meta Configuration       : Striped
    Meta Stripe Size         : 960k    (1 Cylinders)
    Meta Device Members (4)  :
        {
        ------------------------------------------------------------------------
                               BCV  DATA                    RDF  DATA
                        ----------------------------  --------------------------
        Sym    Cap     Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev    (MB)    Tracks  Tracks  State         Tracks Tracks State
        ------------------------------------------------------------------------
    --> 01DA  17263        -       -  N/A                -      - N/A
        01DB  17263        -       -  N/A                -      - N/A
        01DC  17263        -       -  N/A                -      - N/A
        01DD  17263        -       -  N/A                -      - N/A
        ------------------------------------------------------------------------
              69053        -       -                     -      -
        }

    Mirror Set Type          : [RAID-1,N/A,N/A,N/A]

    Mirror Set DA Status     : [RW,N/A,N/A,N/A]

    Mirror Set Inv. Tracks   : [0,0,0,0]

    Back End Disk Director Information
        {
        Hyper Type                              : RAID-1
        Hyper Status                            : Ready           (RW)
        Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
        Spindle ID                              : N/A
        Disk Director Volume Number             : N/A
        Hyper Number                            : N/A
        Mirror Number                           : 1
        Disk Group Number                       : 21
        Disk Group Name                         : FC_R1_DG21
        }

    RAID Group Information
        {
        Mirror Number                             : 1
        RAID Type                                 : RAID-1
        Device Position                           : Primary
        Protection Level                          : 2
        RAID Group Service State                  : Normal
        Hyper Devices:
            {
            Device : 01DA (M)
                {
                ------------------------------------------------------------------
                Spindle   Disk     DA       Hyper      Member        Disk
                          DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
                ------------------------------------------------------------------
                B07       08B:D7    199    7   17536   1 RW        21   558281
                BF7       10B:D7    200    7   17536   2 RW        21   558281
                }
```

```
        Device : 01DB (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            30F       07A:D7     142    7   17536   1 RW        21   558281
            3FF       09A:D7     199    7   17536   2 RW        21   558281
            }
        Device : 01DC (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            A90       07B:D8     164    7   17536   1 RW        21   558281
            B80       09B:D8     164    7   17536   2 RW        21   558281
            }
        Device : 01DD (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            19CC      08D:C8      80    7   17536   1 RW        21   558281
            1ABC      10D:C8      80    7   17536   2 RW        21   558281
            }
        }
    }
```

After the devices to be migrated and the disk group to be migrated to have been identified, along with the desired protection type, the migration can be submitted to the array.

First, the **symmigrate validate** command is used to test the potential success of the migration. In this example, the migration session name being used is mig_app1:

```
symmigrate –sid 0398 –sg TEST_DP_App -name mig_DP_app -tgt_dsk_grp 20
-tgt_raid5 -tgt_prot 7+1 -tgt_unconfig validate -v

Execute 'Validate' operation execution for
the device group 'TEST_DP_App' (y/[n]) ? y

'Validate' operation execution is in progress for
the device group 'TEST_DP_App'. Please wait...

STARTING a Migrate 'VALIDATE' operation.

Source devices:
 01DA:01E9 [SELECTED]

  Validate Migration.............................................Started.
  Validate Migration.............................................Done.

The Migrate 'VALIDATE' operation SUCCEEDED.
```

```
'Validate' operation successfully executed for
the device group 'TEST_DP_App'.
```

When the proposed migration has been validated successfully, it can then be established, executing the migration:

```
symmigrate –sid 0398 –sg TEST_DP_App -name mig_DP_app -tgt_dsk_grp 20
-tgt_raid5 -tgt_prot 7+1 -tgt_unconfig establish -v

'Establish' operation execution is in progress for
the device group 'DP_ProdApp1'. Please wait...

STARTING a Migrate 'ESTABLISH' operation.

Source devices:
 00FD:0106 [SELECTED]

  Establish Migration.............................................Started.
  Establish Migration.............................................In Progress.
  Establish Migration.............................................Done.

The Migrate 'ESTABLISH' operation SUCCEEDED.

'Establish' operation successfully executed for
the device group 'DP_ProdApp1'.
```

An initial query of the migration shows the migration session state as being SyncInProg:

```
symmigrate –sid 0398 –name mig_DP_app query –detail

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA  N/A  1673610 SyncInProg     24   U   N/A          20   RAID-5(7+1)         mig_DP_app
01DE  N/A  1787994 SyncInProg     19   U   N/A          20   RAID-5(7+1)         mig_DP_app
01E2  N/A  1495372 SyncInProg     32   U   N/A          20   RAID-5(7+1)         mig_DP_app
01E6  N/A  1510130 SyncInProg     31   U   N/A          20   RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks    6467106
 MB(s)      404194
 Done(%)        26

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

The **symmigrate query** command, when used with the –i interval options, allows for the query to be run automatically at the given interval (in seconds). After the second iteration of the query, an estimated time to

completion is included with the output, along with the current data transfer rate:

```
symmigrate –sid 0398 –name mig_DP_app query –detail –i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA  N/A  1051090 SyncInProg     52   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A  1394348 SyncInProg     36   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A   724160 SyncInProg     67   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A   764392 SyncInProg     65   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks    3933990
 MB(s)      245874
 Done(%)        55

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA  N/A   719408 SyncInProg     67   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A  1207820 SyncInProg     45   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A   319114 SyncInProg     85   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A   385436 SyncInProg     82   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks    2631778
 MB(s)      164486
 Done(%)        70


Copy Rate                       :   2325.4 MB/S
Estimated time to completion    : 00:01:12

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

While the migration is in the SyncInProg state, the output of a **symdev show** command shows the device being migrated as now being locally protected by two separate RAID groups, the primary RAID 1 group, which the device started with, and a secondary RAID 5 group to which the device is being migrated. The secondary RAID group can be seen to

belong to disk group 20, while the primary RAID group belongs to disk group 21:

```
symdev –sid 0398 show 1DA

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Number of RAID Groups    : 2
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
...
    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      73656
        Tracks               :    1104840
        512-byte Blocks      :  141419520
        MegaBytes            :      69053
        KiloBytes            :   70709760

        Geometry Limited     : No
        }
...

    Device Configuration     : 2-Way Mir       (Meta Head)
...
    Device Status            : Ready            (RW)
    Device SA Status         : N/A              (N/A)
    Device User Pinned       : False
    Host Access Mode         : Active
    Device Tag(s)            : None
...
    Meta Configuration       : Striped
    Meta Stripe Size         : 960k    (1 Cylinders)
    Meta Device Members (4)  :
        {
        --------------------------------------------------------------------
                                BCV  DATA                    RDF  DATA
                            ----------------------------  -------------------------
        Sym    Cap    Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev    (MB)   Tracks  Tracks  State         Tracks Tracks State
        --------------------------------------------------------------------
    --> 01DA  17263        -       -  N/A                -      - N/A
        01DB  17263        -       -  N/A                -      - N/A
        01DC  17263        -       -  N/A                -      - N/A
        01DD  17263        -       -  N/A                -      - N/A
        --------------------------------------------------------------------
              69053        -       -                     -      -
        }

    Mirror Set Type          : [RAID-1,RAID-5,N/A,N/A]
```

```
Mirror Set DA Status     : [RW,RW,N/A,N/A]

Mirror Set Inv. Tracks   : [0,267290,0,0]

Back End Disk Director Information
    {
    Hyper Type                              : RAID-1
    Hyper Status                            : Ready           (RW)
    Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
    Spindle ID                              : N/A
    Disk Director Volume Number             : N/A
    Hyper Number                            : N/A
    Mirror Number                           : 1
    Disk Group Number                       : 21
    Disk Group Name                         : FC_R1_DG21

    Hyper Type                              : RAID-5
    Hyper Status                            : Ready           (RW)
    Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
    Spindle ID                              : N/A
    Disk Director Volume Number             : N/A
    Hyper Number                            : N/A
    Mirror Number                           : 2
    Disk Group Number                       : 20
    Disk Group Name                         : FC_R57_DG20
    }

RAID Group Information
    {
    Mirror Number                             : 1
    RAID Type                                 : RAID-1
    Device Position                           : Primary
    Protection Level                          : 2
    RAID Group Service State                  : Normal
    Hyper Devices:
        {
        Device : 01DA (M)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            B07       08B:D7     207    7   17536   1 RW        21   558281
            BF7       10B:D7     206    7   17536   2 RW        21   558281
            }
        Device : 01DB (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            30F       07A:D7     150    7   17536   1 RW        21   558281
            3FF       09A:D7     209    7   17536   2 RW        21   558281
            }
        Device : 01DC (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
```

```
        ---------------------------------------------------------------
        A90      07B:D8     170    7   17536   1 RW        21   558281
        B80      09B:D8     170    7   17536   2 RW        21   558281
        }
    Device : 01DD (m)
        {
        ---------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member         Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ---------------------------------------------------------------
        19CC     08D:C8      84    7   17536   1 RW        21   558281
        1ABC     10D:C8      84    7   17536   2 RW        21   558281
        }
    }

Mirror Number                           : 2
RAID Type                               : RAID-5
Device Position                         : Secondary
Protection Level                        : 7+1
RAID Group Service State                : Normal
Hyper Devices:
    {
    Device : 01DA (M)
        {
        ---------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member         Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ---------------------------------------------------------------
        198D     07D:D2     148   21    2505   1 RW        20   558281
        3C1      09A:C2      46   22    2505   2 RW        20   558281
        2D1      07A:C2      22   22    2505   3 RW        20   558281
        BB9      10B:C2      45   22    2505   4 RW        20   558281
        AC9      08B:C2      46   22    2505   5 RW        20   558281
        1375     10C:D2     166   21    2505   6 RW        20   558281
        1285     08C:D2     166   21    2505   7 RW        20   558281
        1A7D     09D:D2     148   21    2505   8 RW        20   558281
        }
    Device : 01DB (m)
        {
        ---------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member         Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ---------------------------------------------------------------
        1A05     08D:D3     180   23    2505   1 RW        20   558281
        475      10A:D2     151   23    2505   2 RW        20   558281
        385      08A:D2     174   23    2505   3 RW        20   558281
        B7E      09B:D4     156   23    2505   4 RW        20   558281
        A8E      07B:D4     156   23    2505   5 RW        20   558281
        12FD     09C:D3     181   23    2505   6 RW        20   558281
        120D     07C:D3     181   23    2505   7 RW        20   558281
        1AF5     10D:D3     145   23    2505   8 RW        20   558281
        }
    Device : 01DC (m)
        {
        ---------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member         Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ---------------------------------------------------------------
        1338     10C:C1      23   23    2505   1 RW        20   558281
        1248     08C:C1      23   23    2505   2 RW        20   558281
```

```
            3FC      09A:D1     157   23    2505   3 RW        20   558281
            30C      07A:D1      98   23    2505   4 RW        20   558281
            BF4      10B:D1     155   23    2505   5 RW        20   558281
            B04      08B:D1     156   23    2505   6 RW        20   558281
            1A40     09D:C1      23   23    2505   7 RW        20   558281
            1950     07D:C1      23   23    2505   8 RW        20   558281
            }
        Device : 01DD (m)
            {
            ------------------------------------------------------------------
            Spindle   Disk     DA        Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------------
            2D2      07A:C4      46   23    2505   1 RW        20   558281
            BBA      10B:C4      69   23    2505   2 RW        20   558281
            ACA      08B:C4      70   23    2505   3 RW        20   558281
            1AB8     10D:C0      24   24    2505   4 RW        20   558281
            19C8     08D:C0      24   24    2505   5 RW        20   558281
            12C0     09C:C0      24   24    2505   6 RW        20   558281
            11D0     07C:C0      24   24    2505   7 RW        20   558281
            3C2      09A:C4      70   23    2505   8 RW        20   558281
            }
        }
    }
```

At the end of the migration, the **symmigrate query** command will show the session status change from SyncInProg to Synchronized, to MigrInProg, and finally to Migrated:

```
symmigrate –sid 0398 –name mig_DP_app query –detail –i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A    67878 SyncInProg     96   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks      67878
 MB(s)      4242.4
 Done(%)        99


Copy Rate                      :    337.1 MB/S
Estimated time to completion   : 00:00:03

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398
```

```
           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- ------------
01DA  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A        0 Synchronized  100   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks          0
 MB(s)         0.0
 Done(%)       100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.


Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- ------------
01DA  N/A        0 MigrInProg    100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A        0 MigrInProg    100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A        0 MigrInProg    100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A        0 MigrInProg    100   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks          0
 MB(s)         0.0
 Done(%)       100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- ------------
01DA  N/A        0 Migrated      100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01DE  N/A        0 Migrated      100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E2  N/A        0 Migrated      100   U   N/A          20 RAID-5(7+1)         mig_DP_app
01E6  N/A        0 Migrated      100   U   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks          0
 MB(s)         0.0
 Done(%)       100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
```

```
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

Alternatively, the **symmigrate verify** command can be used to determine if all the devices in a single session have reached the state of Migrated:

```
symmigrate –sid 0398 –name mig_DP_app verify -migrated

All session(s) with name 'mig_DP_app' are in 'Migrated' state.
```

When the migration session has reached the Migrated status, the **symdev show** output now shows that the devices migrated are once again protected by a single local RAID group. However, the primary RAID group now is the RAID 5 group located on the FC drives in disk group 20.

```
symdev –sid 0398 show 1DA

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Number of RAID Groups    : 1
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030314441
    Device Emulation Type    : FBA
    Device Defined Label Type: N/A
    Device Defined Label     : N/A
    Device Sub System Id     : 0x0001
    Cache Partition Name     : DEFAULT_PARTITION

    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      73656
        Tracks               :    1104840
        512-byte Blocks      :  141419520
        MegaBytes            :      69053
        KiloBytes            :   70709760

        Geometry Limited     : No
        }
...
    Device Configuration     : RAID-5          (Meta Head)
...
    Device Service State     : Normal

    Device Status            : Ready            (RW)
    Device SA Status         : N/A              (N/A)
    Device User Pinned       : False
    Host Access Mode         : Active
```

```
    Device Tag(s)            : None
...
    Meta Configuration       : Striped
    Meta Stripe Size         : 960k    (1 Cylinders)
    Meta Device Members (4)  :
        {
        --------------------------------------------------------------------
                              BCV  DATA                    RDF  DATA
                         ---------------------------  -------------------------
        Sym    Cap       Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev    (MB)      Tracks  Tracks  State         Tracks Tracks State
        --------------------------------------------------------------------
    --> 01DA  17263        -       -  N/A                -      - N/A
        01DB  17263        -       -  N/A                -      - N/A
        01DC  17263        -       -  N/A                -      - N/A
        01DD  17263        -       -  N/A                -      - N/A
        --------------------------------------------------------------------
              69053        -       -                     -      -
        }

    Mirror Set Type          : [RAID-5,N/A,N/A,N/A]

    Mirror Set DA Status     : [RW,N/A,N/A,N/A]

    Mirror Set Inv. Tracks   : [0,0,0,0]

    Back End Disk Director Information
        {
        Hyper Type                              : RAID-5
        Hyper Status                            : Ready           (RW)
        Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
        Spindle ID                              : N/A
        Disk Director Volume Number             : N/A
        Hyper Number                            : N/A
        Mirror Number                           : 1
        Disk Group Number                       : 20
        Disk Group Name                         : FC_R57_DG20
        }

    RAID Group Information
        {
        Mirror Number                             : 1
        RAID Type                                 : RAID-5
        Device Position                           : Primary
        Protection Level                          : 7+1
        RAID Group Service State                  : Normal
        Hyper Devices:
            {
            Device : 01DA (M)
                {
                ------------------------------------------------------------
                Spindle   Disk     DA       Hyper      Member        Disk
                          DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
                ------------------------------------------------------------
                198D      07D:D2    147   21    2505   1 RW        20   558281
                3C1       09A:C2     46   22    2505   2 RW        20   558281
                2D1       07A:C2     22   22    2505   3 RW        20   558281
                BB9       10B:C2     45   22    2505   4 RW        20   558281
                AC9       08B:C2     46   22    2505   5 RW        20   558281
                1375      10C:D2    165   21    2505   6 RW        20   558281
```

```
        1285     08C:D2     165   21    2505   7 RW        20   558281
        1A7D     09D:D2     147   21    2505   8 RW        20   558281
        }
    Device : 01DB (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA        Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        1A05     08D:D3     179   23    2505   1 RW        20   558281
        475      10A:D2     150   23    2505   2 RW        20   558281
        385      08A:D2     173   23    2505   3 RW        20   558281
        B7E      09B:D4     155   23    2505   4 RW        20   558281
        A8E      07B:D4     155   23    2505   5 RW        20   558281
        12FD     09C:D3     180   23    2505   6 RW        20   558281
        120D     07C:D3     180   23    2505   7 RW        20   558281
        1AF5     10D:D3     144   23    2505   8 RW        20   558281
        }
    Device : 01DC (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA        Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        1338     10C:C1      23   23    2505   1 RW        20   558281
        1248     08C:C1      23   23    2505   2 RW        20   558281
        3FC      09A:D1     156   23    2505   3 RW        20   558281
        30C      07A:D1      97   23    2505   4 RW        20   558281
        BF4      10B:D1     154   23    2505   5 RW        20   558281
        B04      08B:D1     155   23    2505   6 RW        20   558281
        1A40     09D:C1      23   23    2505   7 RW        20   558281
        1950     07D:C1      23   23    2505   8 RW        20   558281
        }
    Device : 01DD (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA        Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        2D2      07A:C4      46   23    2505   1 RW        20   558281
        BBA      10B:C4      69   23    2505   2 RW        20   558281
        ACA      08B:C4      70   23    2505   3 RW        20   558281
        1AB8     10D:C0      24   24    2505   4 RW        20   558281
        19C8     08D:C0      24   24    2505   5 RW        20   558281
        12C0     09C:C0      24   24    2505   6 RW        20   558281
        11D0     07C:C0      24   24    2505   7 RW        20   558281
        3C2      09A:C4      70   23    2505   8 RW        20   558281
        }
    }
}
```

Run the **symmigrate terminate** command to complete the migration, and to remove the migration session from the Symmetrix array:

```
symmigrate -sid 0398 -name mig_DP_app terminate -v

Execute 'Terminate' operation execution for
```

```
the session named 'mig_DP_app' (y/[n]) ? y

'Terminate' operation execution is in progress for
the session named 'mig_DP_app'. Please wait...

STARTING a Migrate 'TERMINATE' operation.

  Terminate Migration.............................................Started.
  Terminate Migration.............................................Done.

The Migrate 'TERMINATE' operation SUCCEEDED.

'Terminate' operation successfully executed for
the session named 'mig_DP_app'.
```

A subsequent query shows the session no longer exists:

```
symmigrate -sid 0398 -name mig_DP_app query

Symmetrix ID: 000195700398

The device list with session name 'mig_DP_app' does not have any session information.
```

The Virtual LUN migration is now complete.

Migration to configured space using SYMCLI

In this example, four metadevices, currently configured as RAID 1 on FC drives, will be migrated to configured space on other FC drives, as RAID 5 (7+1).

The devices being migrated are grouped together in a device group, TEST_DP_App.

To determine which disk group to perform the migration to, the **symdisk** command can be used to list all physical drives in the array sorted by disk group:

```
symdisk –sid 0398 list –dskgrp_summary

Symmetrix ID: 000195700398

      Disk Group                Disk                      Capacity
---------------------- ---------------------- --------------------------------
                          Flgs Speed  Size      Total      Free      Actual
Num  Name               Cnt LT  (RPM)  (MB)      (MB)       (MB)       (MB)
---------------------- ---------------------- --------------------------------

  10 EFD_R53_DG10        16 IE      0  381470    6103515       8865    6103515
  20 FC_R57_DG20         96 IF  15000  558281   53594939   38926992   53594939
  21 FC_R1_DG21          80 IF  15000  558281   44662450   20298953   44662450
  30 ATA_R614_DG30       32 IS   7200 1823565   58354066   42865297   58354066
 513 FTS_FASTVP          16 X-    N/A     N/A    1104840        480    1104840
                                                ---------- ---------- ----------
Total                                          163819810  102100587  163819810
```

```
Legend:
  Disk (L)ocation:
    I = Internal, X = External, - = N/A
  (T)echnology:
    S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, - = N/A
```

After it has been determined that disk group 20 contains the other FC drives, the **symdev** command can be used to determine if there are sufficient configured devices of the required protection and capacity in the disk group. Solutions Enabler contains a **–migr_tgt** option to filter devices that are either unmapped or unmasked, or both, and so can be used as the target of a migration.

Run the following command to list all migration-target-eligible devices in disk group 20, of protection level RAID 5 (7+1) and capacity 17,263 MB:

```
symdev –sid 0398 list -disk_group 20 -migr_tgt -emulation fba -raid5
-prot 7+1 -cap 17263
```

```
Symmetrix ID: 000195700398

        Device Name           Directors                  Device
--------------------------- ------------- ------------------------------------
                                                                          Cap
Sym  Physical               SA :P DA :IT  Config        Attribute    Sts   (MB)
--------------------------- ------------- ------------------------------------

04AC Not Visible            ???:? 10B:D3  RAID-5        N/Grp'd      RW   17263
0665 Not Visible            ???:? 07B:D2  RAID-5        N/Grp'd      RW   17263
0666 Not Visible            ???:? 08D:D5  RAID-5        N/Grp'd      RW   17263
0667 Not Visible            ???:? 07C:D1  RAID-5        N/Grp'd      RW   17263
0668 Not Visible            ???:? 10B:C0  RAID-5        N/Grp'd      RW   17263
0669 Not Visible            ???:? 09B:D4  RAID-5        N/Grp'd      RW   17263
...
0681 Not Visible            ???:? 09D:D0  RAID-5        N/Grp'd      RW   17263
0682 Not Visible            ???:? 07A:D3  RAID-5        N/Grp'd      RW   17263
0683 Not Visible            ???:? 09C:C4  RAID-5        N/Grp'd      RW   17263
0684 Not Visible            ???:? 08C:C1  RAID-5        N/Grp'd      RW   17263
```

As can be seen, there are sufficient devices to complete the migration.

Prior to migrating the device, the output of the **symdev show** command against one of the devices shows that the device is locally protected by a single RAID 1 primary RAID group, configured in disk group 21:

```
symdev –sid 0398 show 1DA

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
```

```
    Symmetrix ID              : 000195700398

    Number of RAID Groups     : 1
...
    Vendor ID                 : EMC
    Product ID                : SYMMETRIX
    Product Revision          : 5876
    Device WWN                : 60000970000195700398533030314441
    Device Emulation Type     : FBA
    Device Defined Label Type: N/A
    Device Defined Label      : N/A
    Device Sub System Id      : 0x0001
    Cache Partition Name      : DEFAULT_PARTITION

    Device Block Size         : 512

    Device Capacity
        {
        Cylinders             :      73656
        Tracks                :    1104840
        512-byte Blocks       :  141419520
        MegaBytes             :      69053
        KiloBytes             :   70709760

        Geometry Limited      : No
        }
...
    Device Configuration      : 2-Way Mir       (Meta Head)
...
    Device Service State      : Normal

    Device Status             : Ready            (RW)
    Device SA Status          : N/A              (N/A)
    Device User Pinned        : False
    Host Access Mode          : Active
    Device Tag(s)             : None
...
    Meta Configuration        : Striped
    Meta Stripe Size          : 960k    (1 Cylinders)
    Meta Device Members (4)   :
        {
        ------------------------------------------------------------------------
                                BCV  DATA                    RDF  DATA
                            ----------------------------  -------------------------
        Sym    Cap     Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev    (MB)    Tracks  Tracks  State         Tracks Tracks State
        ------------------------------------------------------------------------
    --> 01DA  17263         -       -  N/A                -      - N/A
        01DB  17263         -       -  N/A                -      - N/A
        01DC  17263         -       -  N/A                -      - N/A
        01DD  17263         -       -  N/A                -      - N/A
        ------------------------------------------------------------------------
              69053         -       -                     -      -
```

```
    }

Mirror Set Type          : [RAID-1,N/A,N/A,N/A]

Mirror Set DA Status     : [RW,N/A,N/A,N/A]

Mirror Set Inv. Tracks   : [0,0,0,0]

Back End Disk Director Information
    {
    Hyper Type                              : RAID-1
    Hyper Status                            : Ready           (RW)
    Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
    Spindle ID                              : N/A
    Disk Director Volume Number             : N/A
    Hyper Number                            : N/A
    Mirror Number                           : 1
    Disk Group Number                       : 21
    Disk Group Name                         : FC_R1_DG21
    }

RAID Group Information
    {
    Mirror Number                             : 1
    RAID Type                                 : RAID-1
    Device Position                           : Primary
    Protection Level                          : 2
    RAID Group Service State                  : Normal
    Hyper Devices:
        {
        Device : 01DA (M)
            {
            ------------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------------
            120F      07C:D7     203    7   17536   1 RW        21   558281
            12FF      09C:D7     203    7   17536   2 RW        21   558281
            }
        Device : 01DB (m)
            {
            ------------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------------
            1A07      08D:D7     202    7   17536   1 RW        21   558281
            1AF7      10D:D7     167    7   17536   2 RW        21   558281
            }
        Device : 01DC (m)
            {
            ------------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
```

```
            ---------------------------------------------------------------
            B07      08B:D7     198    7   17536   1 RW        21   558281
            BF7      10B:D7     199    7   17536   2 RW        21   558281
            }
        Device : 01DD (m)
            {
            ---------------------------------------------------------------
            Spindle   Disk     DA        Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ---------------------------------------------------------------
            30F      07A:D7     141    7   17536   1 RW        21   558281
            3FF      09A:D7     198    7   17536   2 RW        21   558281
            }
        }
    }
```

After the devices to be migrated, and the disk group to be migrated to, have been identified, along with the desired protection type, the migration can be submitted to the array.

First, the **symmigrate validate** command is used to test the potential success of the migration. The **–outfile** option is also used to generate a device file containing exact device pairs that can be used for the subsequent **symmigrate establish** command. In this example, the migration session name being used is mig_DP_app:

```
symmigrate -g TEST_DP_App -tgt_dsk_grp 20 -tgt_raid5 -tgt_prot 7+1
-tgt_config -name mig_DP_app validate -outfile dev_pairs.txt -v

Execute 'Validate' operation execution for
the device group 'TEST_DP_App' (y/[n]) ? y

'Validate' operation execution is in progress for
the device group 'TEST_DP_App'. Please wait...

STARTING a Migrate 'VALIDATE' operation.

Source devices:
 01DA:01E9 [SELECTED]

Target devices:
 0000:0054 [SKIPPED - Invalid device configuration]
 0055:005F [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 0060:0071 [SKIPPED - Host visible]
 0072:0079 [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 007A:0085 [SKIPPED - Host visible]
 0086:0089 [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 008A:008F [SKIPPED - Host visible]
 0090:00CF [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 00D0:018F [SKIPPED - Invalid device configuration]
 0190:0191 [SKIPPED - Host visible]
 0192:03F3 [SKIPPED - Invalid device configuration]
 03F4:042F [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 0430:04AA [SKIPPED - Invalid device configuration]
```

```
 04AB   [SKIPPED - Capacity, emulation, prot type or block size mis-match]
 04AC   [SELECTED]
 04AD:0664 [SKIPPED - Invalid device configuration]
 0665:0684 [SELECTED]

  Validate Migration.............................................Started.
  Validate Migration.............................................Done.

The Migrate 'VALIDATE' operation SUCCEEDED.

'Validate' operation successfully executed for
the device group 'TEST_DP_App'.
```

> **Note:** Using the **-v** option when validating a migration to configured space will list all devices in the target disk group and indicate whether there are valid candidates as targets of the migration. In the case where a device, or range of devices, is not a valid candidate a reason is provided.

The resulting output file, dev_pairs.txt, contains the recommended device pairings for performing the migration.

```
1da 0670,0671,0672,0674
1de 066c,066d,066e,066f
1e2 0668,066b,0669,066a
1e6 04ac,0665,0666,0667
```

> **Note:** As the devices being migrated are metadevices, multiple target devices, separated by commas, are listed corresponding to each meta member.

This file can be used as is or can be edited as needed.

When the proposed migration has been validated successfully, it can then be established, thereby executing the migration. Here, the device file generated by the **symmigrate validate** command is used to specify the devices to be migrated:

```
symmigrate –sid 0398 –f dev_pairs.txt -name mig_DP_app establish

Execute 'Establish' operation execution for
the device list in device file 'dev_pairs.txt' (y/[n]) ?y

'Establish' operation execution is in progress for
the device list in device file 'dev_pairs.txt'. Please wait...

  Establish Migration............................................Started.
  Establish Migration.........................................In Progress.
  Establish Migration............................................Done.

'Establish' operation successfully executed for
the device list in device file 'dev_pairs.txt'.
```

An initial query of the migration shows the migration session state as being SyncInProg. The query also shows the target device being used for the migration:

```
symmigrate –sid 0398 –name mig_DP_app query –detail

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description  Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------ -------------
01DA 0670  2144568 SyncInProg      2   C   N/A          20 RAID-5(7+1)        mig_DP_app
01DE 066C  2122496 SyncInProg      3   C   N/A          20 RAID-5(7+1)        mig_DP_app
01E2 0668  2116502 SyncInProg      4   C   N/A          20 RAID-5(7+1)        mig_DP_app
01E6 04AC  2146124 SyncInProg      2   C   N/A          20 RAID-5(7+1)        mig_DP_app

Total     --------
 Tracks    8529690
 MB(s)      533106
 Done(%)         3

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

The **symmigrate query** command, when used with the –i interval options, allows for the query to be run automatically at the given interval (in seconds). After the second iteration of the query, an estimated time to completion is included with the output, along with the current data transfer rate:

```
symmigrate –sid 0398 –name mig_DP_app query –detail –i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------ -------------
01DA 0670  1946912 SyncInProg     11   C   N/A          20 RAID-5(7+1)        mig_DP_app
01DE 066C  1919820 SyncInProg     13   C   N/A          20 RAID-5(7+1)        mig_DP_app
01E2 0668  1915258 SyncInProg     13   C   N/A          20 RAID-5(7+1)        mig_DP_app
01E6 04AC  1980556 SyncInProg     10   C   N/A          20 RAID-5(7+1)        mig_DP_app

Total     --------
 Tracks    7762546
 MB(s)      485159
 Done(%)        12

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
```

```
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA 0670  1772694 SyncInProg     19   C   N/A          20 RAID-5(7+1)         mig_DP_app
01DE 066C  1716324 SyncInProg     22   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E2 0668  1713358 SyncInProg     22   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E6 04AC  1798640 SyncInProg     18   C   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks    7001016
 MB(s)      437564
 Done(%)        20


Copy Rate                       :   1487.4 MB/S
Estimated time to completion    : 00:04:58

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

While the migration is in the SyncInProg state, the output of a **symdev show** command shows the device being migrated as now being locally protected by two separate RAID groups—the primary RAID 1 group that the device started with, and a secondary RAID 5 group to which the device is being migrated. The secondary RAID group can be seen to belong to disk group 20, while the primary RAID group belongs to disk group 21:

```
symdev -sid 0398 show 1DA

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Device Group Name        : TEST_DP_App
    Device Logical Name      : DEV001

    Number of RAID Groups    : 2
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030314441
    Device Emulation Type    : FBA
    Device Defined Label Type: N/A
    Device Defined Label     : N/A
    Device Sub System Id     : 0x0001
```

```
    Cache Partition Name     : DEFAULT_PARTITION

    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      73656
        Tracks               :    1104840
        512-byte Blocks      :  141419520
        MegaBytes            :      69053
        KiloBytes            :   70709760

        Geometry Limited     : No
        }
...
    Device Configuration     : 2-Way Mir       (Meta Head)
...
    Device Service State     : Normal

    Device Status            : Ready            (RW)
    Device SA Status         : N/A              (N/A)
...
    Meta Configuration       : Striped
    Meta Stripe Size         : 960k    (1 Cylinders)
    Meta Device Members (4)  :
        {
        --------------------------------------------------------------------------
                               BCV  DATA                    RDF  DATA
                          ----------------------------  --------------------------
        Sym    Cap     Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev     (MB)   Tracks  Tracks  State         Tracks Tracks State
        --------------------------------------------------------------------------
    --> 01DA  17263         -       -  N/A                -      - N/A
        01DB  17263         -       -  N/A                -      - N/A
        01DC  17263         -       -  N/A                -      - N/A
        01DD  17263         -       -  N/A                -      - N/A
        --------------------------------------------------------------------------
              69053         -       -                     -      -
        }

    Mirror Set Type          : [RAID-1,RAID-5,N/A,N/A]

    Mirror Set DA Status     : [RW,RW,N/A,N/A]

    Mirror Set Inv. Tracks   : [0,258701,0,0]

    Back End Disk Director Information
        {
        Hyper Type                              : RAID-1
        Hyper Status                            : Ready           (RW)
        Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
        Spindle ID                              : N/A
        Disk Director Volume Number             : N/A
        Hyper Number                            : N/A
        Mirror Number                           : 1
        Disk Group Number                       : 21
        Disk Group Name                         : FC_R1_DG21

        Hyper Type                              : RAID-5
        Hyper Status                            : Ready           (RW)
```

```
    Disk [Director, Interface, TID]        : [N/A,N/A,N/A]
    Spindle ID                             : N/A
    Disk Director Volume Number            : N/A
    Hyper Number                           : N/A
    Mirror Number                          : 2
    Disk Group Number                      : 20
    Disk Group Name                        : FC_R57_DG20
    }

RAID Group Information
    {
    Mirror Number                            : 1
    RAID Type                                : RAID-1
    Device Position                          : Primary
    Protection Level                         : 2
    RAID Group Service State                 : Normal
    Hyper Devices:
        {
        Device : 01DA (M)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            120F      07C:D7     203    7   17536   1 RW        21   558281
            12FF      09C:D7     203    7   17536   2 RW        21   558281
            }
        Device : 01DB (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            1A07      08D:D7     202    7   17536   1 RW        21   558281
            1AF7      10D:D7     167    7   17536   2 RW        21   558281
            }
        Device : 01DC (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            B07       08B:D7     198    7   17536   1 RW        21   558281
            BF7       10B:D7     199    7   17536   2 RW        21   558281
            }
        Device : 01DD (m)
            {
            ------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ------------------------------------------------------------
            30F       07A:D7     141    7   17536   1 RW        21   558281
            3FF       09A:D7     198    7   17536   2 RW        21   558281
            }
        }

    Mirror Number                            : 2
    RAID Type                                : RAID-5
    Device Position                          : Secondary
    Protection Level                         : 7+1
```

```
RAID Group Service State                : Normal
Hyper Devices:
    {
    Device : 01DA (M)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        30C       07A:D1      90   20    2505   1 RW        20   558281
        BF4       10B:D1     147   20    2505   2 RW        20   558281
        B04       08B:D1     146   20    2505   3 RW        20   558281
        1A40      09D:C1      20   20    2505   4 RW        20   558281
        1950      07D:C1      20   20    2505   5 RW        20   558281
        1338      10C:C1      20   20    2505   6 RW        20   558281
        1248      08C:C1      20   20    2505   7 RW        20   558281
        3FC       09A:D1     147   20    2505   8 RW        20   558281
        }
    Device : 01DB (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        385       08A:D2     167   21    2505   1 RW        20   558281
        B7E       09B:D4     149   21    2505   2 RW        20   558281
        A8E       07B:D4     149   21    2505   3 RW        20   558281
        12FD      09C:D3     174   21    2505   4 RW        20   558281
        120D      07C:D3     174   21    2505   5 RW        20   558281
        1AF5      10D:D3     138   21    2505   6 RW        20   558281
        1A05      08D:D3     173   21    2505   7 RW        20   558281
        475       10A:D2     144   21    2505   8 RW        20   558281
        }
    Device : 01DC (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        ACA       08B:C4      64   21    2505   1 RW        20   558281
        1AB8      10D:C0      22   22    2505   2 RW        20   558281
        19C8      08D:C0      22   22    2505   3 RW        20   558281
        12C0      09C:C0      22   22    2505   4 RW        20   558281
        11D0      07C:C0      22   22    2505   5 RW        20   558281
        3C2       09A:C4      64   21    2505   6 RW        20   558281
        2D2       07A:C4      42   21    2505   7 RW        20   558281
        BBA       10B:C4      65   21    2505   8 RW        20   558281
        }
    Device : 01DD (m)
        {
        ------------------------------------------------------------------
        Spindle   Disk     DA       Hyper      Member        Disk
                  DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
        ------------------------------------------------------------------
        B06       08B:D5     190   20    2505   1 RW        20   558281
        BF6       10B:D5     191   20    2505   2 RW        20   558281
        1A42      09D:C5      48   20    2505   3 RW        20   558281
        1952      07D:C5      48   20    2505   4 RW        20   558281
        120E      07C:D5     195   20    2505   5 RW        20   558281
        12FE      09C:D5     195   20    2505   6 RW        20   558281
```

```
                43A      10A:C5      49   20    2505   7 RW        20   558281
                34A      08A:C5      49   20    2505   8 RW        20   558281
                }
            }
        }
```

While the migration is progressing, the target device specified will be shown to be a donor device. This indicates that it is providing the target storage for the migration. The donor status can be seen in the RAID Group Information section of the symdev show output of the target device. The device state is also shown as Not Ready. This is to prevent use of the device during the migration:

symdev –sid 0398 show 670

```
    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 0670
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Number of RAID Groups    : 1
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030363730
    Device Emulation Type    : FBA
    Device Defined Label Type: N/A
    Device Defined Label     : N/A
    Device Sub System Id     : 0x0001
    Cache Partition Name     : DEFAULT_PARTITION

    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      18414
        Tracks               :     276210
        512-byte Blocks      :   35354880
        MegaBytes            :      17263
        KiloBytes            :   17677440

        Geometry Limited     : No
        }
...
    Device Configuration     : RAID-5
...
    Device Service State     : Normal

    Device Status            : Not Ready        (NR)
    Device SA Status         : N/A              (N/A)
...
    Mirror Set Type          : [RAID-5,N/A,N/A,N/A]

    Mirror Set DA Status     : [NR,N/A,N/A,N/A]
```

```
Mirror Set Inv. Tracks   : [0,0,0,0]

Back End Disk Director Information
    {
    Hyper Type                              : RAID-5
    Hyper Status                            : Not Ready       (NR)
    Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
    Spindle ID                              : N/A
    Disk Director Volume Number             : N/A
    Hyper Number                            : N/A
    Mirror Number                           : 1
    Disk Group Number                       : 20
    Disk Group Name                         : FC_R57_DG20
    }

RAID Group Information
    {
    Mirror Number                             : 1
    RAID Type                                 : RAID-5
    Device Position                           : Primary (Donor)
    Protection Level                          : 7+1
    RAID Group Service State                  : Normal
    Hyper Devices:
        {
        Device : 0670
            {
            ---------------------------------------------------------------
            Spindle   Disk     DA       Hyper      Member        Disk
                      DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
            ---------------------------------------------------------------
            30C       07A:D1      90   20    2505   1 RW        20   558281
            BF4       10B:D1     147   20    2505   2 RW        20   558281
            B04       08B:D1     146   20    2505   3 RW        20   558281
            1A40      09D:C1      20   20    2505   4 RW        20   558281
            1950      07D:C1      20   20    2505   5 RW        20   558281
            1338      10C:C1      20   20    2505   6 RW        20   558281
            1248      08C:C1      20   20    2505   7 RW        20   558281
            3FC       09A:D1     147   20    2505   8 RW        20   558281
            }
        }
    }
```

At the end of the migration, the **symmigrate query** command shows the session status change from SyncInProg to Synchronized, to MigrInProg, and finally to Migrated:

```
symmigrate –sid 0398 –name mig_DP_app query –detail –i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
01DA 0670    37876 SyncInProg     98   C   N/A          20 RAID-5(7+1)         mig_DP_app
01DE 066C    23564 SyncInProg     98   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E2 0668    26266 SyncInProg     98   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E6 04AC    35424 SyncInProg     98   C   N/A          20 RAID-5(7+1)         mig_DP_app
```

```
Total     --------
 Tracks     123130
 MB(s)      7695.6
 Done(%)        98

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- -------------------- -------------
01DA 0670        0 Synchronized  100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01DE 066C        0 Synchronized  100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E2 0668        0 Synchronized  100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E6 04AC        0 Synchronized  100   C   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks           0
 MB(s)          0.0
 Done(%)        100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.


Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- -------------------- -------------
01DA 0670        0 MigrInProg    100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01DE 066C        0 MigrInProg    100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E2 0668        0 MigrInProg    100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E6 04AC        0 MigrInProg    100   C   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks           0
 MB(s)          0.0
 Done(%)        100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- -------------------- -------------
```

```
01DA 0670        0 Migrated      100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01DE 066C        0 Migrated      100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E2 0668        0 Migrated      100   C   N/A          20 RAID-5(7+1)         mig_DP_app
01E6 04AC        0 Migrated      100   C   N/A          20 RAID-5(7+1)         mig_DP_app

Total     --------
 Tracks          0
 MB(s)         0.0
 Done(%)       100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

Alternatively, the **symmigrate verify** command can be used to determine if all the devices in a single session have reached the state of Migrated:

```
symmigrate -sid 0398 -name mig_DP_app verify -migrated

All session(s) with name 'mig_DP_app' are in 'Migrated' state.
```

When the migration session has reached the Migrated status, the symdev show output now shows that the devices migrated are once again protected by a single local RAID group. However, the primary RAID group now is the RAID 5 group located on the FC drives in disk group 20:

```
symdev –sid 0398 show 1DA

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 01DA
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Device Group Name        : TEST_DP_App
    Device Logical Name      : DEV001

    Number of RAID Groups    : 1
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030314441
    Device Emulation Type    : FBA
    Device Defined Label Type: N/A
    Device Defined Label     : N/A
    Device Sub System Id     : 0x0001
    Cache Partition Name     : DEFAULT_PARTITION

    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      73656
```

```
        Tracks                :    1104840
        512-byte Blocks       :  141419520
        MegaBytes             :      69053
        KiloBytes             :   70709760

        Geometry Limited      : No
        }
...
    Device Configuration      : RAID-5          (Meta Head)
...
    Device Service State      : Normal

    Device Status             : Ready            (RW)
    Device SA Status          : N/A              (N/A)
...
    Meta Configuration        : Striped
    Meta Stripe Size          : 960k    (1 Cylinders)
    Meta Device Members (4)   :
        {
        --------------------------------------------------------------------
                                BCV  DATA                    RDF  DATA
                            ----------------------------  -------------------------
        Sym    Cap     Std Inv BCV Inv Pair          R1 Inv R2 Inv Pair
        Dev    (MB)    Tracks  Tracks  State         Tracks Tracks State
        --------------------------------------------------------------------
    --> 01DA  17263        -       -  N/A                -      - N/A
        01DB  17263        -       -  N/A                -      - N/A
        01DC  17263        -       -  N/A                -      - N/A
        01DD  17263        -       -  N/A                -      - N/A
        --------------------------------------------------------------------
              69053        -       -                     -      -
        }

    Mirror Set Type           : [RAID-5,N/A,N/A,N/A]

    Mirror Set DA Status      : [RW,N/A,N/A,N/A]

    Mirror Set Inv. Tracks    : [0,0,0,0]

    Back End Disk Director Information
        {
        Hyper Type                              : RAID-5
        Hyper Status                            : Ready           (RW)
        Disk [Director, Interface, TID]         : [N/A,N/A,N/A]
        Spindle ID                              : N/A
        Disk Director Volume Number             : N/A
        Hyper Number                            : N/A
        Mirror Number                           : 1
        Disk Group Number                       : 20
        Disk Group Name                         : FC_R57_DG20
        }

    RAID Group Information
        {
        Mirror Number                             : 1
        RAID Type                                 : RAID-5
        Device Position                           : Primary
        Protection Level                          : 7+1
        RAID Group Service State                  : Normal
        Hyper Devices:
```

```
{
Device : 01DA (M)
    {
    ------------------------------------------------------------------
    Spindle   Disk     DA        Hyper      Member         Disk
              DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
    ------------------------------------------------------------------
    30C       07A:D1      90   20    2505   1 RW         20   558281
    BF4       10B:D1     147   20    2505   2 RW         20   558281
    B04       08B:D1     146   20    2505   3 RW         20   558281
    1A40      09D:C1      20   20    2505   4 RW         20   558281
    1950      07D:C1      20   20    2505   5 RW         20   558281
    1338      10C:C1      20   20    2505   6 RW         20   558281
    1248      08C:C1      20   20    2505   7 RW         20   558281
    3FC       09A:D1     147   20    2505   8 RW         20   558281
    }
Device : 01DB (m)
    {
    ------------------------------------------------------------------
    Spindle   Disk     DA        Hyper      Member         Disk
              DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
    ------------------------------------------------------------------
    385       08A:D2     167   21    2505   1 RW         20   558281
    B7E       09B:D4     149   21    2505   2 RW         20   558281
    A8E       07B:D4     149   21    2505   3 RW         20   558281
    12FD      09C:D3     174   21    2505   4 RW         20   558281
    120D      07C:D3     174   21    2505   5 RW         20   558281
    1AF5      10D:D3     138   21    2505   6 RW         20   558281
    1A05      08D:D3     173   21    2505   7 RW         20   558281
    475       10A:D2     144   21    2505   8 RW         20   558281
    }
Device : 01DC (m)
    {
    ------------------------------------------------------------------
    Spindle   Disk     DA        Hyper      Member         Disk
              DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
    ------------------------------------------------------------------
    ACA       08B:C4      64   21    2505   1 RW         20   558281
    1AB8      10D:C0      22   22    2505   2 RW         20   558281
    19C8      08D:C0      22   22    2505   3 RW         20   558281
    12C0      09C:C0      22   22    2505   4 RW         20   558281
    11D0      07C:C0      22   22    2505   5 RW         20   558281
    3C2       09A:C4      64   21    2505   6 RW         20   558281
    2D2       07A:C4      42   21    2505   7 RW         20   558281
    BBA       10B:C4      65   21    2505   8 RW         20   558281
    }
Device : 01DD (m)
    {
    ------------------------------------------------------------------
    Spindle   Disk     DA        Hyper      Member         Disk
              DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
    ------------------------------------------------------------------
    B06       08B:D5     190   20    2505   1 RW         20   558281
    BF6       10B:D5     191   20    2505   2 RW         20   558281
    1A42      09D:C5      48   20    2505   3 RW         20   558281
    1952      07D:C5      48   20    2505   4 RW         20   558281
    120E      07C:D5     195   20    2505   5 RW         20   558281
    12FE      09C:D5     195   20    2505   6 RW         20   558281
    43A       10A:C5      49   20    2505   7 RW         20   558281
    34A       08A:C5      49   20    2505   8 RW         20   558281
```

```
                }
            }
        }
```

Also, the target device used in the migration now has the original storage previously associated with the device migrated. A **symdev show** output from the target device shows that it is now RAID 1 protected on storage configured in disk group 21. The device is also now ready again:

```
symdev -sid 0398 show 670

    Device Physical Name     : Not Visible

    Device Symmetrix Name    : 0670
    Device Serial ID         : N/A
    Symmetrix ID             : 000195700398

    Number of RAID Groups    : 1
...
    Vendor ID                : EMC
    Product ID               : SYMMETRIX
    Product Revision         : 5876
    Device WWN               : 60000970000195700398533030363730
    Device Emulation Type    : FBA
    Device Defined Label Type: N/A
    Device Defined Label     : N/A
    Device Sub System Id     : 0x0001
    Cache Partition Name     : DEFAULT_PARTITION

    Device Block Size        : 512

    Device Capacity
        {
        Cylinders            :      18414
        Tracks               :     276210
        512-byte Blocks      :   35354880
        MegaBytes            :      17263
        KiloBytes            :   17677440

        Geometry Limited     : No
        }
...
    Device Configuration     : 2-Way Mir
...
    Device Service State     : Normal

    Device Status            : Ready            (RW)
    Device SA Status         : N/A              (N/A)
...
    Mirror Set Type          : [RAID-1,N/A,N/A,N/A]

    Mirror Set DA Status     : [RW,N/A,N/A,N/A]

    Mirror Set Inv. Tracks   : [0,0,0,0]

    Back End Disk Director Information
        {
```

```
      Hyper Type                            : RAID-1
      Hyper Status                          : Ready           (RW)
      Disk [Director, Interface, TID]       : [N/A,N/A,N/A]
      Spindle ID                            : N/A
      Disk Director Volume Number           : N/A
      Hyper Number                          : N/A
      Mirror Number                         : 1
      Disk Group Number                     : 21
      Disk Group Name                       : FC_R1_DG21
      }

   RAID Group Information
      {
      Mirror Number                           : 1
      RAID Type                               : RAID-1
      Device Position                         : Primary
      Protection Level                        : 2
      RAID Group Service State                : Normal
      Hyper Devices:
          {
          Device : 0670
              {
              ------------------------------------------------------------------
              Spindle   Disk     DA       Hyper      Member        Disk
                        DA :IT   Vol#   Num Cap(MB) Num Status  Grp#  Cap(MB)
              ------------------------------------------------------------------
              120F     07C:D7     203    7   17536   1 RW        21   558281
              12FF     09C:D7     203    7   17536   2 RW        21   558281
              }
          }
      }
```

To complete the migration, and to remove the migration session from the Symmetrix array, the **symmigrate terminate** command is run:

```
symmigrate -sid 0398 -name mig_DP_app terminate

Execute 'Terminate' operation execution for
the session named 'mig_DP_app' (y/[n]) ? y

'Terminate' operation execution is in progress for
the session named 'mig_DP_app'. Please wait...

  Terminate Migration.............................................Started.
  Terminate Migration.............................................Done.

'Terminate' operation successfully executed for
the session named 'mig_DP_app'.
```

A subsequent query shows the session no longer exists:

```
symmigrate -sid 0398 -name mig_DP_app query

Symmetrix ID: 000195700398

The device list with session name 'mig_DP_app' does not have any session information.
```

The Virtual LUN migration is now complete.

Migration to target thin pool using SYMCLI

In this example, four thin metadevices, currently bound to a thin pool containing RAID 1 data devices, configured on FC drives, will be migrated to a thin pool containing RAID 5 (3+1) data devices, configured on EFDs.

The devices being migrated are grouped together in a storage group TEST_VP_App:

```
symsg -sid 0398 show TEST_VP_App

Name: TEST_VP_App

   Symmetrix ID             : 000195700398
   Last updated at          : Mon Jan 21 11:15:53 2013
   Masking Views            : Yes
   FAST Policy              : No
   Host I/O Limit           : None
   Host I/O Limit MB/Sec    : N/A
   Host I/O Limit IO/Sec    : N/A
   Number of Storage Groups : 0
   Storage Group Names      : N/A

   Devices (4):
    {
    ----------------------------------------------------------
    Sym                               Device               Cap
    Dev    Pdev Name                  Config        Sts    (MB)
    ----------------------------------------------------------
    019C   N/A                        TDEV           RW   69053
    01A0   N/A                        TDEV           RW   69053
    01A4   N/A                        TDEV           RW   69053
    01A8   N/A                        TDEV           RW   69053
    }
```

The amount of space allocated for each device, and the pool they are bound to, can be determined by running:

```
symcfg -sid 0398 list -tdev -sg TEST_VP_App


Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  635295810
Bound   Capacity (Tracks) :    4419360

                S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                          Total          Total       Compressed
       Bound      Flgs      Total       Allocated       Written      Size/Ratio
Sym  Pool Name    EMPT     Tracks      Tracks (%)     Tracks (%)     Tracks (%)
---- ------------ ---- ---------- ---------- --- ---------- --- ---------- ---
019C R1_FC_Pool   F..B    1104840     780636  71     355996  32     780636   0
01A0 R1_FC_Pool   F..B    1104840     499668  45     136949  12     499668   0
```

```
01A4 R1_FC_Pool   F..B    1104840    1097304  99     388217  35    1097304   0
01A8 R1_FC_Pool   F..B    1104840     718080  65     340527  31     718080   0

Total                   ---------- ---------- --- ---------- --- ---------- ---
Tracks                     4419360    3095688   0    1221689   0    3095688   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (M)ultipool : X = multi-pool allocations, . = single pool allocation
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

To determine which thin pool to perform the migration to, the **symcfg** command can be used to list all thin pools in the array, showing the RAID protection type, the enabled space, and the amount of free space, as the total number of free tracks and a percentage, in each of the pools:

symcfg -sid 0398 list -pools -thin

```
Symmetrix ID: 000195700398

                        S Y M M E T R I X   P O O L S
-------------------------------------------------------------------------------
Pool          Flags  Dev              Usable       Free       Used Full Comp
Name          PTECSL Config           Tracks     Tracks     Tracks  (%)  (%)
------------ ------ ------------ ---------- ---------- ---------- ---- ----
R53_EFD_Pool TEFDEI RAID-5(3+1)    71999616   69006084    2993532    4    0
R1_FC_Pool   TFFDEI 2-Way Mir     175680000  161380608   14299392    8    0
R57_FC_Pool  TFFDEI RAID-5(7+1)   175680000  175680000          0    0    0
R0_FTS_Pool  T-FDEX Unprotected    17664000   15009312    2654688   15    0
R6_SATA_Pool TSFEEI RAID-6(6+2)   167771136  151517688   16253448    9    1

Total                           ---------- ---------- ---------- ---- ----
Tracks                           608794752  572593692   36201060    6    0

Legend:
  (P)ool Type:
    S = Snap,  R = Rdfa DSE  T = Thin
  (T)echnology:
    S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, M = Mixed, - = N/A
  Dev (E)mulation:
    F = FBA, A = AS400, 8 = CKD3380, 9 = CKD3390, - = N/A
  (C)ompression:
    E = Enabled, D = Disabled, N = Enabling, S = Disabling, - = N/A
  (S)tate:
    E = Enabled, D = Disabled, B = Balancing
  Disk (L)ocation:
    I = Internal, X = External, M = Mixed, - = N/A
```

This information can be used to determine if there is sufficient free space in the target pool to accept the allocated space of all the thin devices to be migrated.

After the devices to be migrated, and the thin pool to be migrated to, have been identified, the migration can be submitted to the array.

First, the **symmigrate validate** command is used to test the potential success of the migration. In this example, the migration session name being used is mig_thin_app1:

```
symmigrate –sid 0398 –sg TEST_VP_App -name mig_VP_app -tgt_pool
–pool R53_EFD_Pool validate -v

Execute 'Validate' operation execution for
the device group 'TEST_VP_App' (y/[n]) ? y

'Validate' operation execution is in progress for
the device group 'TEST_VP_App'. Please wait...

STARTING a Migrate 'VALIDATE' operation.

Source devices:
 019C:01AB [SELECTED]

  Validate Migration.............................................Started.
  Validate Migration.............................................Done.

The Migrate 'VALIDATE' operation SUCCEEDED.

'Validate' operation successfully executed for
the device group 'TEST_VP_App'.
```

When the proposed migration has been validated successfully, it can then be established, thereby executing the migration:

```
symmigrate -sid 0398 -sg TEST_VP_App -name mig_VP_app -tgt_pool -pool
R53_EFD_Pool establish -v

Execute 'Establish' operation execution for
the device group 'TEST_VP_App' (y/[n]) ? y

'Establish' operation execution is in progress for
the device group 'TEST_VP_App'. Please wait...

STARTING a Migrate 'ESTABLISH' operation.

Source devices:
019C:01AB [SELECTED]

  Establish Migration............................................Started.
  Establish Migration............................................Done.

The Migrate 'ESTABLISH' operation SUCCEEDED.

'Establish' operation successfully executed for
the device group 'TEST_VP_App'.
```

An initial query of the migration shows the migration session state as being SyncInProg:

```
symmigrate –sid 0398 –name mig_VP_app query –detail
```

```
Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
019C  N/A   727800 SyncInProg     34   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A0  N/A   446652 SyncInProg     59   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A4  N/A  1044420 SyncInProg      5   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A8  N/A   665184 SyncInProg     39   V   N/A          10 R53_EFD_Pool        mig_VP_app

Total     --------
 Tracks    2884056
 MB(s)      180254
 Done(%)        34

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

The **symmigrate query** command, when used with the –i interval options, allows for the query to be run automatically at the given interval (in seconds). After the second iteration of the query, an estimated time to completion is included with the output, along with the current data transfer rate:

```
symmigrate –sid 0398 –name mig_VP_app query –detail –i 30
```

```
Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
019C  N/A   664392 SyncInProg     39   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A0  N/A   372948 SyncInProg     66   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A4  N/A   970440 SyncInProg     12   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A8  N/A   601668 SyncInProg     45   V   N/A          10 R53_EFD_Pool        mig_VP_app

Total     --------
 Tracks    2609448
 MB(s)      163090
 Done(%)        40

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

```
Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
019C  N/A   590436 SyncInProg     46   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A0  N/A   298944 SyncInProg     72   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A4  N/A   906240 SyncInProg     17   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A8  N/A   527940 SyncInProg     52   V   N/A          10 R53_EFD_Pool        mig_VP_app

Total     --------
 Tracks    2323560
 MB(s)      145222
 Done(%)        47


Copy Rate                       :    558.4 MB/S
Estimated time to completion    : 00:06:25

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

While the migration is in the SyncInProg state, the output of a **symcfg list** command, with the **–detail** option, shows the devices being migrated as being bound to the target pool, R53_EFD_Pool, but still having tracks allocated in the original thin pool, R1_FC_Pool:

```
symcfg –sid 0398 list –tdev –sg TEST_VP_App -detail

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  635295810
Bound   Capacity (Tracks) :    4419360

                    S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                  Pool         Pool          Total      Compressed
      Bound      Flags      Total  Subs      Allocated        Written     Size/Ratio
Sym  Pool Name    ESPT      Tracks   (%)     Tracks (%)     Tracks (%)     Tracks (%)
---- ------------ ----- ---------- ----- ---------- --- ---------- --- ---------- ---
019C R53_EFD_Pool F..B     1104840     2      42276   4     355996  32      42276   0
     R1_FC_Pool   -.--           -     -     738360  67          -   -     738360   0
01A0 R53_EFD_Pool F..B     1104840     2      52824   5     136949  12      52824   0
     R1_FC_Pool   -.--           -     -     446844  40          -   -     446844   0
01A4 R53_EFD_Pool F..B     1104840     2      52884   5     388217  35      52884   0
     R1_FC_Pool   -.--           -     -    1044420  95          -   -    1044420   0
01A8 R53_EFD_Pool F..B     1104840     2      42444   4     340527  31      42444   0
     R1_FC_Pool   -.--           -     -     675636  61          -   -     675636   0

Total                   ---------- ----- ---------- --- ---------- --- ---------- ---
Tracks                     4419360     1    3095688   0    1221689   0    3095688   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
```

```
        (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
        (P)ersistent Allocs : A = All, S = Some, . = None
        S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                      D = Deallocating, R = Reclaiming, C = Compressing,
                      N = Uncompressing, . = Unbound,
```

At the end of the migration, the **symmigrate query** command will show the session status change from SyncInProg to Migrated:

```
symmigrate -sid 1849 -name mig_app1 query -detail -i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
019C  N/A        0 SyncInProg    100   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A0  N/A        0 SyncInProg    100   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A4  N/A   220140 SyncInProg     80   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A8  N/A        0 SyncInProg    100   V   N/A          10 R53_EFD_Pool        mig_VP_app

Total     --------
 Tracks     220140
 MB(s)     13758.8
 Done(%)        95


Copy Rate                       :    273.8 MB/S
Estimated time to completion    : 00:00:42

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags            Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T    SRC Pool  Grp    TGT Description   Session Name
---- ---- -------- ------------ ---- ----- ---------- ---- ------------------- -------------
019C  N/A        0 Migrated      100   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A0  N/A        0 Migrated      100   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A4  N/A        0 Migrated      100   V   N/A          10 R53_EFD_Pool        mig_VP_app
01A8  N/A        0 Migrated      100   V   N/A          10 R53_EFD_Pool        mig_VP_app

Total     --------
 Tracks           0
 MB(s)          0.0
 Done(%)        100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

Alternatively, the **symmigrate verify** command can be used to determine

if all the devices in a single session have reached the state of Migrated:

```
symmigrate –sid 0398 –name mig_VP_app verify -migrated

All session(s) with name 'mig_VP_app' are in 'Migrated' state.
```

When the migration session has reached the Migrated status, the **symcfg list** output now shows that the devices migrated have tracks allocated in only one pool, the target pool – R53_EFD_Pool:

```
symcfg –sid 0398 list –tdev –sg TEST_VP_App

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  635295810
Bound   Capacity (Tracks) :    4419360

                S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                          Total          Total       Compressed
       Bound      Flgs      Total      Allocated       Written      Size/Ratio
Sym  Pool Name    EMPT     Tracks     Tracks (%)     Tracks (%)     Tracks (%)
---- ------------ ---- ---------- ---------- --- ---------- --- ---------- ---
019C R53_EFD_Pool F..B    1104840     780636  71     355996  32     780636   0
01A0 R53_EFD_Pool F..B    1104840     499668  45     136949  12     499668   0
01A4 R53_EFD_Pool F..B    1104840    1097304  99     388217  35    1097304   0
01A8 R53_EFD_Pool F..B    1104840     718080  65     340527  31     718080   0

Total                  ---------- ---------- --- ---------- --- ---------- ---
Tracks                    4419360    3095688   0    1221689   0    3095688   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (M)ultipool : X = multi-pool allocations, . = single pool allocation
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

Run the **symmigrate terminate** command to complete the migration, and to remove the migration session from the Symmetrix array:

```
symmigrate -sid 0398 -name mig_VP_app terminate -v

Execute 'Terminate' operation execution for
the session named 'mig_VP_app' (y/[n]) ? y

'Terminate' operation execution is in progress for
the session named 'mig_VP_app'. Please wait...

STARTING a Migrate 'TERMINATE' operation.

  Terminate Migration.............................................Started.
  Terminate Migration.............................................Done.
```

```
The Migrate 'TERMINATE' operation SUCCEEDED.

'Terminate' operation successfully executed for
the session named 'mig_VP_app'.
```

A subsequent query shows the session no longer exists:

```
symmigrate -sid 0398 -name mig_VP_app query

Symmetrix ID: 000195700398

The device list with session name 'mig_VP_app' does not have any session information.
```

The Virtual LUN migration is now complete.

Migration from source thin pool to target thin pool using SYMCLI

In this example, four thin metadevices, managed by FAST VP and with data spread across three separate pools, will have all data currently allocated in a RAID 6 (6+2) SATA thin pool migrated to a RAID 1 FC thin pool. All the data allocated in the RAID 5 (3+1) EFD thin pool will remain in that pool.

The devices being migrated are grouped together in a storage group, TEST_VP_App:

```
symsg –sid 0398 show TEST_VP_App

Name: TEST_VP_App

   Symmetrix ID               : 000195700398
   Last updated at            : Mon Jan 21 11:13:49 2013
   Masking Views              : Yes
   FAST Policy                : Yes
   Host I/O Limit             : None
   Host I/O Limit MB/Sec      : N/A
   Host I/O Limit IO/Sec      : N/A
   Dynamic Distribution       : N/A
   Number of Storage Groups   :    0
   Storage Group Names        : N/A

   Devices (4):
    {
    ----------------------------------------------------------
    Sym                              Device               Cap
    Dev    Pdev Name                 Config        Sts    (MB)
    ----------------------------------------------------------
    019C   N/A                       TDEV           RW   69053
    01A0   N/A                       TDEV           RW   69053
    01A4   N/A                       TDEV           RW   69053
    01A8   N/A                       TDEV           RW   69053
    }
```

Run the following command to determine the amount of space allocated

for each device, and the pools the data is allocated in:

```
symcfg -sid 0398 list -tdev -sg TEST_VP_App -detail

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  619729098
Bound   Capacity (Tracks) :    4419360

                    S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                    Pool         Pool         Total    Compressed
       Bound      Flags      Total  Subs    Allocated       Written    Size/Ratio
Sym  Pool Name    ESPT      Tracks   (%)   Tracks (%)     Tracks (%)   Tracks (%)
---- ------------ ----- --------- ----- --------- --- ---------- --- --------- ---
019C R1_FC_Pool   F..B     1104840     1    543552  49     637364  58    543552   0
     R53_EFD_Pool -.--           -     -     67224   6          -   -     67224   0
     R6_SATA_Pool -.--           -     -    214512  19          -   -    214512   0
01A0 R1_FC_Pool   F..B     1104840     1    525060  48     637448  58    525060   0
     R53_EFD_Pool -.--           -     -    126048  11          -   -    126048   0
     R6_SATA_Pool -.--           -     -    174204  16          -   -    174204   0
01A4 R1_FC_Pool   F..B     1104840     1    562968  51     636073  58    562968   0
     R53_EFD_Pool -.--           -     -     47820   4          -   -     47820   0
     R6_SATA_Pool -.--           -     -    214512  19          -   -    214512   0
01A8 R1_FC_Pool   F..B     1104840     1    460284  42     638864  58    460284   0
     R53_EFD_Pool -.--           -     -    190824  17          -   -    190824   0
     R6_SATA_Pool -.--           -     -    174192  16          -   -    174192   0

Total                   ---------- ----- --------- --- ---------- --- --------- ---
Tracks                     4419360     1   3301200   1   2549749   0  3301200   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

To determine which thin pool to perform the migration to, the **symcfg** command can be used to list all thin pools in the array, showing the RAID protection type, the enabled space, and the amount of free space, as the total number of free tracks and a percentage, in each of the pools:

```
symcfg -sid 0398 list -pools -thin

Symmetrix ID: 000195700398

                    S Y M M E T R I X   P O O L S
--------------------------------------------------------------------------
Pool         Flags  Dev             Usable       Free       Used Full Comp
Name         PTECSL Config          Tracks     Tracks     Tracks  (%)  (%)
------------ ------ ------------ ---------- ---------- ---------- ---- ----
R53_EFD_Pool TEFDEI RAID-5(3+1)    71999616   68146908    3852708    5    0
R1_FC_Pool   TFFDEI 2-Way Mir     175680000  113245716   62434284   35    0
```

```
R57_FC_Pool  TFFDEI RAID-5(7+1)   175680000  175680000          0    0    0
small_pool   TFFEEI 2-Way Mir       4392000     141480    4250520   96    0
R0_FTS_Pool  T-FDEX Unprotected    17664000   17664000          0    0    0
R6_SATA_Pool TSFEEI RAID-6(6+2)   167771136  144840156   22930980   13    0

Total                            ---------- ---------- ---------- ---- ----
Tracks                            613186752  519718260   93468492   15    0

Legend:
  (P)ool Type:
    S = Snap,  R = Rdfa DSE  T = Thin
  (T)echnology:
    S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, M = Mixed, - = N/A
  Dev (E)mulation:
    F = FBA, A = AS400, 8 = CKD3380, 9 = CKD3390, - = N/A
  (C)ompression:
    E = Enabled, D = Disabled, N = Enabling, S = Disabling, - = N/A
  (S)tate:
    E = Enabled, D = Disabled, B = Balancing
  Disk (L)ocation:
    I = Internal, X = External, M = Mixed, - = N/A
```

This information can be used to determine if there is sufficient free space in the target pool to accept the allocated space of all the thin devices to be migrated from the SATA pool.

After the devices to be migrated, and the thin pool to be migrated to, have been identified, the migration can be submitted to the array.

First, the **symmigrate validate** command is used to test the potential success of the migration. In this example, the migration session name being used is mig_VP_app:

```
symmigrate –sid 0398 –sg TEST_VP_App -name mig_VP_app -tgt_pool
–pool R1_FC_Pool –src_pool R6_SATA_Pool validate -v

Execute 'Validate' operation execution for
the device group 'TEST_VP_App' (y/[n]) ? y

'Validate' operation execution is in progress for
the device group 'TEST_VP_App' with allocations in source pool 'R6_SATA_Pool'. Please
wait...

STARTING a Migrate 'VALIDATE' operation.

Source devices:
019C:01AB [SELECTED]

  Validate Migration.............................................Started.
  Validate Migration.............................................Done.

The Migrate 'VALIDATE' operation SUCCEEDED.

'Validate' operation successfully executed for
the device group 'TEST_VP_App' with allocations in source pool 'R6_SATA_Pool'.
```

When the proposed migration has been validated successfully, it can then be established, thereby executing the migration:

```
symmigrate –sid 0398 –sg TEST_VP_App -name mig_VP_app -tgt_pool
–pool R1_FC_Pool –src_pool R6_SATA_Pool establish -v

Execute 'Establish' operation execution for
the device group 'TEST_VP_App' (y/[n]) ? y

'Establish' operation execution is in progress for
the device group 'TEST_VP_App' with allocations in source pool 'R6_SATA_Pool'. Please
wait...

STARTING a Migrate 'ESTABLISH' operation.

Source devices:
019C:01AB [SELECTED]

  Establish Migration.............................................Started.
  Establish Migration.............................................Done.

The Migrate 'ESTABLISH' operation SUCCEEDED.

'Establish' operation successfully executed for
the device group 'TEST_VP_App' with allocations in source pool 'R6_SATA_Pool'.
```

An initial query of the migration shows the migration session state as being SyncInProg:

```
symmigrate –sid 0398 –name mig_VP_app query –detail

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags              Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T     SRC Pool   Grp    TGT Description   Session
Name
---- ---- -------- ------------ ---- ----- ------------ ---- ------------------- -----------
-
019C  N/A   214524 SyncInProg     80   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A0  N/A   174204 SyncInProg     84   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A4  N/A   214512 SyncInProg     80   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A8  N/A   174216 SyncInProg     84   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app

Total     --------
 Tracks     777456
 MB(s)     48591.0
 Done(%)        82

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

The **symmigrate query** command, when used with the –i interval option, allows for the query to be run automatically at the given interval (in seconds). After the second iteration of the query, an estimated time to completion is included with the output, along with the current data transfer rate:

```
symmigrate –sid 0398 –name mig_VP_app query –detail –i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags              Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T     SRC Pool   Grp    TGT Description   Session
Name
---- ---- -------- ------------ ---- ----- ------------ ---- ------------------- -----------
019C  N/A   186612 SyncInProg     83   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A0  N/A   139644 SyncInProg     87   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A4  N/A   186684 SyncInProg     83   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A8  N/A   140628 SyncInProg     87   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app

Total     --------
 Tracks     653568
 MB(s)     40848.0
 Done(%)        85


Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags              Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T     SRC Pool   Grp    TGT Description   Session
Name
---- ---- -------- ------------ ---- ----- ------------ ---- ------------------- -----------
019C  N/A   162684 SyncInProg     85   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A0  N/A   111816 SyncInProg     89   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A4  N/A   156912 SyncInProg     85   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A8  N/A   127512 SyncInProg     88   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app

Total     --------
 Tracks     558924
 MB(s)     34932.8
 Done(%)        87


Copy Rate                      :    190.8 MB/S
Estimated time to completion   : 00:02:39
```

While the migration is in the SyncInProg state, the output of a **symcfg list** command, with the **–detail** option, shows the devices being migrated as still being bound to the same pool, R1_FC_Pool, and still having tracks allocated in all three pools. However, the R6_SATA_Pool allocations are

seen to be decreasing and the R1_FC_Pool allocations increasing:

```
symcfg -sid 0398 list -tdev -sg TEST_VP_App -detail

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  619729098
Bound   Capacity (Tracks) :    4419360

                    S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
                                    Pool         Pool          Total      Compressed
       Bound      Flags      Total  Subs      Allocated        Written     Size/Ratio
Sym  Pool Name    ESPT      Tracks   (%)     Tracks (%)     Tracks (%)     Tracks (%)
---- ------------ ----- ---------- ----- ---------- --- ---------- --- ---------- ---
019C R1_FC_Pool   F.SB     1104840     1     717120  65     653899  59     717120   0
     R53_EFD_Pool -.--           -     -      67224   6          -   -      67224   0
     R6_SATA_Pool -.--           -     -      40944   4          -   -      40944   0
01A0 R1_FC_Pool   F.SB     1104840     1     699168  63     655317  59     699168   0
     R53_EFD_Pool -.--           -     -     126060  11          -   -     126060   0
     R6_SATA_Pool -.--           -     -         60   0          -   -         60   0
01A4 R1_FC_Pool   F.SB     1104840     1     718476  65     652504  59     718476   0
     R53_EFD_Pool -.--           -     -      47820   4          -   -      47820   0
     R6_SATA_Pool -.--           -     -      59004   5          -   -      59004   0
01A8 R1_FC_Pool   F.SB     1104840     1     633036  57     657146  59     633036   0
     R53_EFD_Pool -.--           -     -     190824  17          -   -     190824   0
     R6_SATA_Pool -.--           -     -       1428   0          -   -       1428   0

Total                   ---------- ----- ---------- --- ---------- --- ---------- ---
Tracks                     4419360     1    3301164   1    2618866   0    3301164   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

At the end of the migration, the **symmigrate query** command shows the session status change from SyncInProg to Migrated:

```
symmigrate -sid 0398 -name mig_app1 query -detail -i 30

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags              Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T     SRC Pool   Grp    TGT Description   Session
Name
---- ---- -------- ------------ ---- ----- ------------ ---- ------------------- -----------
019C  N/A    58908 SyncInProg     94   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A0  N/A     6216 SyncInProg     99   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A4  N/A    69564 SyncInProg     93   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A8  N/A    11988 SyncInProg     98   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app

Total     --------
```

```
 Tracks     146676
 MB(s)      9167.2
 Done(%)        96


Copy Rate                       :    299.6 MB/S
Estimated time to completion    : 00:00:29

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.

Symmetrix ID: 000195700398

           Invalid    Status    Done Flags              Disk
Src  Tgt    Tracks  SRC => TGT   (%)   T     SRC Pool   Grp    TGT Description   Session
Name
---- ---- -------- ------------ ---- ----- ------------ ---- ------------------- -----------
019C  N/A        0 Migrated      100   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A0  N/A        0 Migrated      100   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A4  N/A        0 Migrated      100   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app
01A8  N/A        0 Migrated      100   P   R6_SATA_Pool 21   R1_FC_Pool          mig_VP_app

Total     --------
 Tracks          0
 MB(s)         0.0
 Done(%)       100

Flags:
(T)ype: V = The session is a Virtual Provisioning migration session.
        C = The session is a configured migration session.
        U = The session is an unconfigured migration session.
        P = The session is a Virtual Provisioning pool migration session.
```

Alternatively, the **symmigrate verify** command can be used to determine if all the devices in a single session have reached the state of Migrated:

```
symmigrate –sid 0398 –name mig_VP_app verify -migrated

All session(s) with name 'mig_VP_app' are in 'Migrated' state.
```

When the migration session has reached the Migrated status, the **symcfg list** output now shows that the devices migrated have tracks allocated in only two pools, R53_EFD_Pool and R1_FC_Pool:

```
symcfg –sid 0398 list –tdev –sg TEST_VP_App

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) :  619729098
Bound   Capacity (Tracks) :    4419360

                  S Y M M E T R I X   T H I N   D E V I C E S
--------------------------------------------------------------------------------
```

```
                                        Pool          Pool          Total    Compressed
       Bound       Flags      Total     Subs     Allocated       Written    Size/Ratio
Sym  Pool Name     ESPT      Tracks      (%)     Tracks (%)     Tracks (%)    Tracks (%)
---- ------------ ----- ---------- ----- --------- --- ---------- --- -------- ---
019C R1_FC_Pool   F..B     1104840     1    758064  69     654643  59   758064   0
     R53_EFD_Pool -.--           -     -     67224   6          -   -    67224   0
01A0 R1_FC_Pool   F..B     1104840     1    699228  63     656049  59   699228   0
     R53_EFD_Pool -.--           -     -    126060  11          -   -   126060   0
01A4 R1_FC_Pool   F..B     1104840     1    777480  70     653264  59   777480   0
     R53_EFD_Pool -.--           -     -     47820   4          -   -    47820   0
01A8 R1_FC_Pool   F..B     1104840     1    634464  57     657925  60   634464   0
     R53_EFD_Pool -.--           -     -    190824  17          -   -   190824   0

Total                   ---------- ----- --------- --- ---------- --- -------- ---
Tracks                    4419360     1   3301164   1    2621881   0    3301164   0


Legend:
 Flags:  (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
         (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
         (P)ersistent Allocs : A = All, S = Some, . = None
         S(T)atus    : B = Bound, I = Binding, U = Unbinding, A = Allocating,
                       D = Deallocating, R = Reclaiming, C = Compressing,
                       N = Uncompressing, . = Unbound,
```

Run the **symmigrate terminate** command to complete the migration, and to remove the migration session from the Symmetrix array:

```
symmigrate -sid 0398 -name mig_VP_app terminate -v

Execute 'Terminate' operation execution for
the session named 'mig_VP_app' (y/[n]) ? y

'Terminate' operation execution is in progress for
the session named 'mig_VP_app'. Please wait...

STARTING a Migrate 'TERMINATE' operation.

  Terminate Migration.............................................Started.
  Terminate Migration.............................................Done.

The Migrate 'TERMINATE' operation SUCCEEDED.

'Terminate' operation successfully executed for
the session named 'mig_VP_app'.
```

A subsequent query shows the session no longer exists:

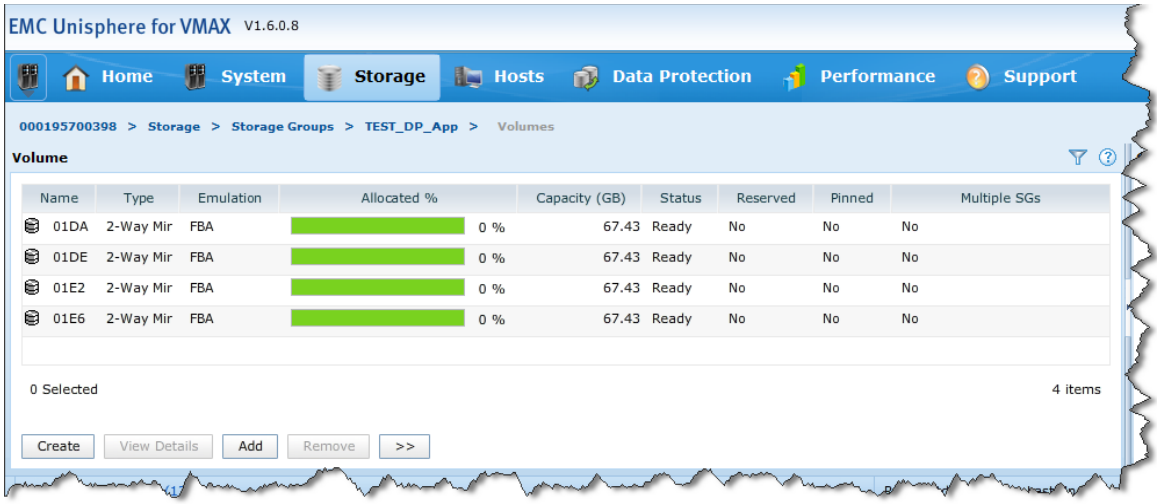
```
symmigrate -sid 0398 -name mig_VP_app query

Symmetrix ID: 000195700398

The device list with session name 'mig_VP_app' does not have any session information.
```

The Virtual LUN migration is now complete.

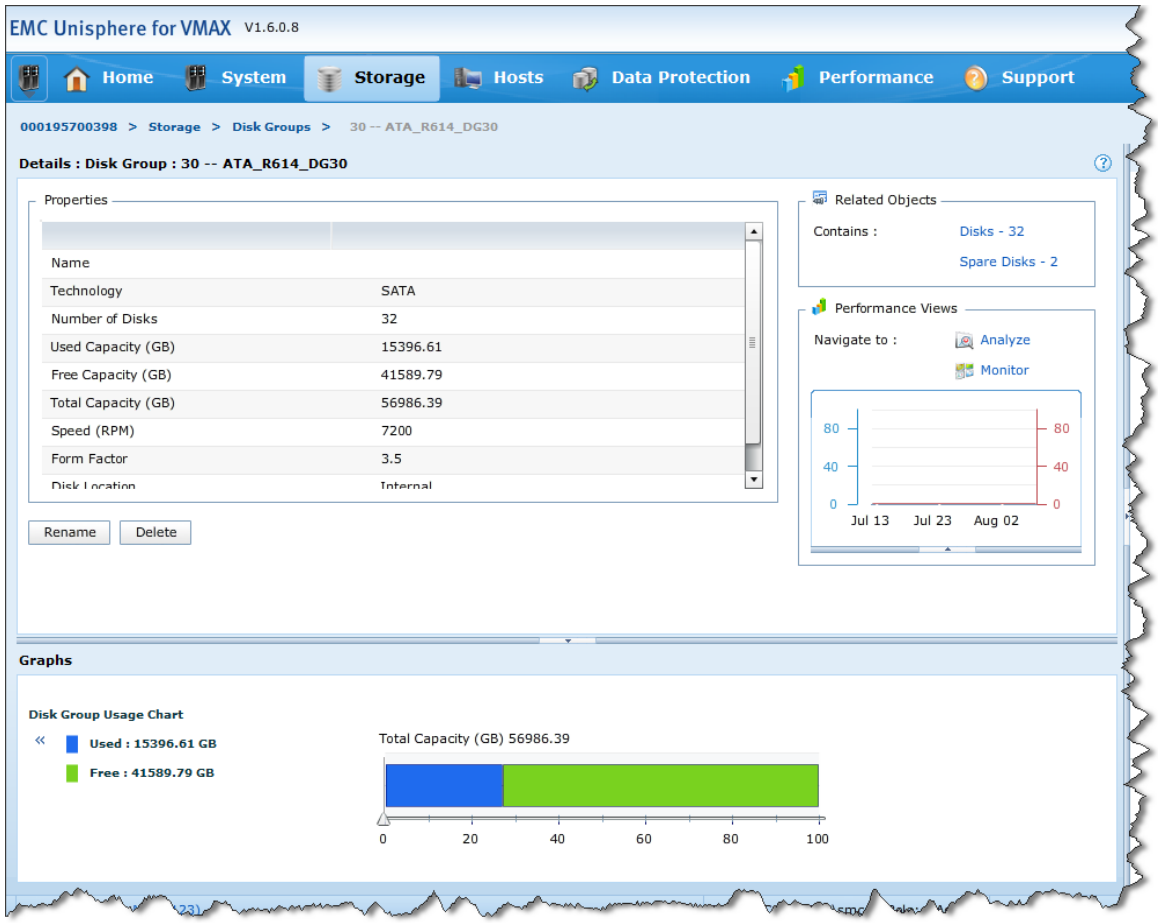
Migration to unconfigured space using Unisphere

In this example, four metadevices, currently configured as RAID 1 on FC drives, will be migrated to unconfigured space on SATA drives, as RAID 6 (6+2).

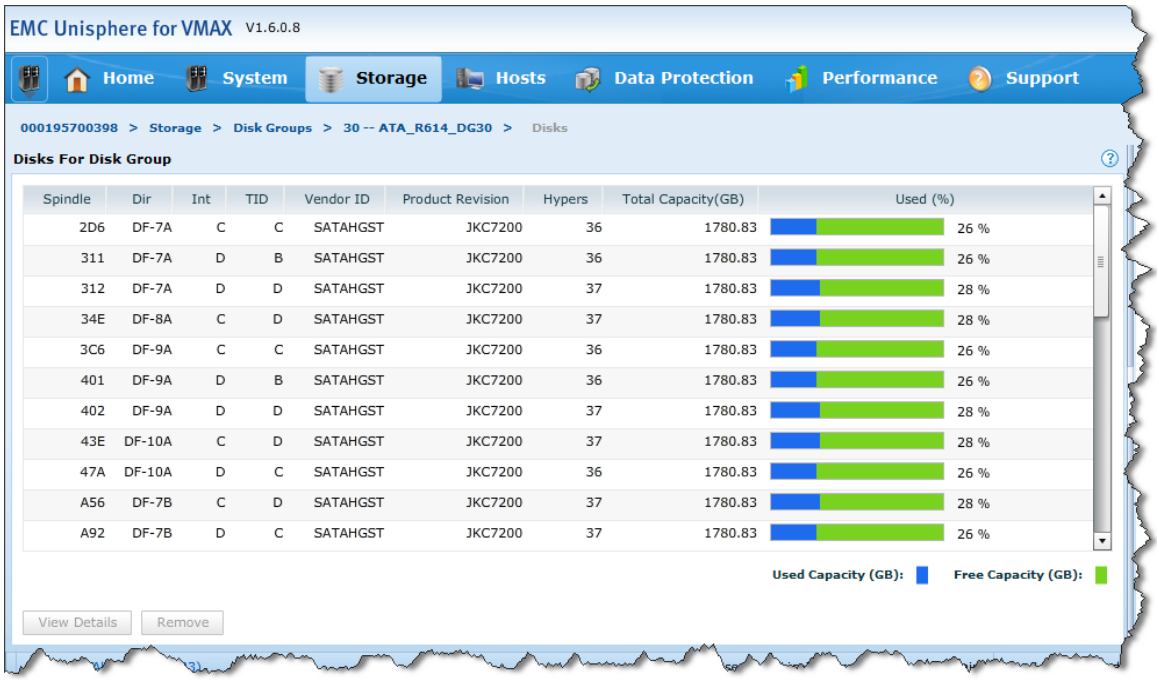
The devices being migrated are grouped together in a storage group, TEST_DP_App.



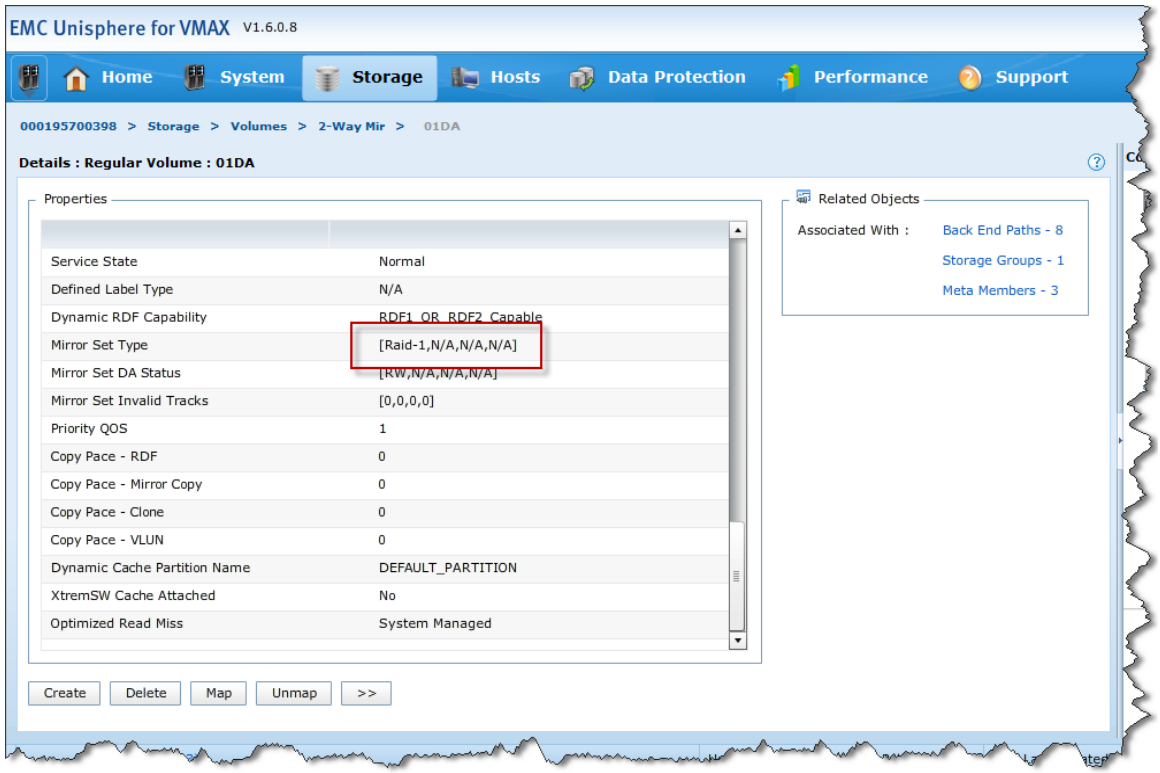
To determine which disk group to perform the migration to, the disk group properties can be viewed by navigating to the Disk Groups subsection page under Storage. Double-clicking on a disk group name displays more details for that disk group. The following illustration shows disk group 30, containing SATA drives.



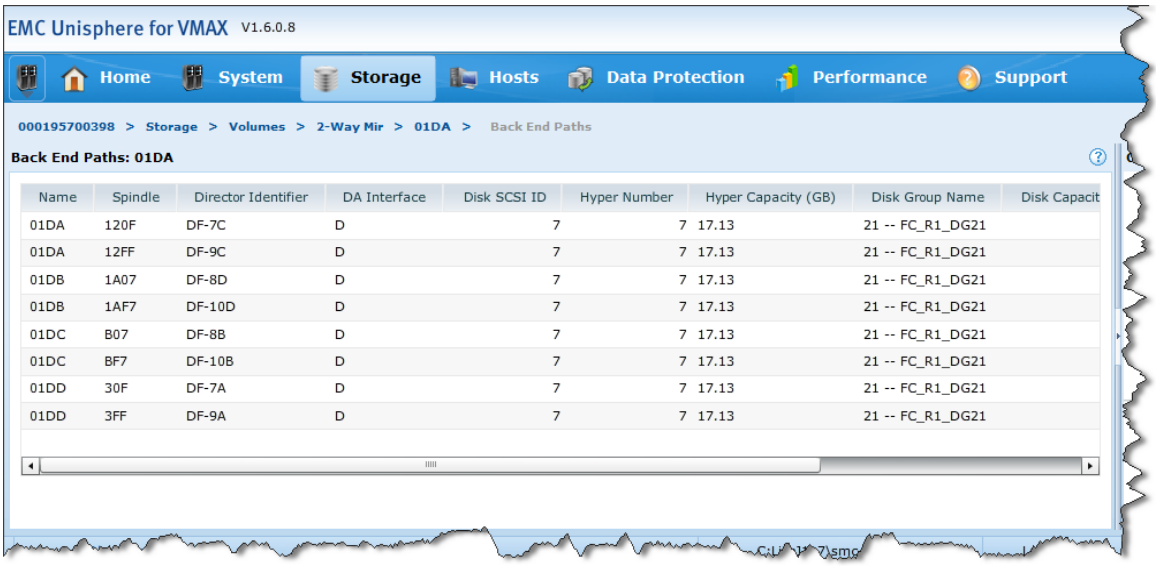
Clicking on Disks under Related Objects shows the individual drives to help determine if there is sufficient free space in the disk group, and sufficient disk adapters (DAs) and physical drives to support RAID 6 6+2 devices.



Prior to migrating the device, the Properties view of one of the devices to be migrated shows that the device is locally protected by a single RAID 1 primary RAID group.

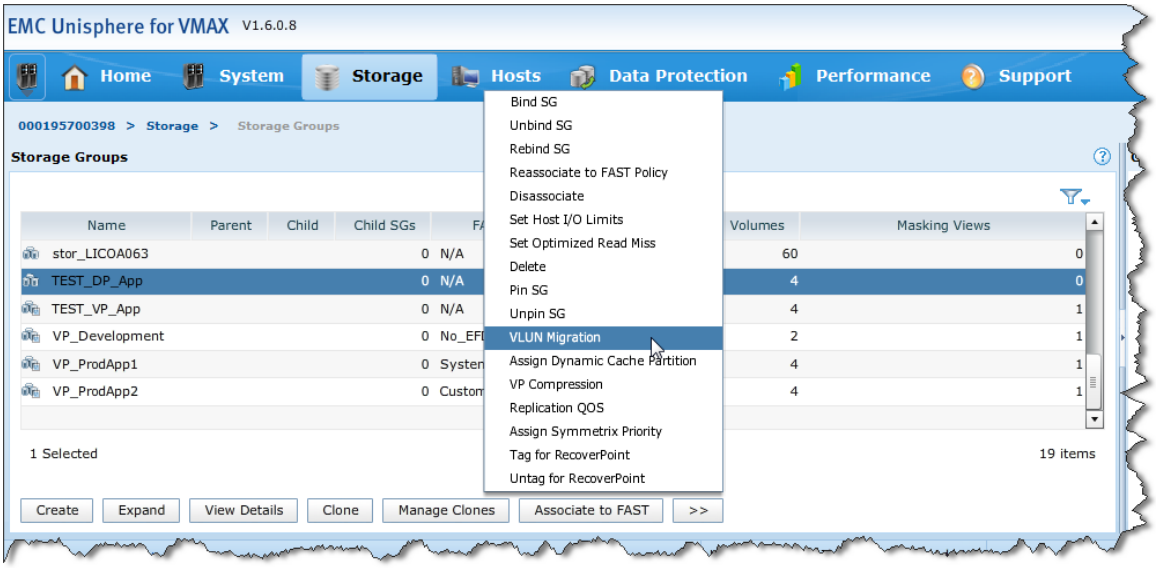


Clicking on Back End Paths under Related Objects shows that the devices are configured in disk group 21.



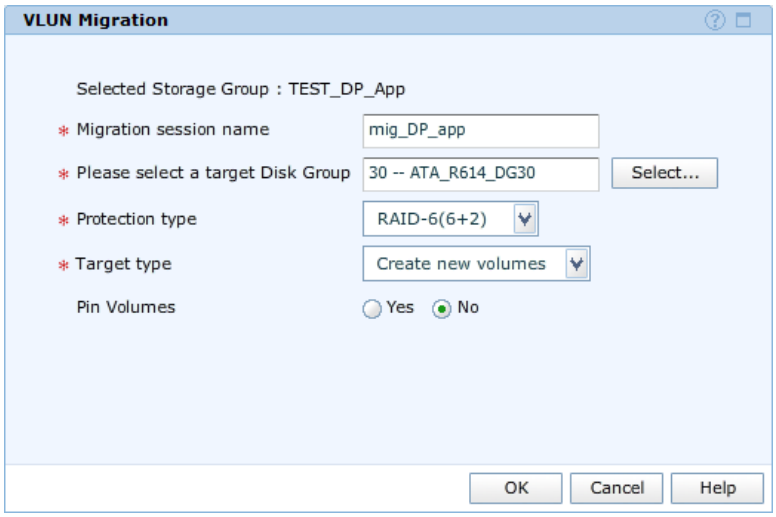
When the devices to be migrated and the disk group to be migrated to have been identified, along with the desired protection type, the migration can be submitted to the array.

On the Storage Groups subsection under Storage, select the appropriate storage group, click >>, and choose VLUN Migration.



On the resulting dialog box, provide a session name for the migration along with the target disk group and the target protection type. As this

migration is going to unconfigured space, the target type is set to Create new volumes.

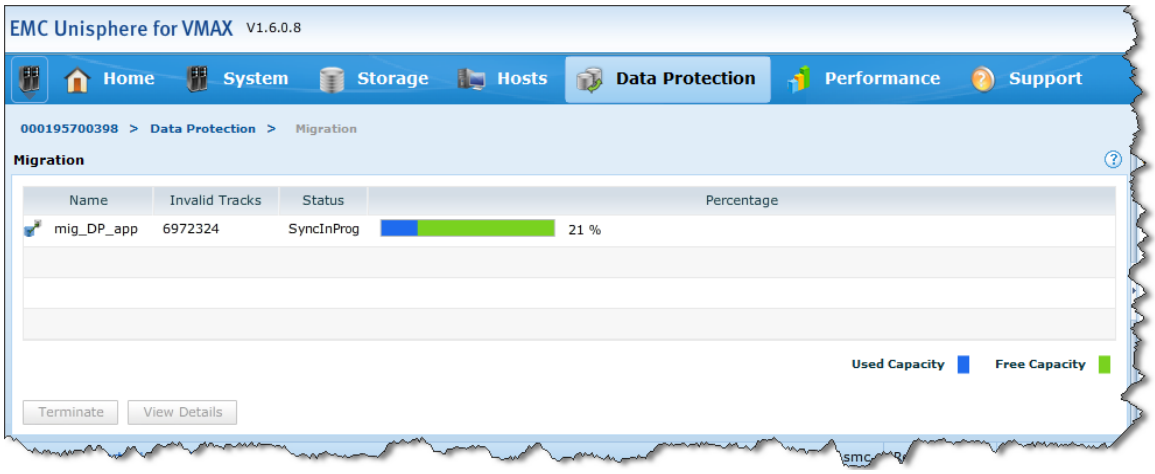


Also on this dialog box, the devices being migrated can be pinned (the default is Yes). Pinning the device prevents FAST from moving the device to another tier, until such time as the device is unpinned following the migration. Clicking Yes next to Pin Volumes pins the device after the migration is submitted.

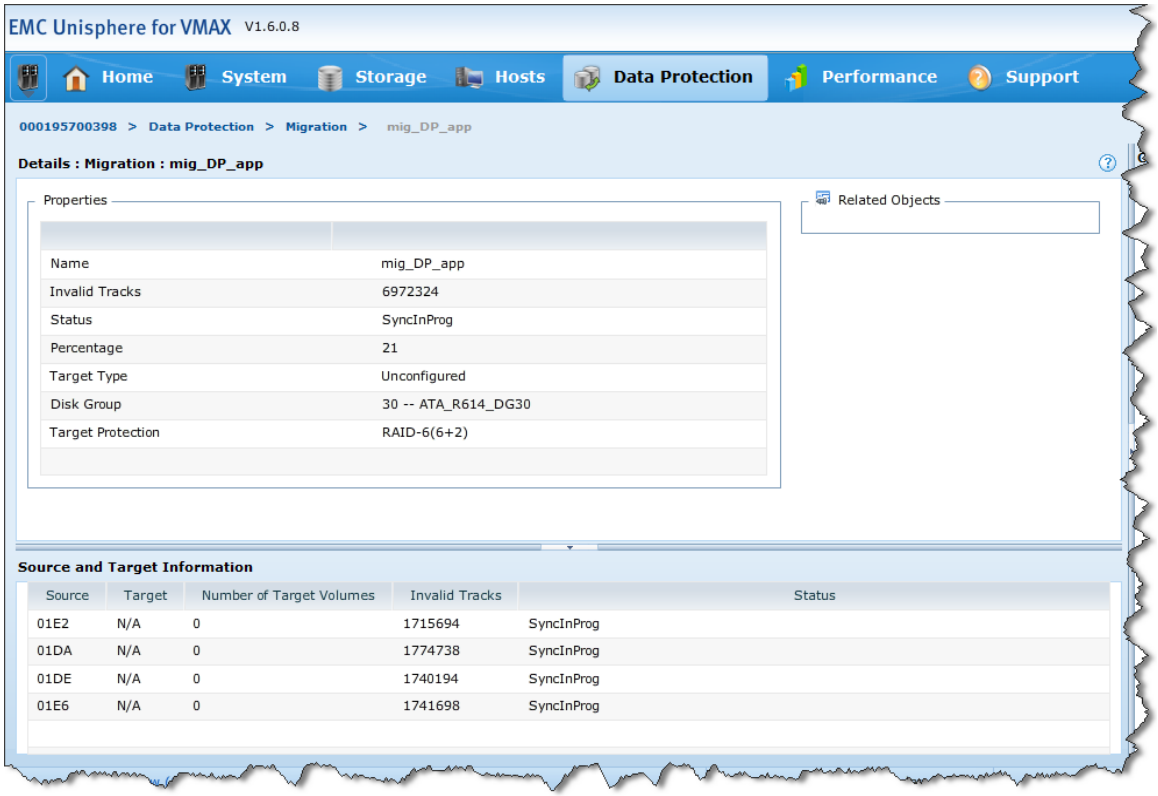
Note: The device is not automatically unpinned following the migration. It must be manually unpinned.

To submit the migration, click OK.

When a migration has been submitted, its progress can be followed from the Migration subsection page under Data Protection.

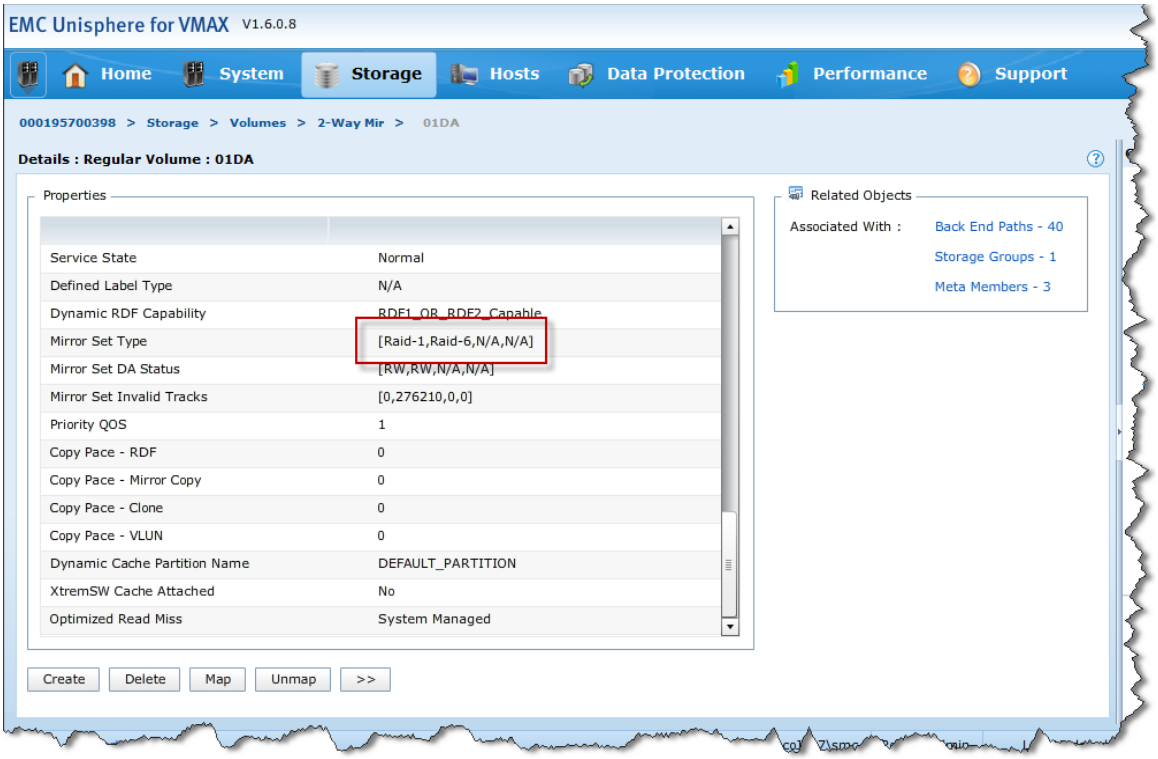


More detailed information on the migration can be seen by selecting the migration name and clicking View Details.

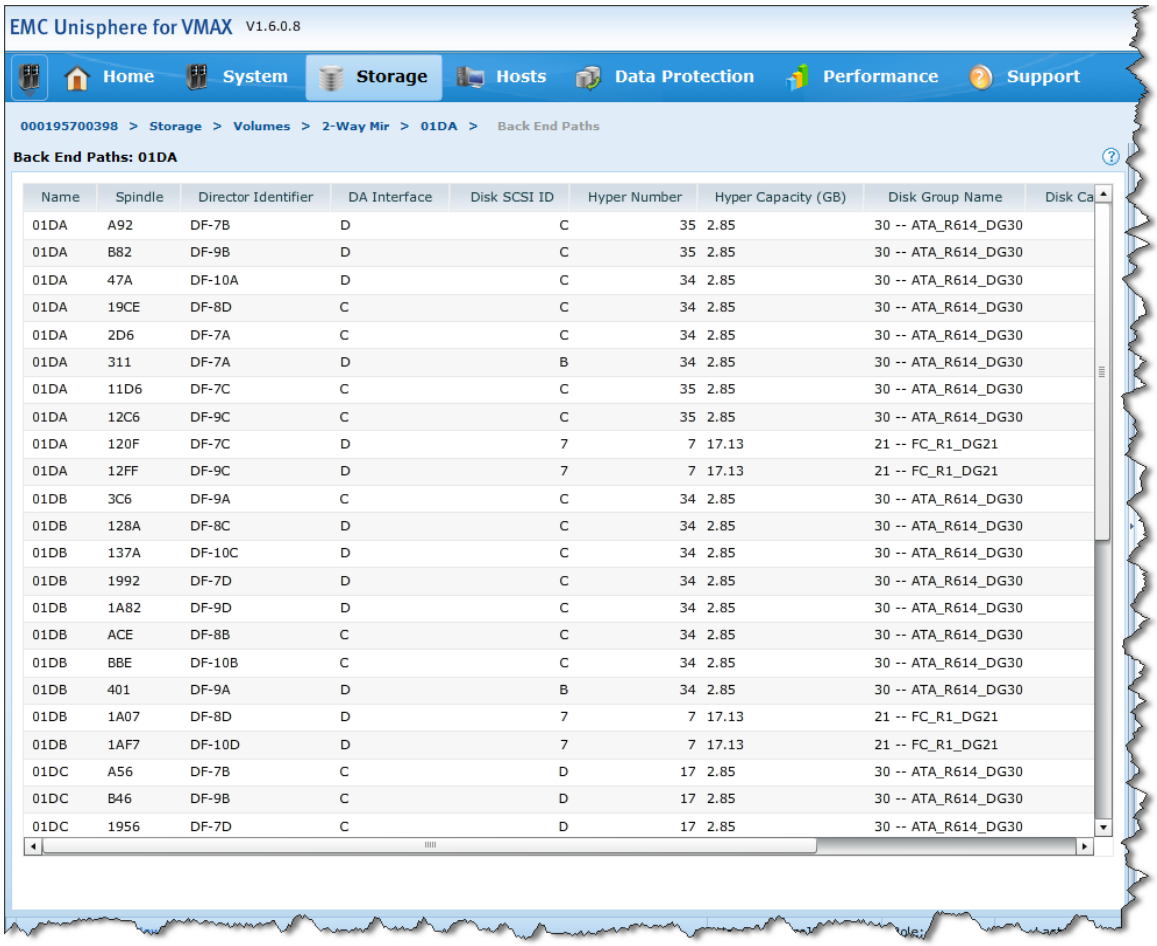


While the migration is in the SyncInProg state, the Properties view of one

of the devices being migrated shows that the device is now locally protected by two separate RAID groups, the primary RAID 1 group that the device started with, and a secondary RAID 6 group to which the device is being migrated.

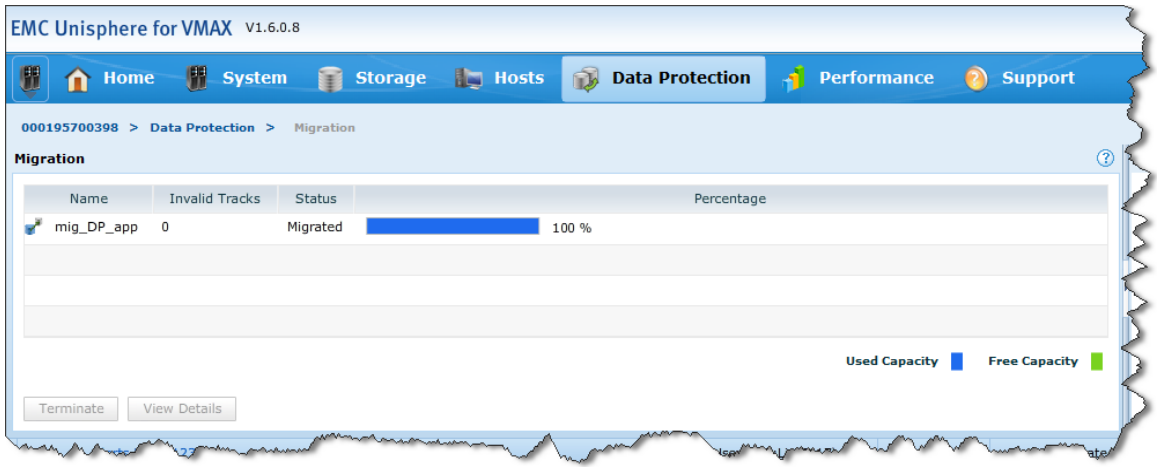


By looking at the back-end paths information for the device, the secondary RAID group can be seen to belong to disk group 30.

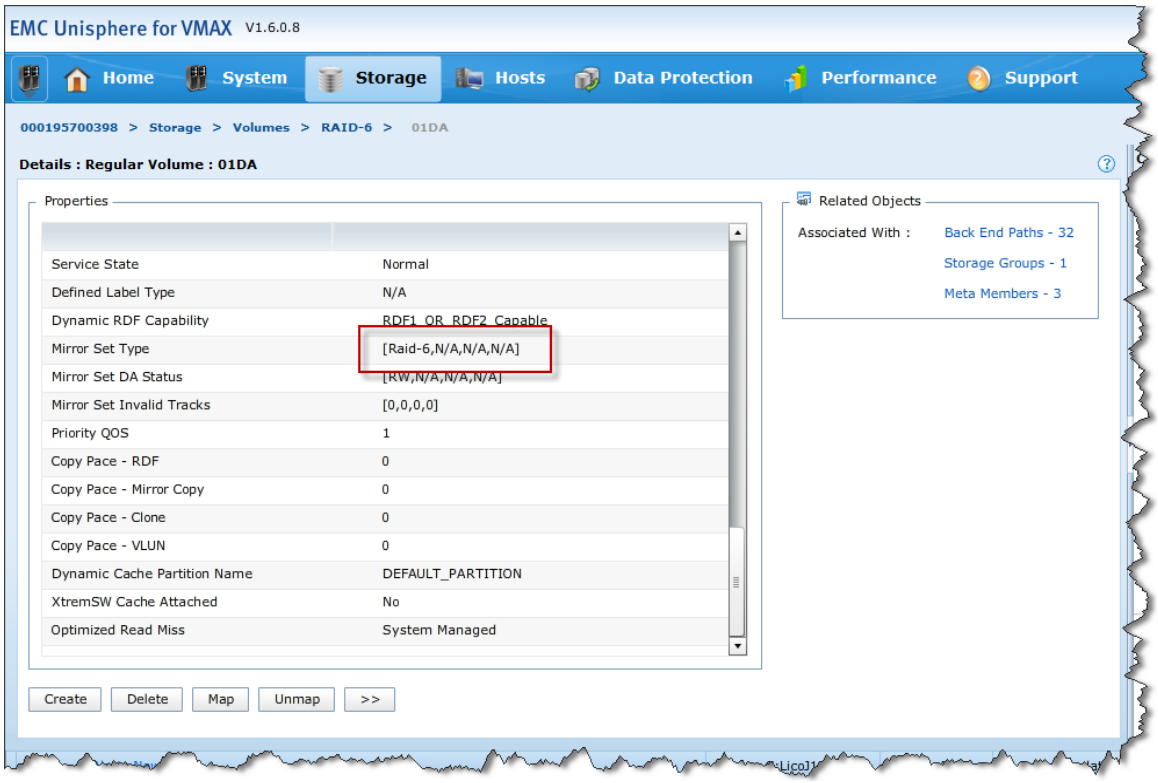


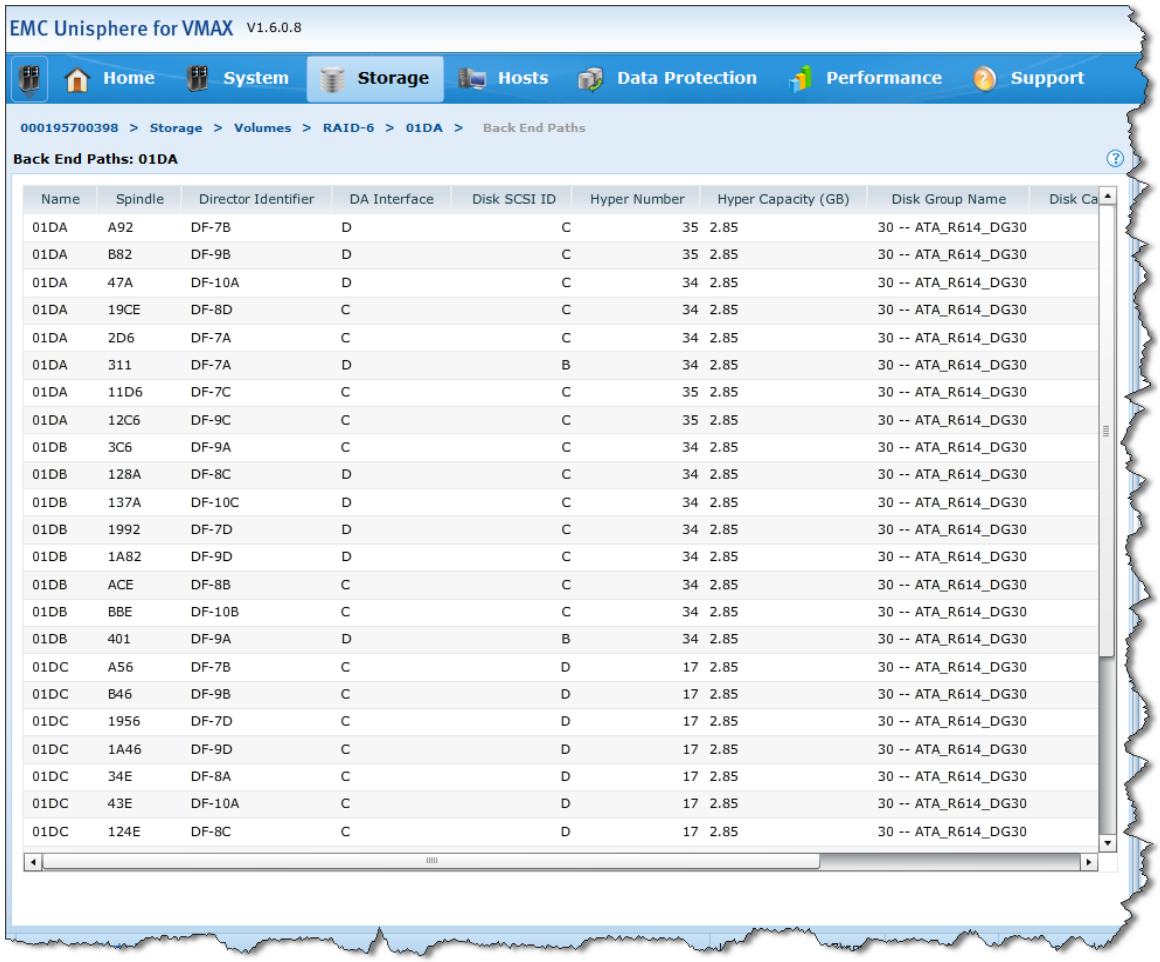
Name	Spindle	Director Identifier	DA Interface	Disk SCSI ID	Hyper Number	Hyper Capacity (GB)	Disk Group Name	Disk Ca
01DA	A92	DF-7B	D	C	35	2.85	30 -- ATA_R614_DG30	
01DA	B82	DF-9B	D	C	35	2.85	30 -- ATA_R614_DG30	
01DA	47A	DF-10A	D	C	34	2.85	30 -- ATA_R614_DG30	
01DA	19CE	DF-8D	C	C	34	2.85	30 -- ATA_R614_DG30	
01DA	2D6	DF-7A	C	C	34	2.85	30 -- ATA_R614_DG30	
01DA	311	DF-7A	D	B	34	2.85	30 -- ATA_R614_DG30	
01DA	11D6	DF-7C	C	C	35	2.85	30 -- ATA_R614_DG30	
01DA	12C6	DF-9C	C	C	35	2.85	30 -- ATA_R614_DG30	
01DA	120F	DF-7C	D	7	7	17.13	21 -- FC_R1_DG21	
01DA	12FF	DF-9C	D	7	7	17.13	21 -- FC_R1_DG21	
01DB	3C6	DF-9A	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	128A	DF-8C	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	137A	DF-10C	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	1992	DF-7D	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	1A82	DF-9D	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	ACE	DF-8B	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	BBE	DF-10B	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	401	DF-9A	D	B	34	2.85	30 -- ATA_R614_DG30	
01DB	1A07	DF-8D	D	7	7	17.13	21 -- FC_R1_DG21	
01DB	1AF7	DF-10D	D	7	7	17.13	21 -- FC_R1_DG21	
01DC	A56	DF-7B	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	B46	DF-9B	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	1956	DF-7D	C	D	17	2.85	30 -- ATA_R614_DG30	

At the end of the migration, the migration session status shows as Migrated.



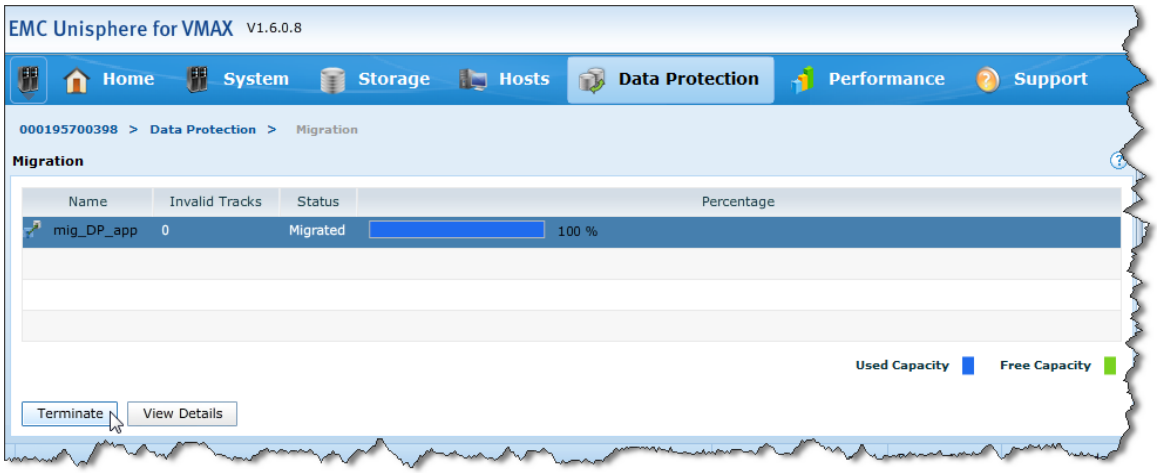
When the migration session has reached the Migrated status, the Properties view of the source devices shows that it is once again protected by a single local RAID group. However, the primary RAID group now is the RAID 6 group, configured on the SATA drives in disk group 30.


EMC Unisphere for VMAX V1.6.0.8
Home
System
Storage
Hosts
Data Protection
Performance
Support
000195700398 > Storage > Volumes > RAID-6 > 01DA
Details : Regular Volume : 01DA
Properties
Service State Normal
Defined Label Type N/A
Dynamic RDF Capability RDF1_OR_RDF2_Capable
Mirror Set Type [Raid-6,N/A,N/A,N/A,N/A]
Mirror Set DA Status [RW,N/A,N/A,N/A,N/A]
Mirror Set Invalid Tracks [0,0,0,0]
Priority QOS 1
Copy Pace - RDF 0
Copy Pace - Mirror Copy 0
Copy Pace - Clone 0
Copy Pace - VLUN 0
Dynamic Cache Partition Name DEFAULT_PARTITION
XtremSW Cache Attached No
Optimized Read Miss System Managed
Related Objects
Associated With :
Back End Paths - 32
Storage Groups - 1
Meta Members - 3
Create
Delete
Map
Unmap
>>



Name	Spindle	Director Identifier	DA Interface	Disk SCSI ID	Hyper Number	Hyper Capacity (GB)	Disk Group Name	Disk Ca
01DA	A92	DF-7B	D	C	35	2.85	30 -- ATA_R614_DG30	
01DA	B82	DF-9B	D	C	35	2.85	30 -- ATA_R614_DG30	
01DA	47A	DF-10A	D	C	34	2.85	30 -- ATA_R614_DG30	
01DA	19CE	DF-8D	C	C	34	2.85	30 -- ATA_R614_DG30	
01DA	2D6	DF-7A	C	C	34	2.85	30 -- ATA_R614_DG30	
01DA	311	DF-7A	D	B	34	2.85	30 -- ATA_R614_DG30	
01DA	11D6	DF-7C	C	C	35	2.85	30 -- ATA_R614_DG30	
01DA	12C6	DF-9C	C	C	35	2.85	30 -- ATA_R614_DG30	
01DB	3C6	DF-9A	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	128A	DF-8C	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	137A	DF-10C	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	1992	DF-7D	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	1A82	DF-9D	D	C	34	2.85	30 -- ATA_R614_DG30	
01DB	ACE	DF-8B	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	BBE	DF-10B	C	C	34	2.85	30 -- ATA_R614_DG30	
01DB	401	DF-9A	D	B	34	2.85	30 -- ATA_R614_DG30	
01DC	A56	DF-7B	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	B46	DF-9B	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	1956	DF-7D	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	1A46	DF-9D	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	34E	DF-8A	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	43E	DF-10A	C	D	17	2.85	30 -- ATA_R614_DG30	
01DC	124E	DF-8C	C	D	17	2.85	30 -- ATA_R614_DG30	

To complete the migration, and to remove the migration session from the Symmetrix array, select the migration and click Terminate.

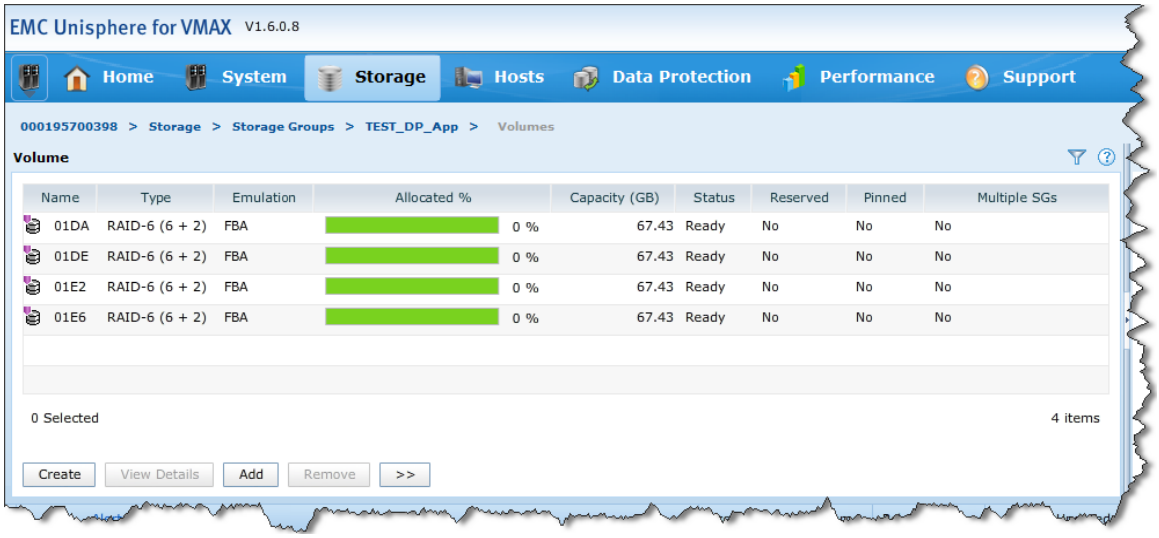


The Virtual LUN migration is complete.

Migration to configured space using Unisphere

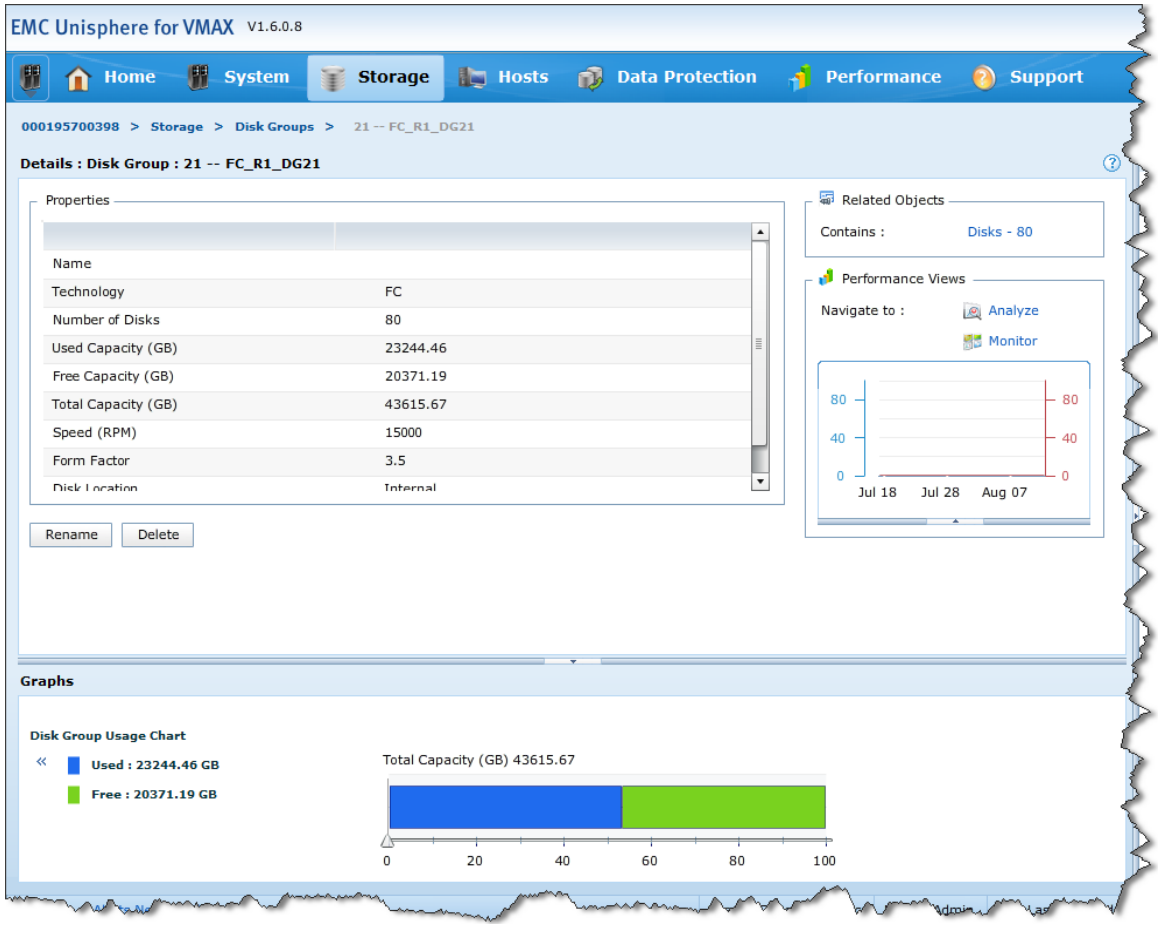
In this example, four metadevices, currently configured as RAID 6 (6+2) on SATA drives, will be migrated to configured space on FC drives, as RAID 1.

The devices being migrated are grouped together in a device group, TEST_DP_App.

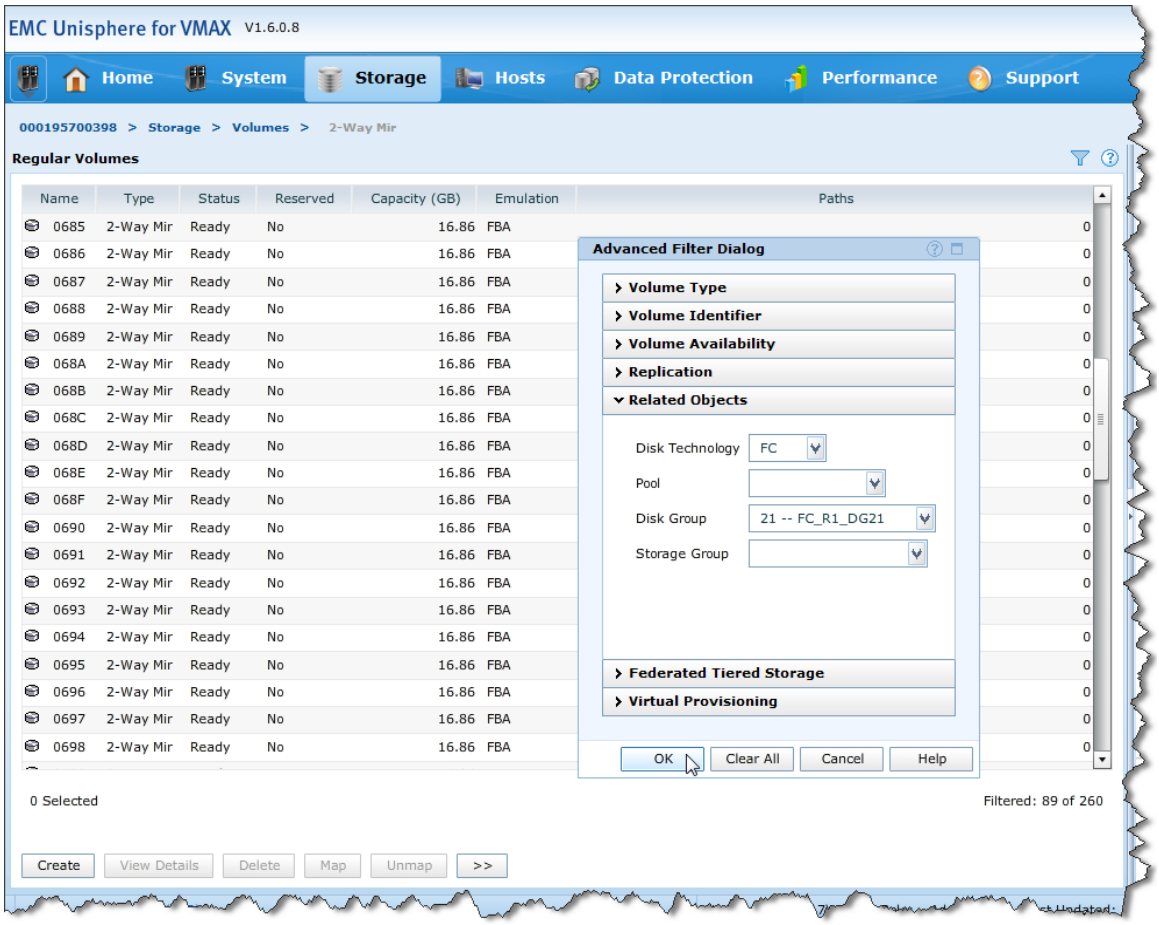


To determine which disk group to perform the migration to, the disk group properties can be viewed by navigating to the Disk Groups

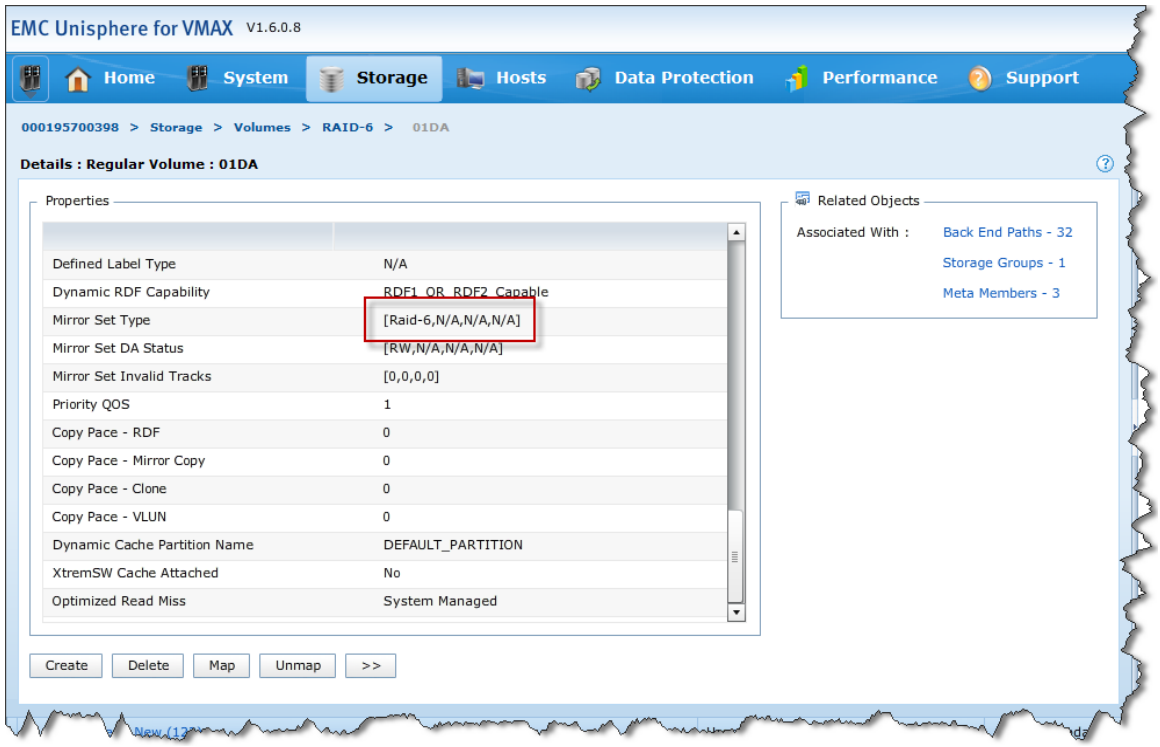
subsection page under Storage. Double-clicking on a disk group name displays more details for that disk group. The following illustration shows disk group 21, containing FC drives.



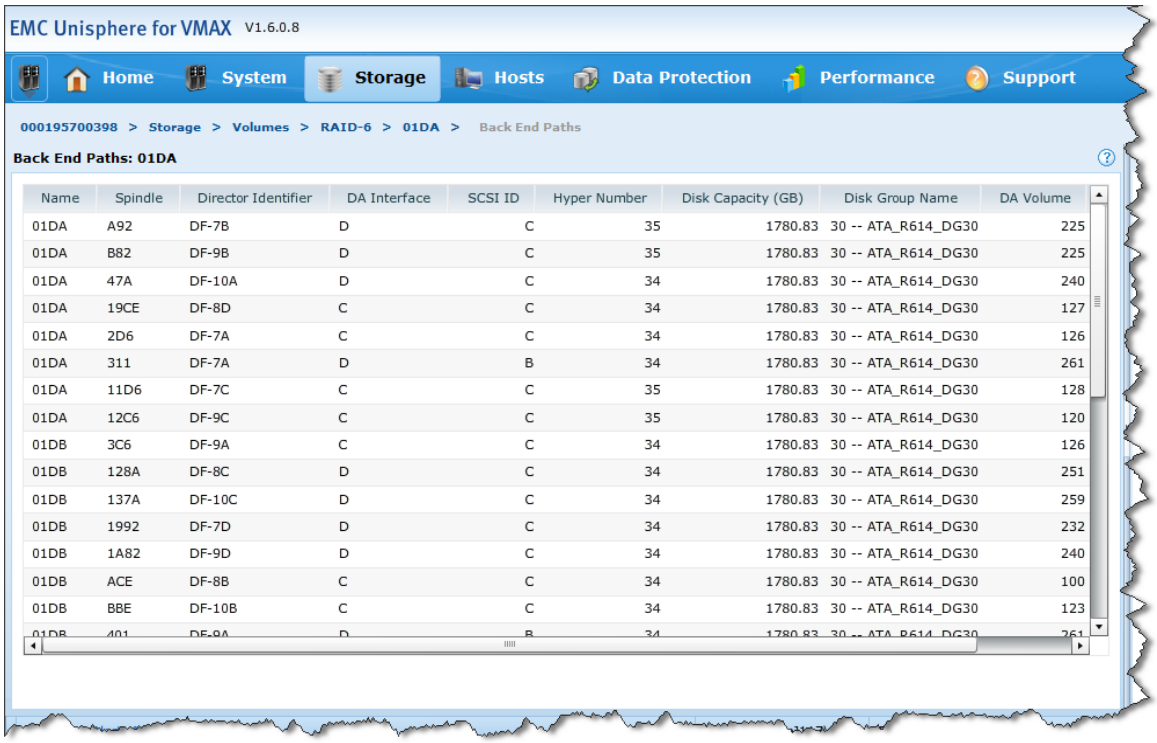
After it has been determined that disk group 21 contains FC drives, then unmapped devices can be looked at to determine if there are sufficient targets to complete the migration. The Advanced Filter Dialog can be used to display only unmapped devices in the desired target disk group.



Prior to migrating the device, the Properties view of one of the devices to be migrated shows that the device is locally protected by a single RAID 6 (6+2) primary RAID group.



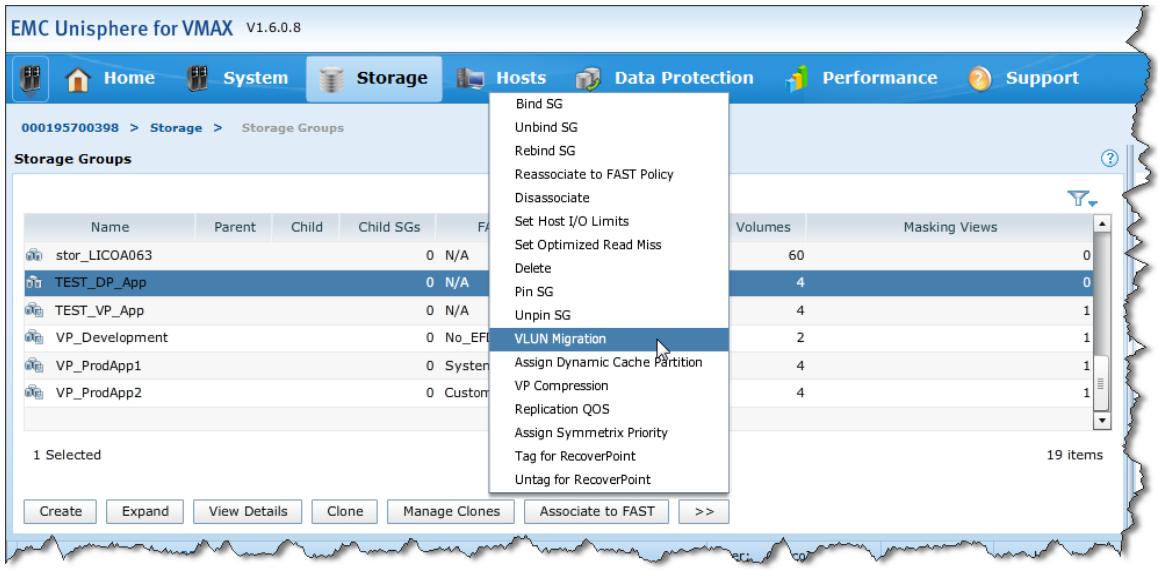
Clicking on Back End Paths under Related Objects shows that the device is configured in disk group 30.



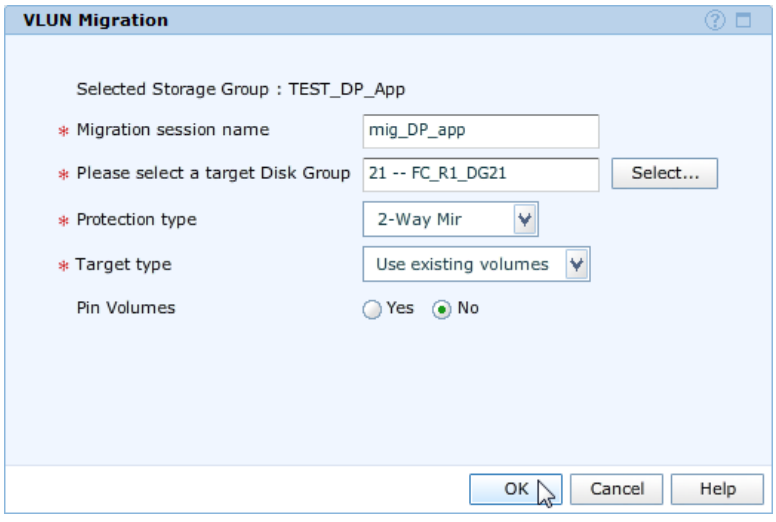
Name	Spindle	Director Identifier	DA Interface	SCSI ID	Hyper Number	Disk Capacity (GB)	Disk Group Name	DA Volume
01DA	A92	DF-7B	D	C	35	1780.83	30 -- ATA_R614_DG30	225
01DA	B82	DF-9B	D	C	35	1780.83	30 -- ATA_R614_DG30	225
01DA	47A	DF-10A	D	C	34	1780.83	30 -- ATA_R614_DG30	240
01DA	19CE	DF-8D	C	C	34	1780.83	30 -- ATA_R614_DG30	127
01DA	2D6	DF-7A	C	C	34	1780.83	30 -- ATA_R614_DG30	126
01DA	311	DF-7A	D	B	34	1780.83	30 -- ATA_R614_DG30	261
01DA	11D6	DF-7C	C	C	35	1780.83	30 -- ATA_R614_DG30	128
01DA	12C6	DF-9C	C	C	35	1780.83	30 -- ATA_R614_DG30	120
01DB	3C6	DF-9A	C	C	34	1780.83	30 -- ATA_R614_DG30	126
01DB	128A	DF-8C	D	C	34	1780.83	30 -- ATA_R614_DG30	251
01DB	137A	DF-10C	D	C	34	1780.83	30 -- ATA_R614_DG30	259
01DB	1992	DF-7D	D	C	34	1780.83	30 -- ATA_R614_DG30	232
01DB	1A82	DF-9D	D	C	34	1780.83	30 -- ATA_R614_DG30	240
01DB	ACE	DF-8B	C	C	34	1780.83	30 -- ATA_R614_DG30	100
01DB	BBE	DF-10B	C	C	34	1780.83	30 -- ATA_R614_DG30	123
01DB	401	DF-9A	D	B	34	1780.83	30 -- ATA_R614_DG30	261

After the devices to be migrated, and the disk group to be migrated to, have been identified, along with the desired protection type, the migration can be submitted to the array.

On the Storage Groups subsection under Storage, select the appropriate storage group, click >>, and choose VLUN Migration.



On the resulting dialog box, provide a session name for the migration, along with the target disk group and the target protection type. As this migration is going to configured space, the target type is set to Use new volumes.



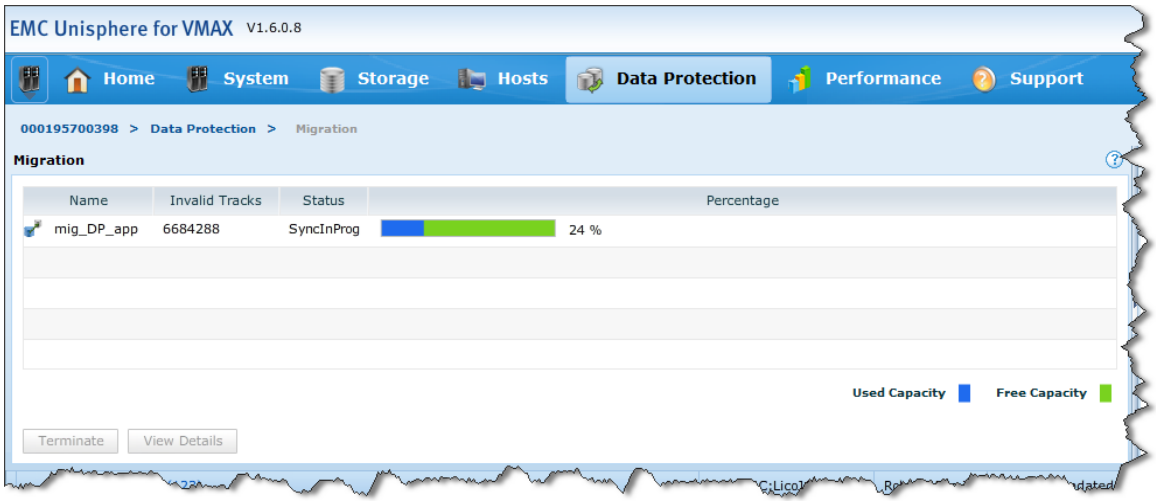
Also on this dialog, the devices being migrated can be pinned (the default is Yes). Pinning the device prevents FAST from moving the device to another tier, until such time as the device is unpinned

following the migration. Clicking Yes next to Pin Volumes pins the device after the migration is submitted.

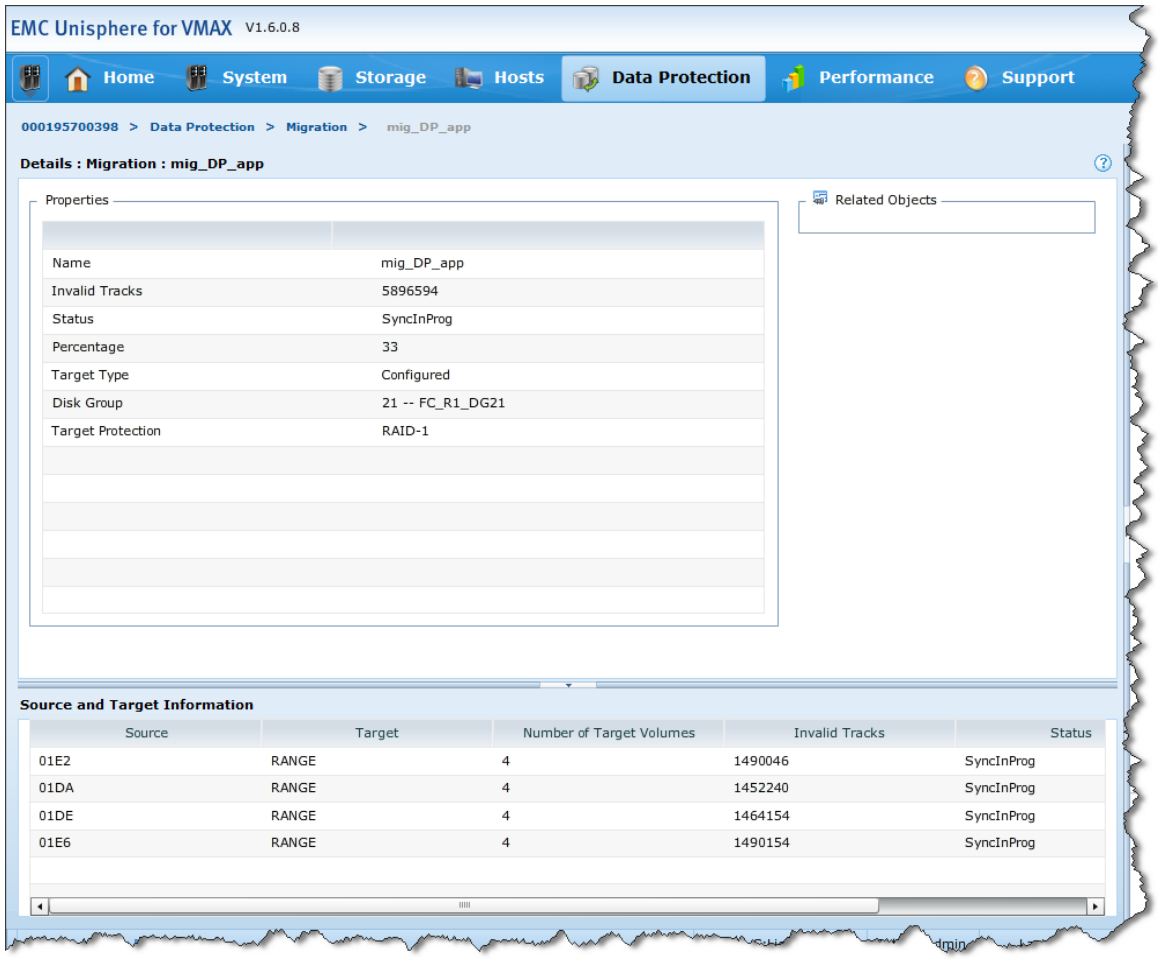
> **Note:** The device is not automatically unpinned following the migration. It must be manually unpinned.

To submit the migration, click OK.

When a migration has been submitted, its progress can be followed from the Migration subsection page under Data Protection.

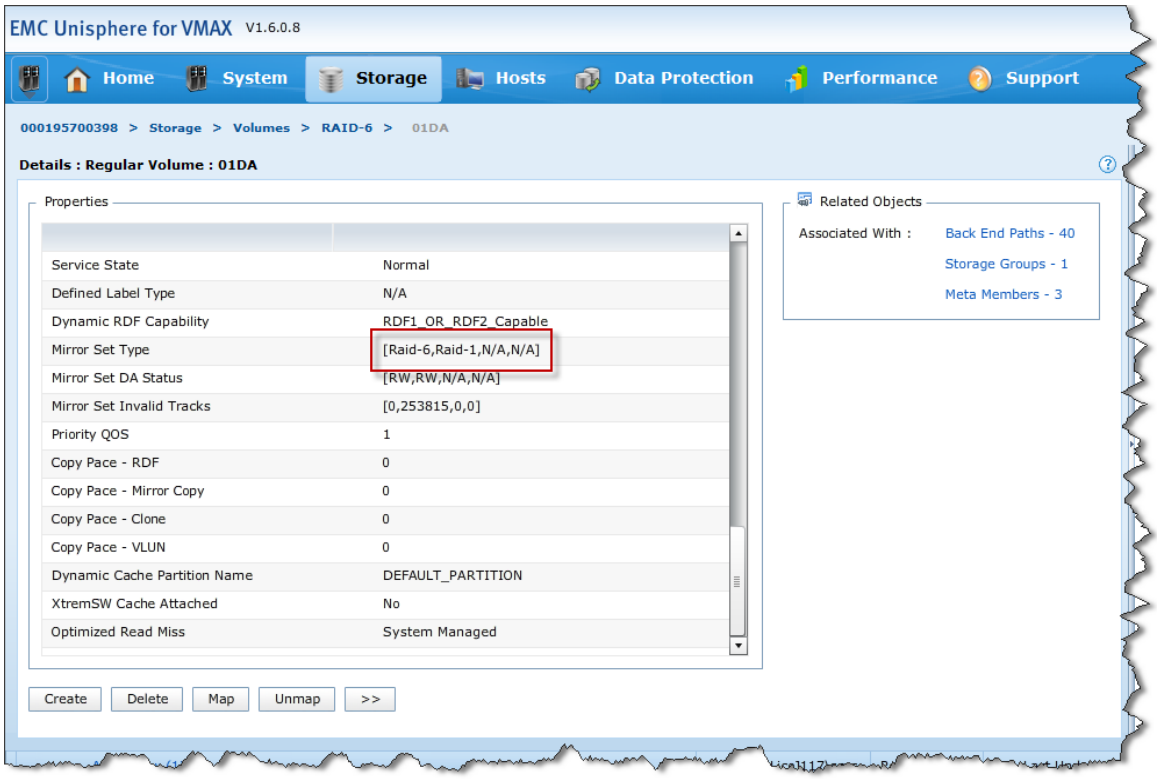


More detailed information on the migration can be seen by selecting the migration name and clicking View Details.

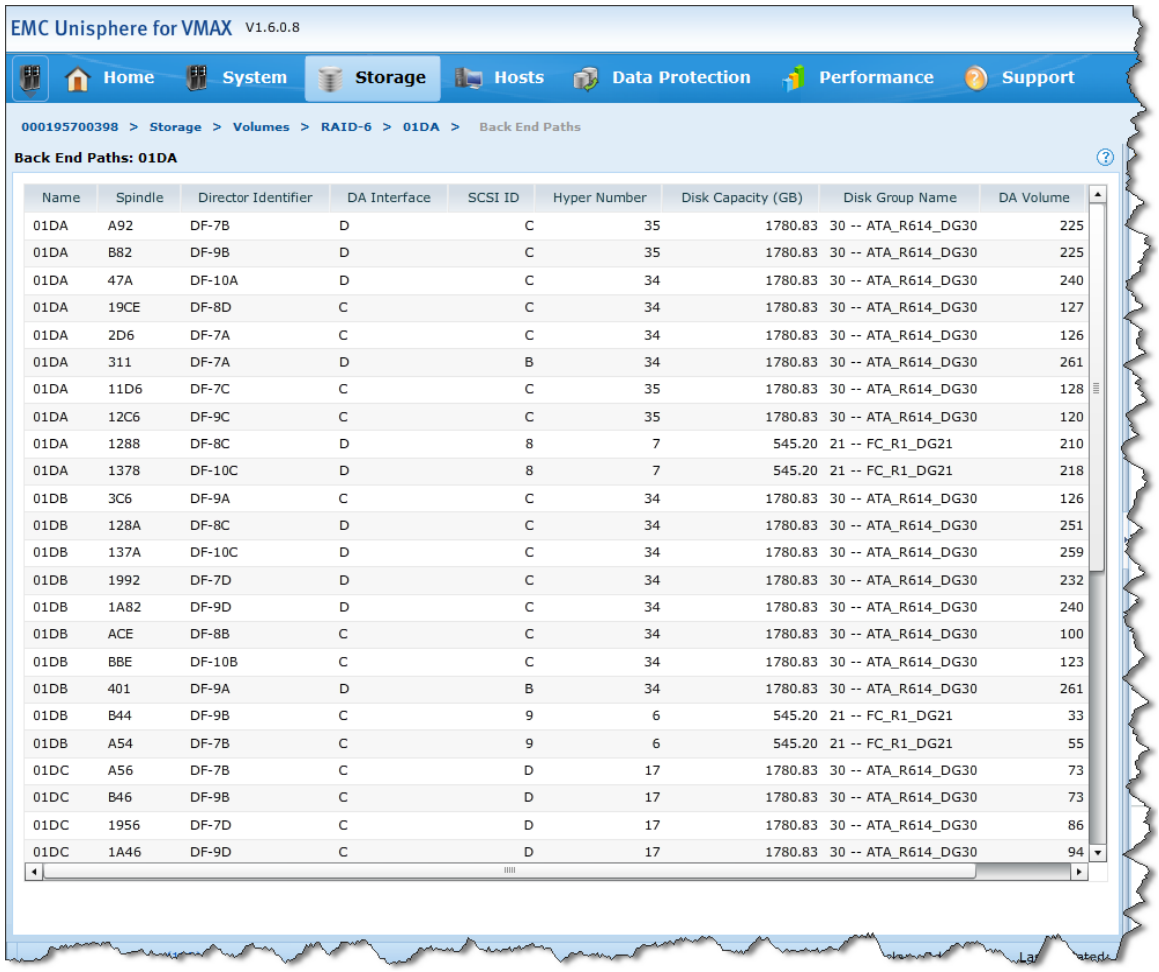


In order to view an updated status of the session, click the Refresh View button, in the upper right-most corner of the screen.

While the migration is in the SyncInProg state, the Properties view of one of the devices being migrated shows that the device is now locally protected by two separate RAID groups, the primary RAID 6 group that the device started with, and a secondary RAID 1 group to which the device is being migrated.

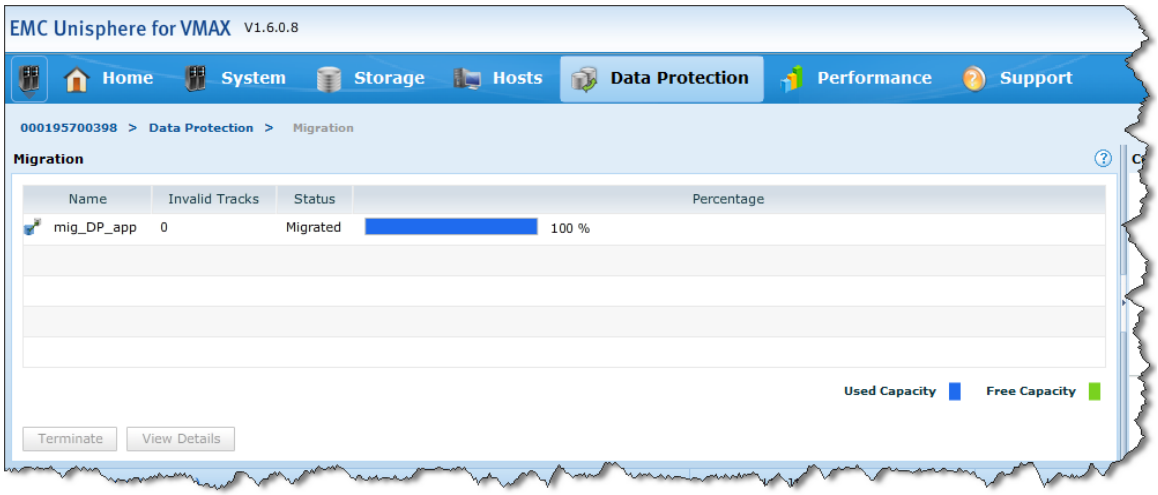


By looking at the back-end paths information for the device, the secondary RAID group can be seen to belong to disk group 21.

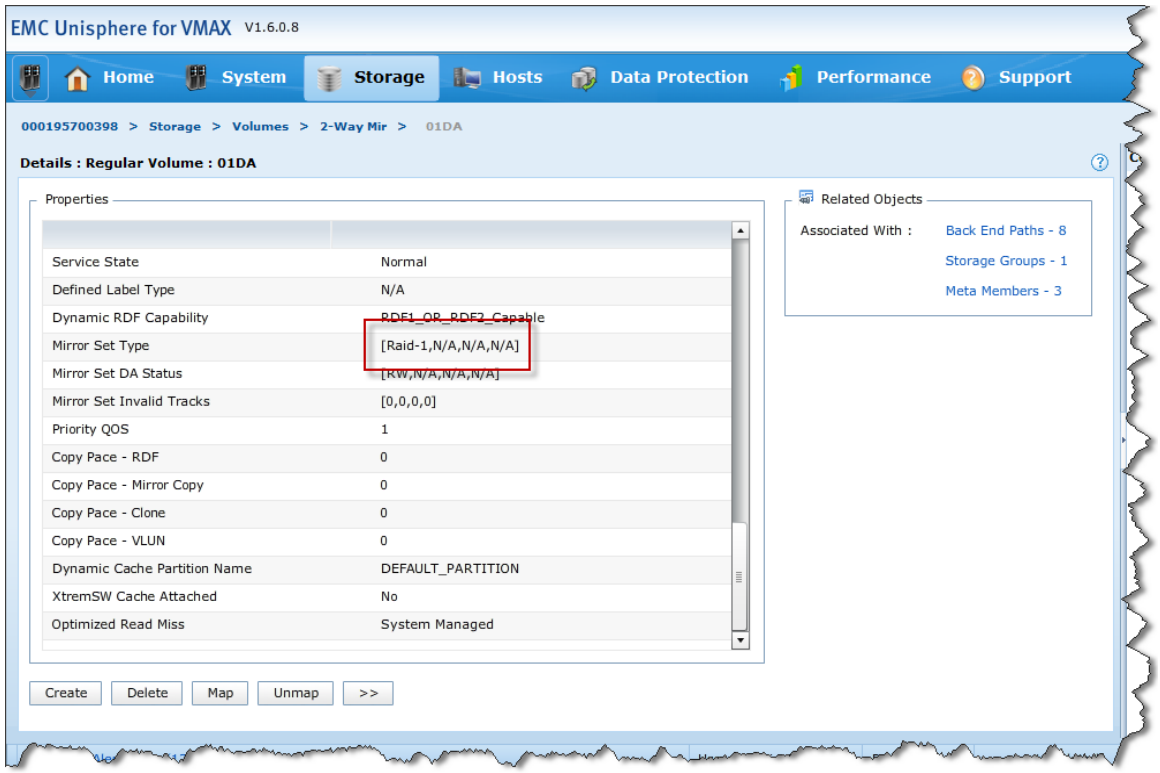


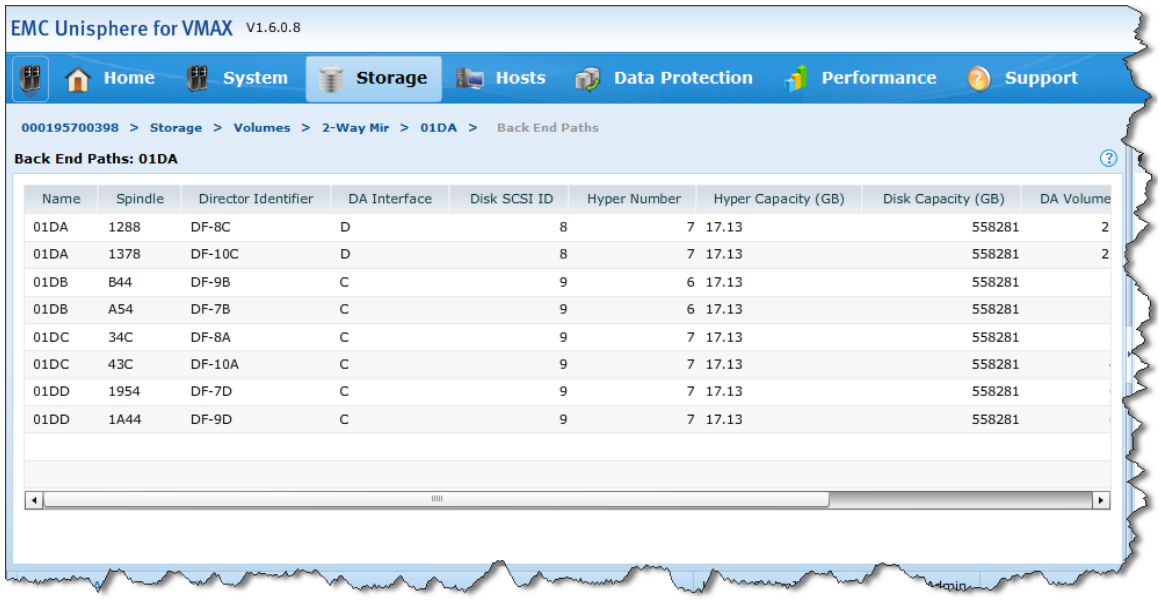
Name	Spindle	Director Identifier	DA Interface	SCSI ID	Hyper Number	Disk Capacity (GB)	Disk Group Name	DA Volume
01DA	A92	DF-7B	D	C	35	1780.83	30 -- ATA_R614_DG30	225
01DA	B82	DF-9B	D	C	35	1780.83	30 -- ATA_R614_DG30	225
01DA	47A	DF-10A	D	C	34	1780.83	30 -- ATA_R614_DG30	240
01DA	19CE	DF-8D	C	C	34	1780.83	30 -- ATA_R614_DG30	127
01DA	2D6	DF-7A	C	C	34	1780.83	30 -- ATA_R614_DG30	126
01DA	311	DF-7A	D	B	34	1780.83	30 -- ATA_R614_DG30	261
01DA	11D6	DF-7C	C	C	35	1780.83	30 -- ATA_R614_DG30	128
01DA	12C6	DF-9C	C	C	35	1780.83	30 -- ATA_R614_DG30	120
01DA	1288	DF-8C	D	8	7	545.20	21 -- FC_R1_DG21	210
01DA	1378	DF-10C	D	8	7	545.20	21 -- FC_R1_DG21	218
01DB	3C6	DF-9A	C	C	34	1780.83	30 -- ATA_R614_DG30	126
01DB	128A	DF-8C	D	C	34	1780.83	30 -- ATA_R614_DG30	251
01DB	137A	DF-10C	D	C	34	1780.83	30 -- ATA_R614_DG30	259
01DB	1992	DF-7D	D	C	34	1780.83	30 -- ATA_R614_DG30	232
01DB	1A82	DF-9D	D	C	34	1780.83	30 -- ATA_R614_DG30	240
01DB	ACE	DF-8B	C	C	34	1780.83	30 -- ATA_R614_DG30	100
01DB	BBE	DF-10B	C	C	34	1780.83	30 -- ATA_R614_DG30	123
01DB	401	DF-9A	D	B	34	1780.83	30 -- ATA_R614_DG30	261
01DB	B44	DF-9B	C	9	6	545.20	21 -- FC_R1_DG21	33
01DB	A54	DF-7B	C	9	6	545.20	21 -- FC_R1_DG21	55
01DC	A56	DF-7B	C	D	17	1780.83	30 -- ATA_R614_DG30	73
01DC	B46	DF-9B	C	D	17	1780.83	30 -- ATA_R614_DG30	73
01DC	1956	DF-7D	C	D	17	1780.83	30 -- ATA_R614_DG30	86
01DC	1A46	DF-9D	C	D	17	1780.83	30 -- ATA_R614_DG30	94

At the end of the migration, the migration session status shows as Migrated.

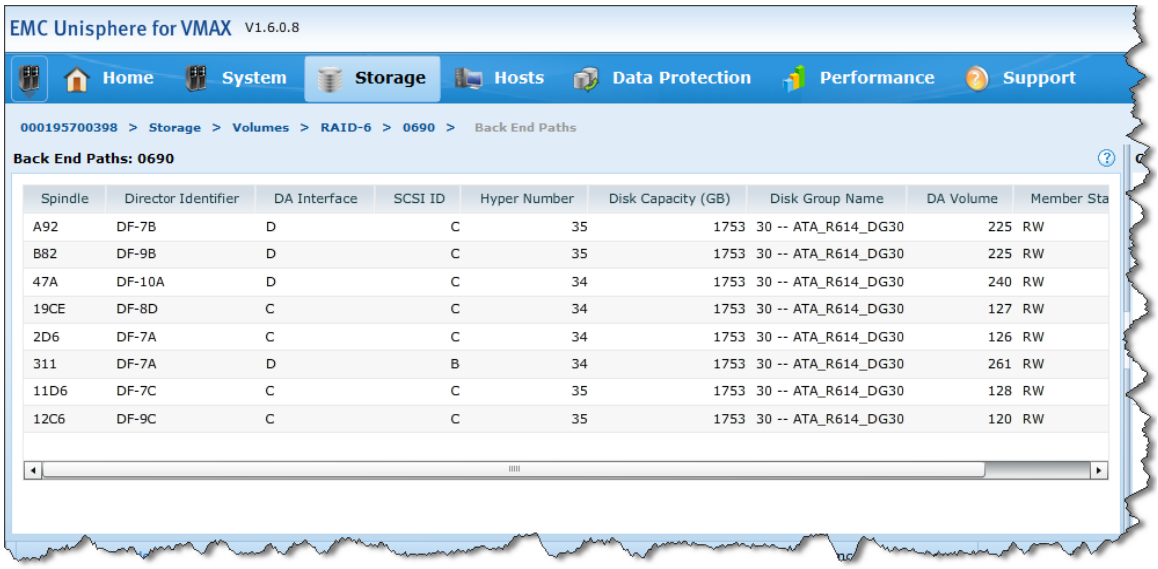


When the migration session has reached the Migrated status, the Properties view of the source device shows that it is once again protected by a single local RAID group. However, the primary RAID group now is the RAID 1 group located on the FC drives in disk group 21.


EMC Unisphere for VMAX V1.6.0.8
Home
System
Storage
Hosts
Data Protection
Performance
Support
000195700398 > Storage > Volumes > 2-Way Mir > 01DA
Details : Regular Volume : 01DA
Properties
Related Objects
Associated With :
Back End Paths - 8
Storage Groups - 1
Meta Members - 3
Service State Normal
Defined Label Type N/A
Dynamic RDF Capability
Mirror Set Type [Raid-1,N/A,N/A,N/A]
Mirror Set DA Status
Mirror Set Invalid Tracks [0,0,0,0]
Priority QOS 1
Copy Pace - RDF 0
Copy Pace - Mirror Copy 0
Copy Pace - Clone 0
Copy Pace - VLUN 0
Dynamic Cache Partition Name DEFAULT_PARTITION
XtremSW Cache Attached No
Optimized Read Miss System Managed
Create
Delete
Map
Unmap
>>

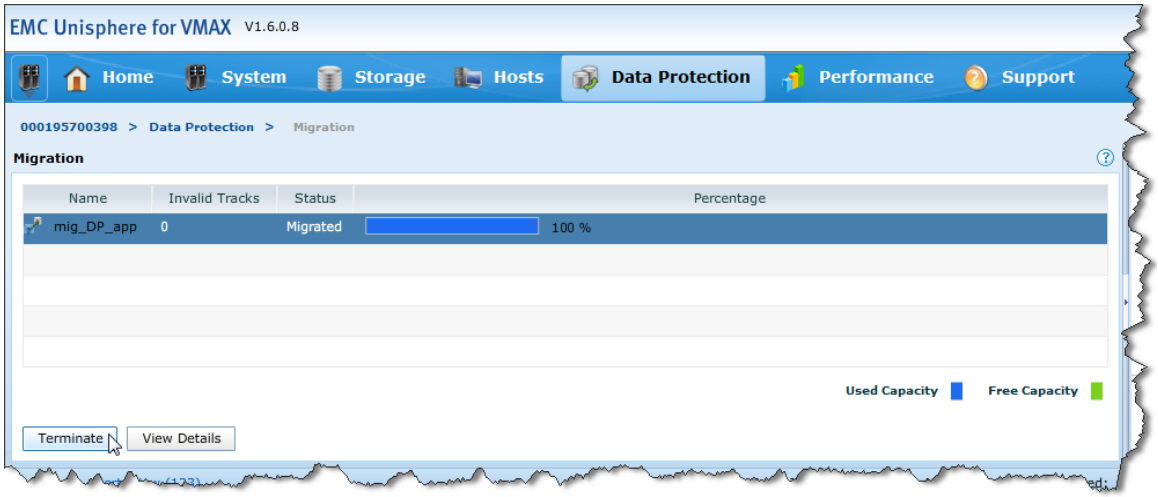

EMC Unisphere for VMAX V1.6.0.8
Home
System
Storage
Hosts
Data Protection
Performance
Support
000195700398 > Storage > Volumes > 2-Way Mir > 01DA > Back End Paths
Back End Paths: 01DA
Name Spindle Director Identifier DA Interface Disk SCSI ID Hyper Number Hyper Capacity (GB) Disk Capacity (GB) DA Volume
01DA 1288 DF-8C D 8 7 17.13 558281 2
01DA 1378 DF-10C D 8 7 17.13 558281 2
01DB B44 DF-9B C 9 6 17.13 558281
01DB A54 DF-7B C 9 6 17.13 558281
01DC 34C DF-8A C 9 7 17.13 558281
01DC 43C DF-10A C 9 7 17.13 558281
01DD 1954 DF-7D C 9 7 17.13 558281
01DD 1A44 DF-9D C 9 7 17.13 558281

Also, the target device used in the migration now has the original storage previously associated with the device migrated.



Spindle	Director Identifier	DA Interface	SCSI ID	Hyper Number	Disk Capacity (GB)	Disk Group Name	DA Volume	Member Sta
A92	DF-7B	D	C	35	1753	30 -- ATA_R614_DG30	225	RW
B82	DF-9B	D	C	35	1753	30 -- ATA_R614_DG30	225	RW
47A	DF-10A	D	C	34	1753	30 -- ATA_R614_DG30	240	RW
19CE	DF-8D	C	C	34	1753	30 -- ATA_R614_DG30	127	RW
2D6	DF-7A	C	C	34	1753	30 -- ATA_R614_DG30	126	RW
311	DF-7A	D	B	34	1753	30 -- ATA_R614_DG30	261	RW
11D6	DF-7C	C	C	35	1753	30 -- ATA_R614_DG30	128	RW
12C6	DF-9C	C	C	35	1753	30 -- ATA_R614_DG30	120	RW

To complete the migration, and to remove the migration session from the Symmetrix array, select the migration session name and click Terminate.



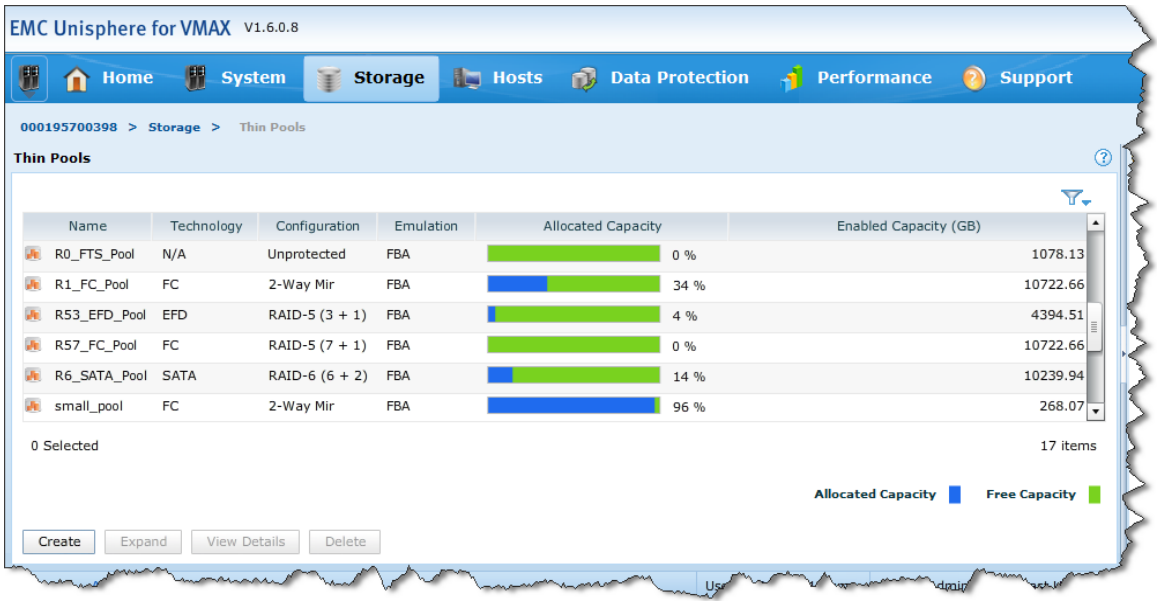
The Virtual LUN migration is complete.

Migration to target thin pool using Unisphere

In this example, four thin metadevices, currently bound to a thin pool containing RAID 6 (6+2) data devices, configured on SATA drives, will be migrated to a thin pool containing RAID 1 data devices, configured on FC drives.

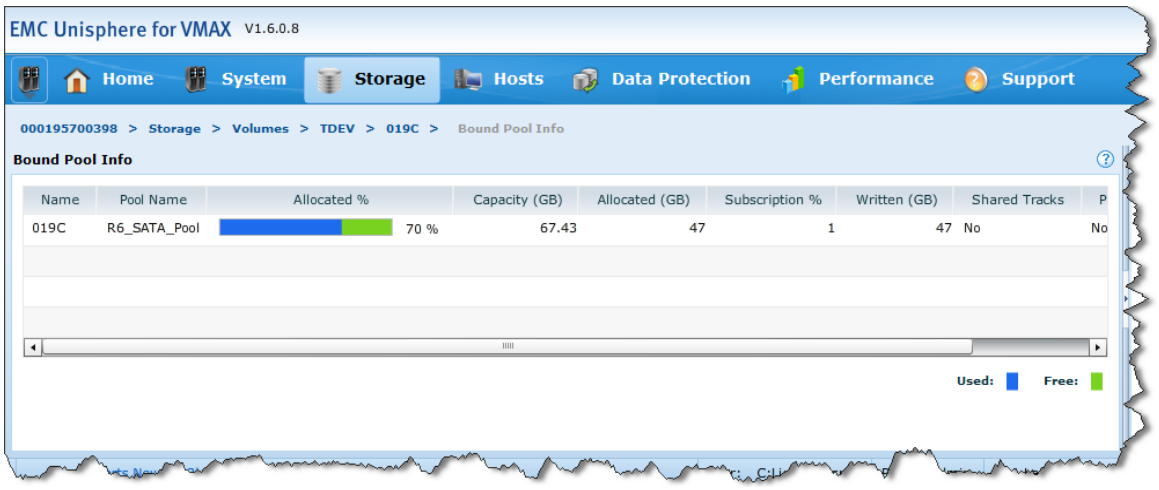
The devices being migrated are grouped together in a device group, TEST_VP_App.

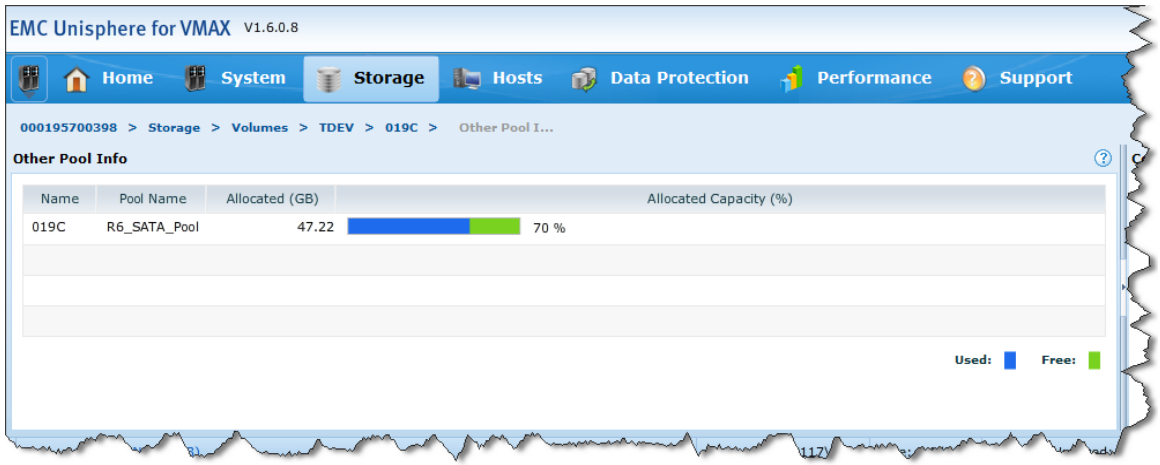
To determine which thin pool to perform the migration to, the Properties of all thin pools can be viewed by navigating to the Thin Pools subsection page under Storage. The R1_FC_Pool is shown to be configured on FC drives, containing RAID 1 (2-Way Mir) data devices.



Prior to migrating, the Properties view of one of the devices to be migrated shows that the device is bound to the R6_SATA_Pool and that all of its tracks are allocated in this pool.

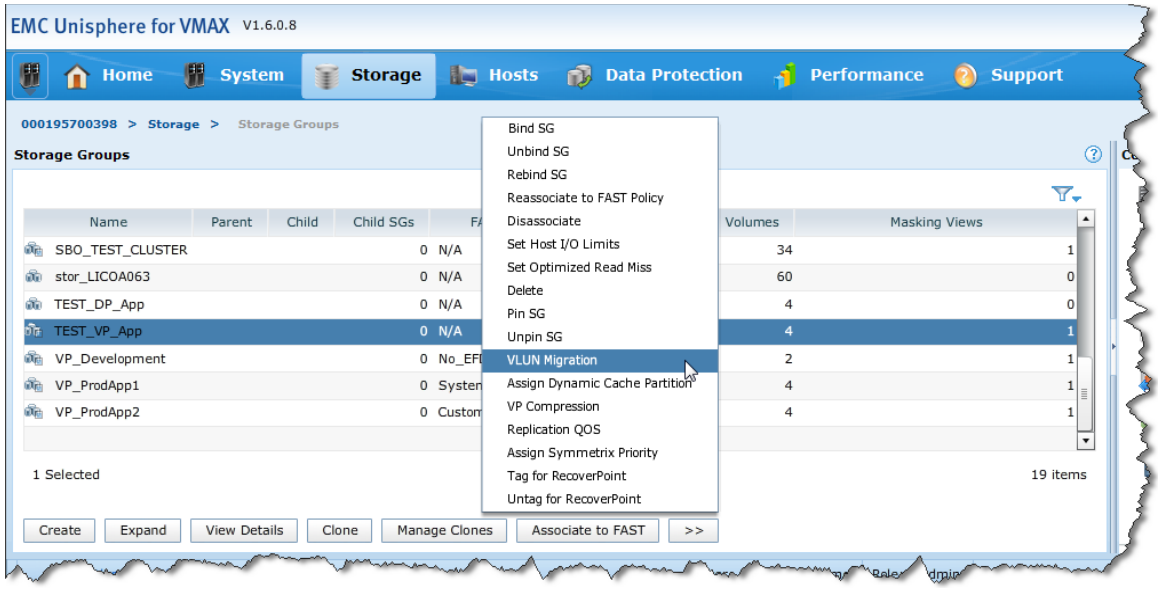
The bound pool information can be viewed by clicking on the Bound pool info link under Related Objects on the properties view. The pool allocation details can be viewed by clicking on the Other bound pool link.



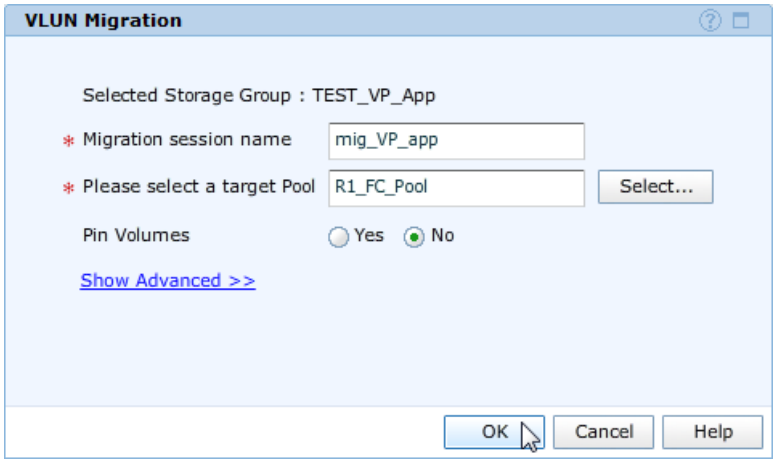


After the devices to be migrated and the thin pool to be migrated to have been identified, the migration can be submitted to the array.

On the Storage Groups subsection under Storage, select the appropriate storage group, click >>, and choose VLUN Migration.



On the resulting dialog box, provide a session name for the migration along with the target thin pool. The target thin pool can be chosen from a list by clicking the Select button.

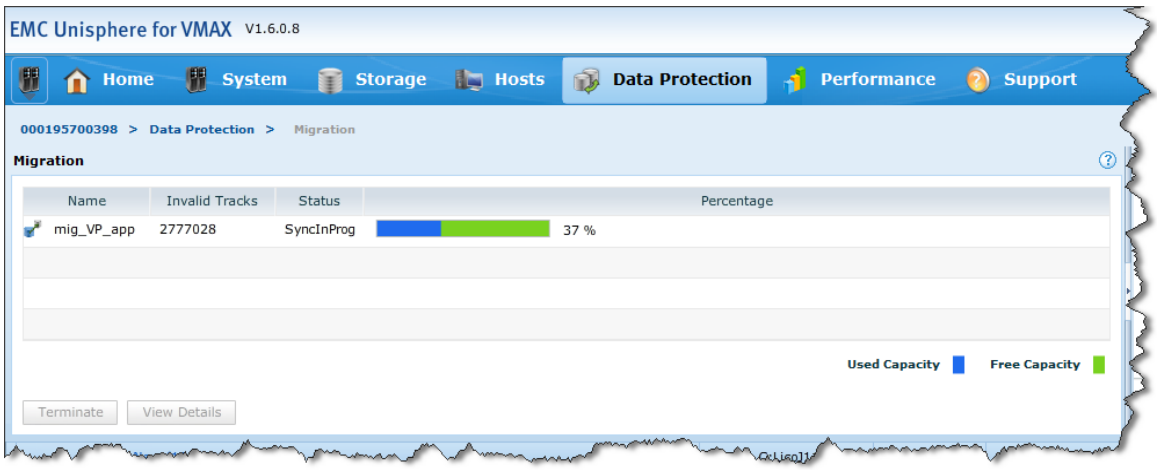


Also on this dialog box, the devices being migrated can be pinned (the default is Yes). Pinning the device prevents FAST from moving the device to another tier, until such time as the device is unpinned following the migration. Clicking Yes next to Pin Volumes pins the device after the migration is submitted.

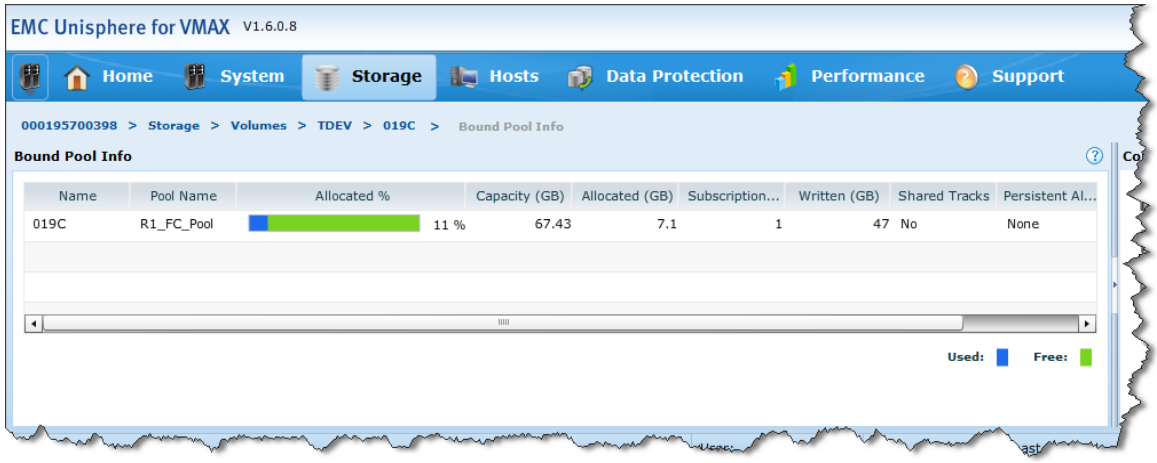
> **Note:** The device is not automatically unpinned following the migration. It must be manually unpinned.

To submit the migration, click OK.

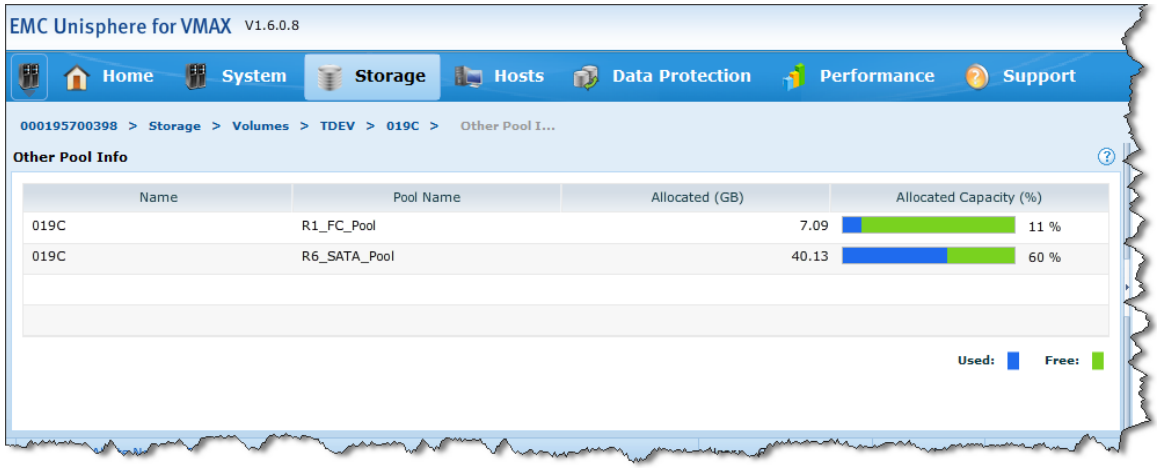
When a migration has been submitted, its progress can be followed from the Migration subsection page under Data Protection.



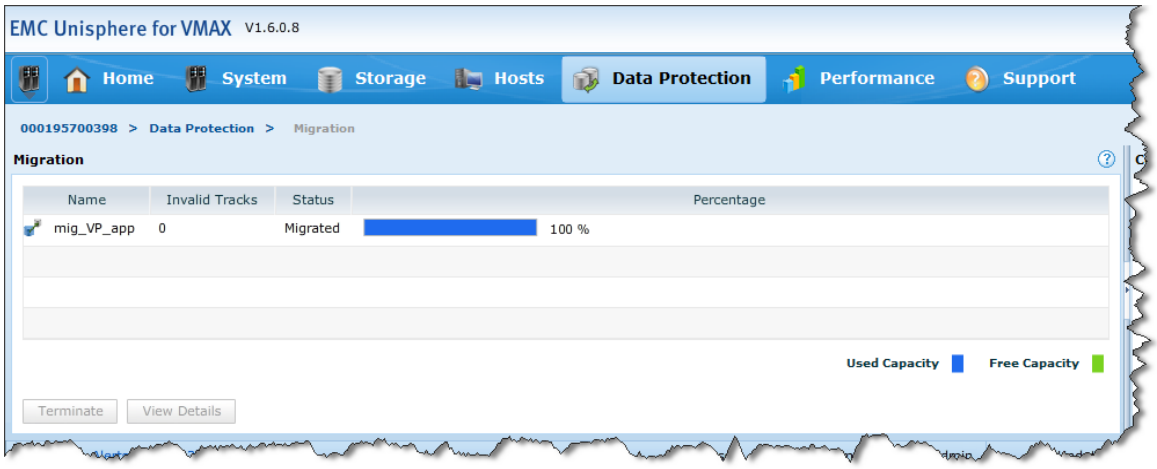
While the migration is in the SyncInProg state, the Properties view of one of the devices being migrated shows that the device is now bound to the R1_FC_Pool.



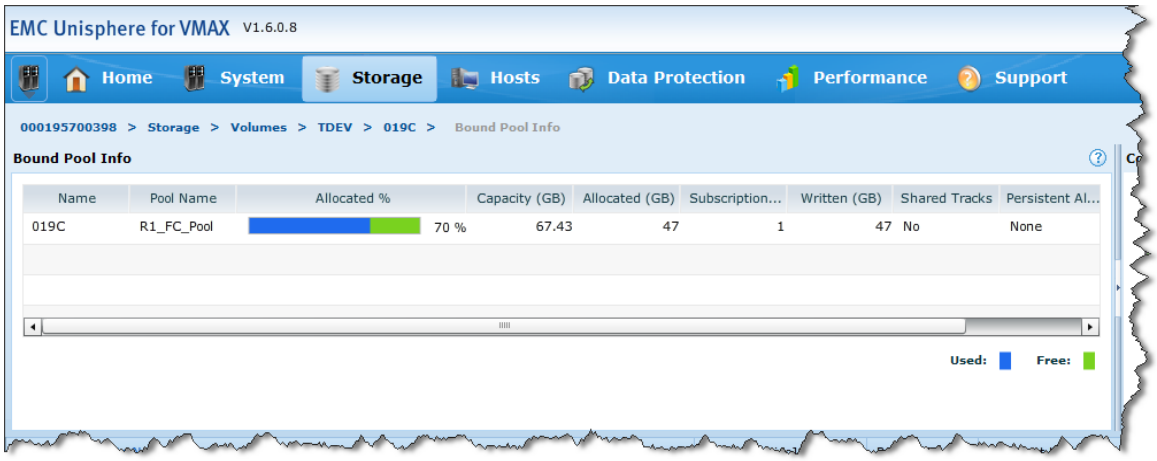
Looking at the Other bound pool information, the device has allocations in both the source and target pool while the migration is in progress.

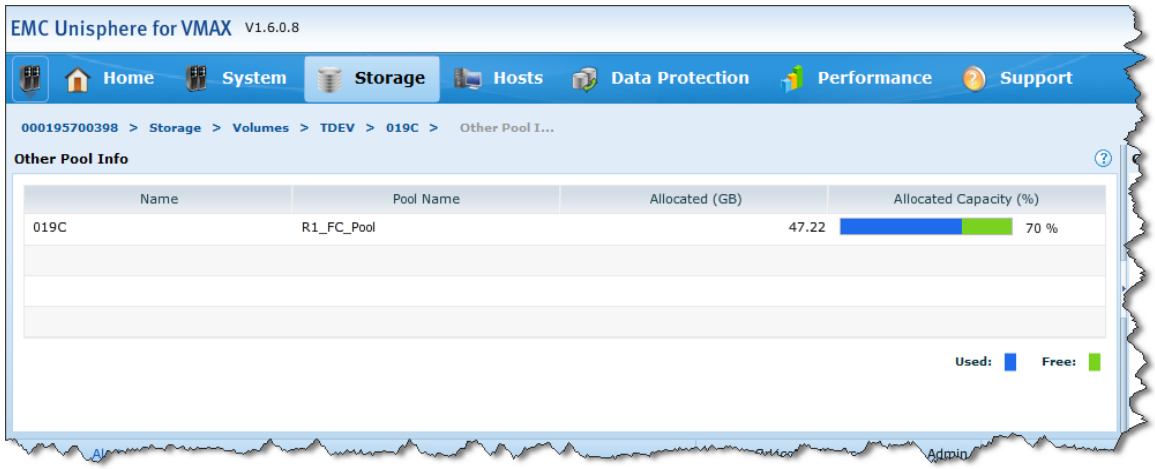


At the end of the migration, the migration session status shows as Migrated.

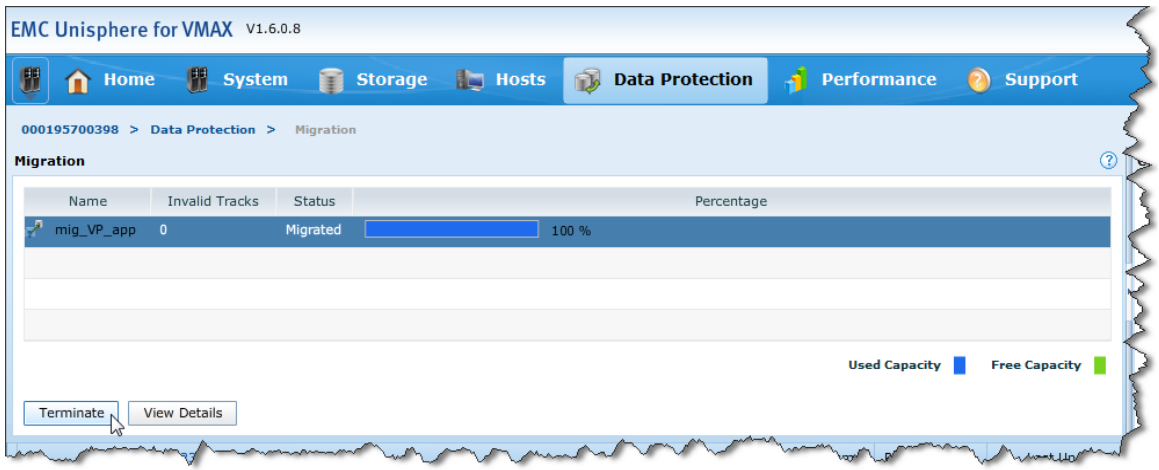


When the migration session has reached the Migrated state, the Properties view of one of the source devices shows that all of the extents for the device are now allocated in the target pool, R1_FC_Pool.





To complete the migration, and to remove the migration session from the Symmetrix array, select the migration and click Terminate.



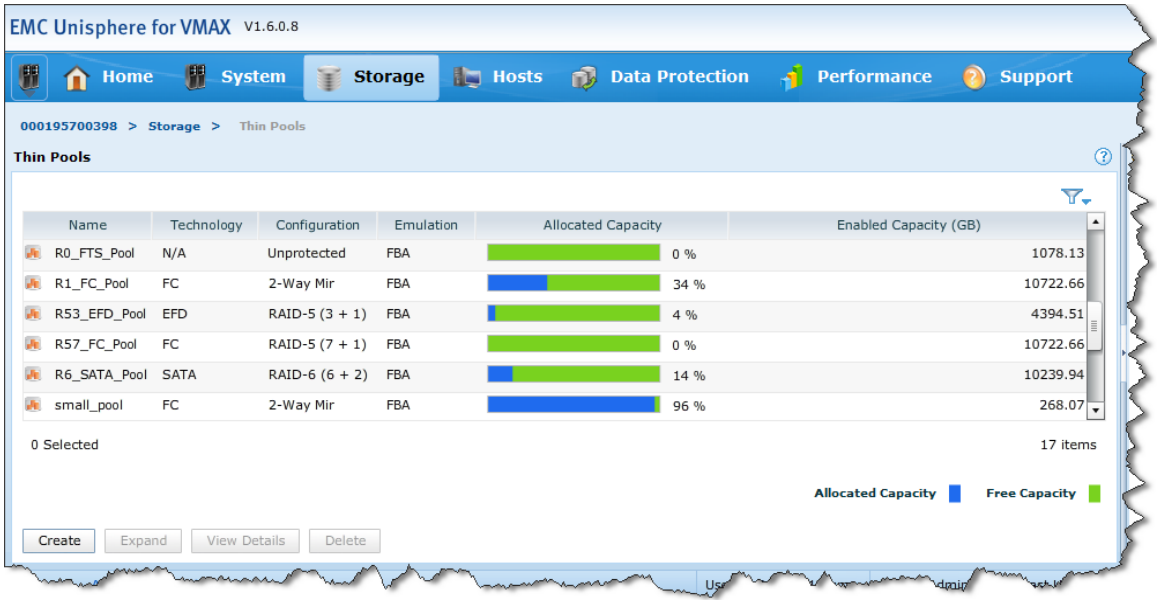
The Virtual LUN migration is complete.

Migration from source thin pool to target thin pool using Unisphere

In this example, four thin metadevices, managed by FAST VP and with data spread across three separate pools, will have all data currently allocated in a RAID 6 (6+2) SATA thin pool migrated to a RAID 1 FC thin pool. All the data allocated in the RAID 5 (3+1) EFD thin pool will remain in that pool.

The devices being migrated are grouped together in a storage group, TEST_VP_App.

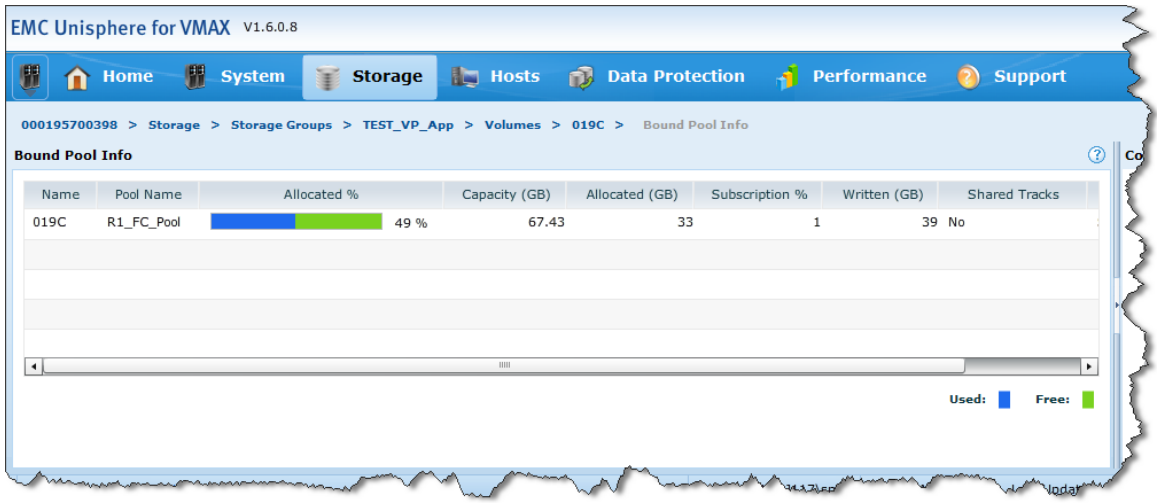
To determine which thin pool to perform the migration to, the properties of all thin pools can be viewed by navigating to the Thin Pools subsection page under Storage. The R1_FC_Pool is shown to be configured on FC drives, containing RAID 1 (2-Way Mir) data devices.

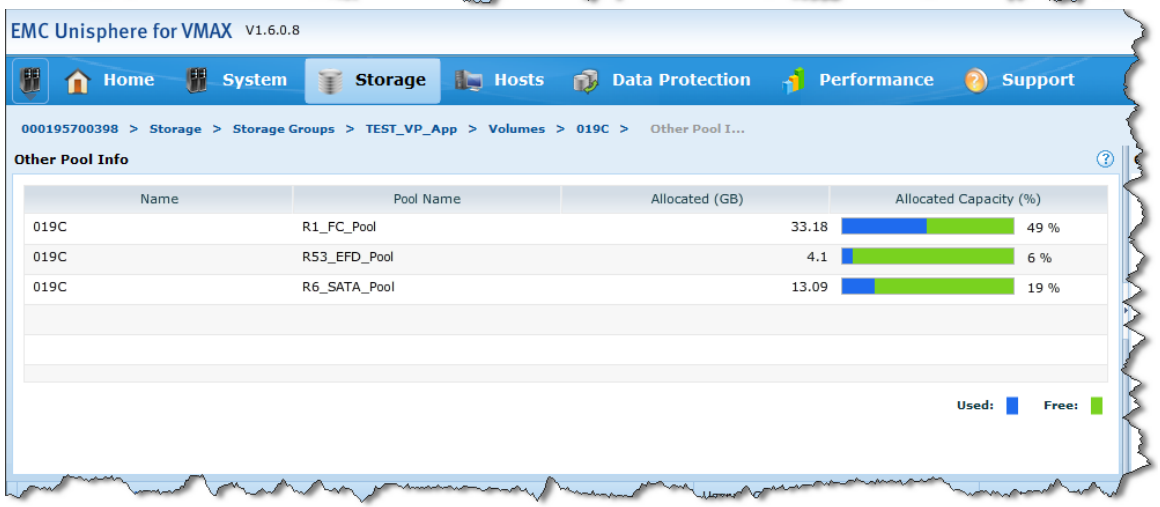


Prior to migrating, the Properties view of one of the devices to be

migrated shows that the device is bound to the R1_FC_Pool. However, looking at the Other bound pool information, the device has extents allocated over three separate pools.

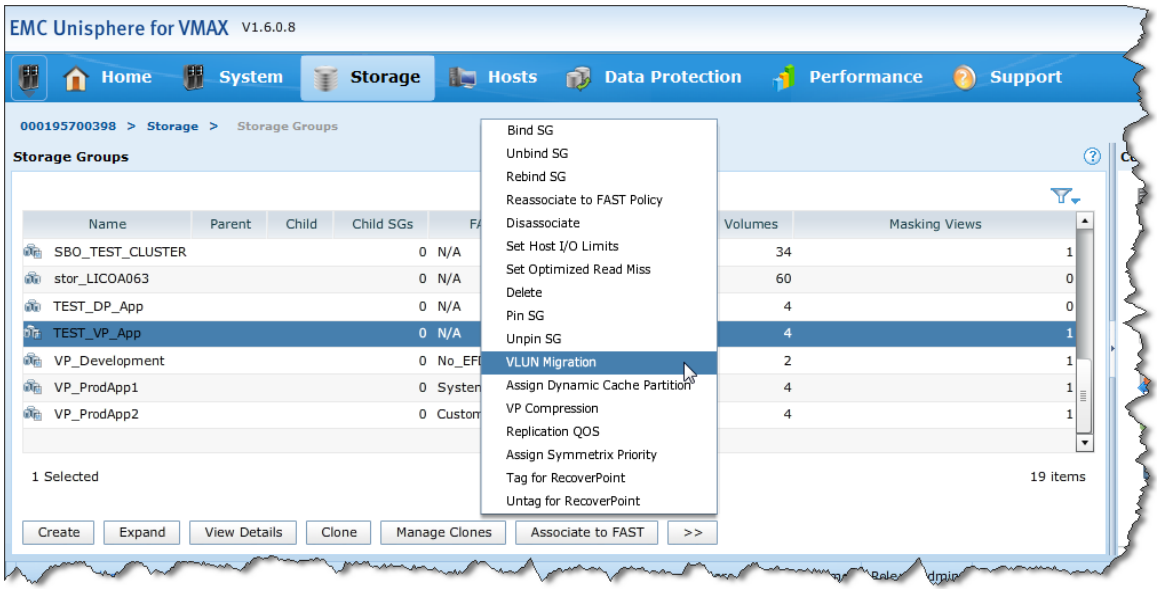
The bound pool information can be viewed by clicking on the Bound pool info link under Related Objects on the Properties view. The pool allocation details can be viewed by clicking on the Other bound pool link.





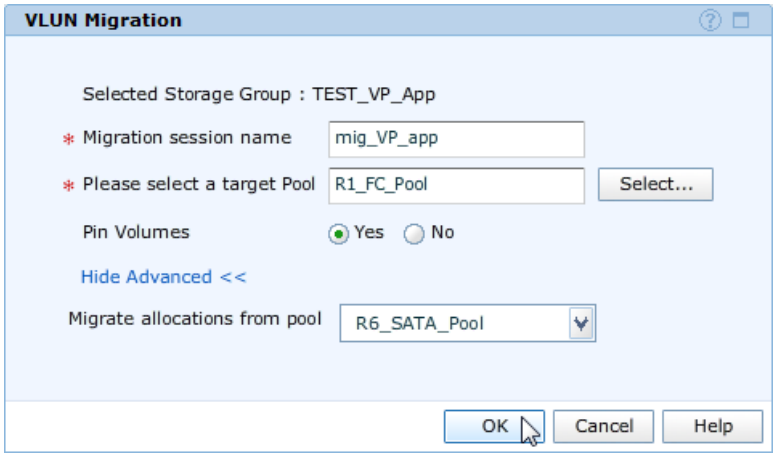
After the devices to be migrated and the thin pool to be migrated to have been identified, the migration can be submitted to the array.

On the Storage Groups subsection under Storage, select the appropriate storage group, click >>, and choose VLUN Migration.



On the resulting dialog box, provide a session name for the migration, along with the target thin pool. The target thin pool can be chosen from a list by clicking the Select button.

To specify the source pool, click the Show Advanced link, then choose a pool from the drop-down list to the right of Migrate allocations from pool.



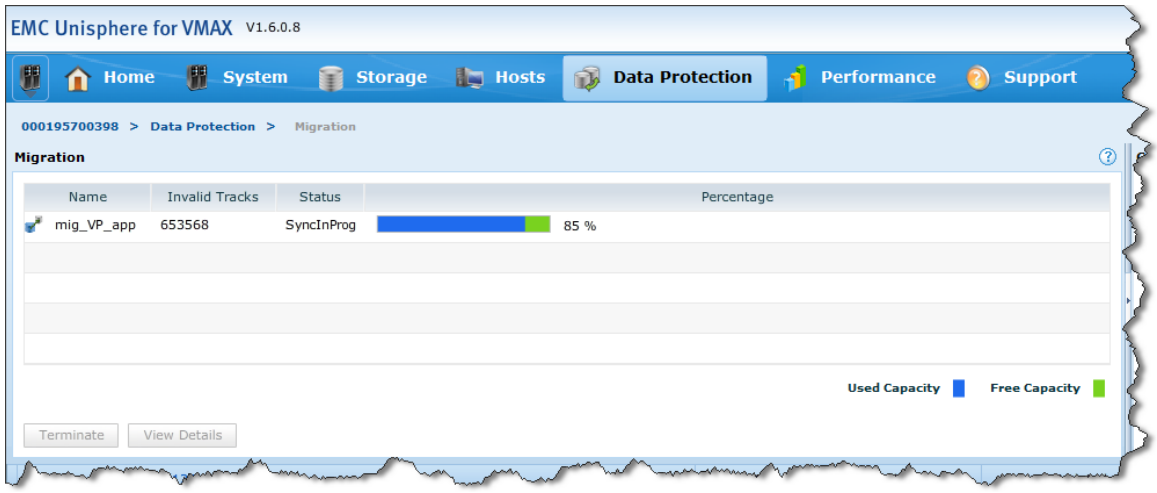
Also on this dialog box, the devices being migrated can be pinned (the default is Yes). Pinning the device prevents FAST from moving the device to another tier, until such time as the device is unpinned

following the migration. Clicking Yes next to Pin Volumes pins the device after the migration is submitted.

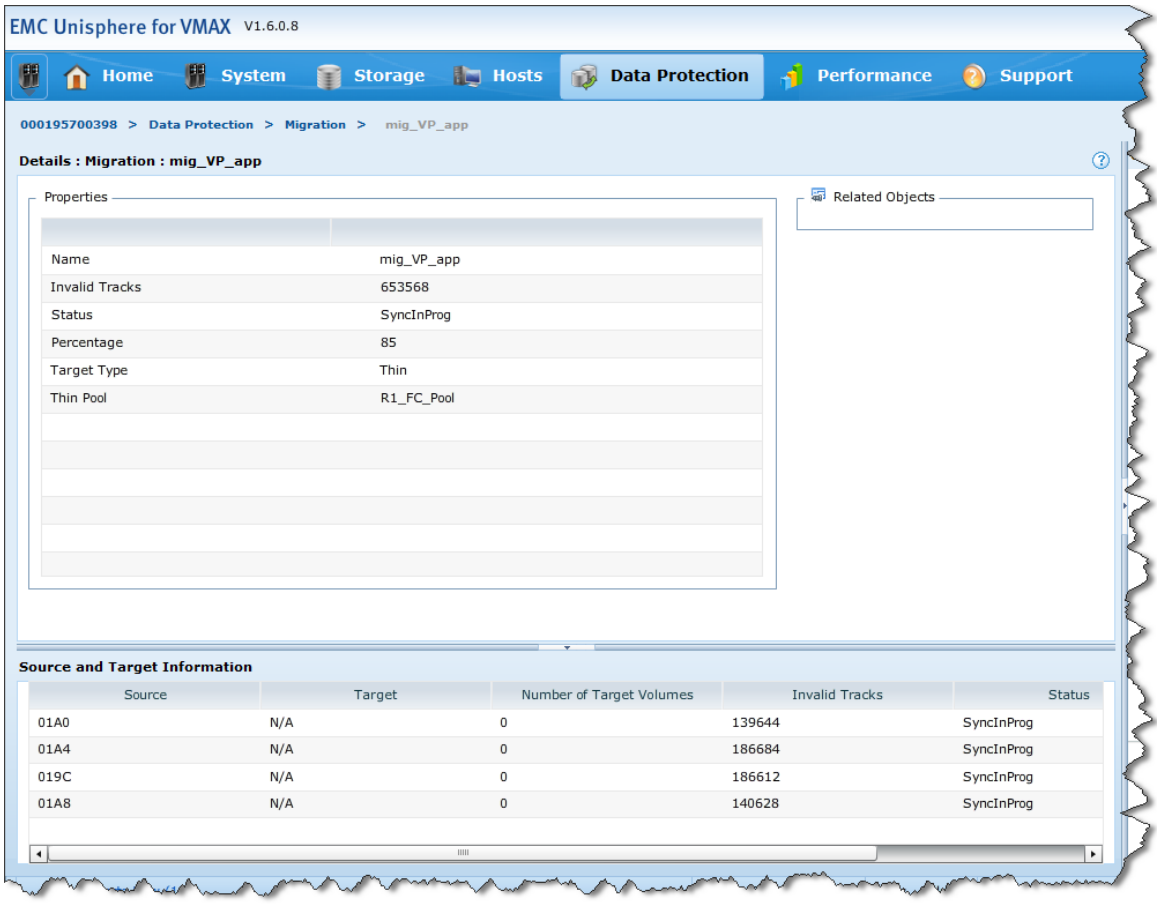
> **Note:** The device is not automatically unpinned following the migration. It must be manually unpinned.

To submit the migration, click OK.

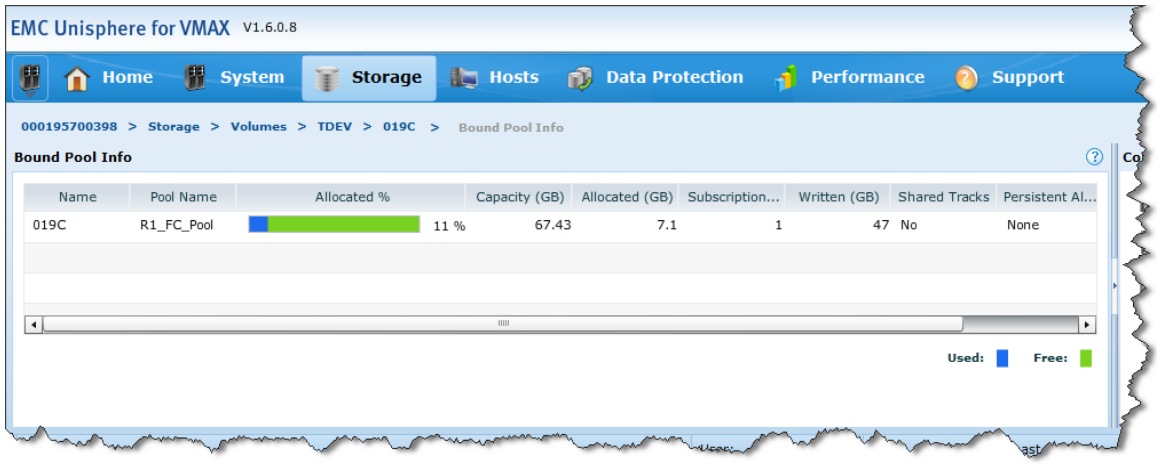
When a migration has been submitted, its progress can be followed from the Migration subsection page under Data Protection.



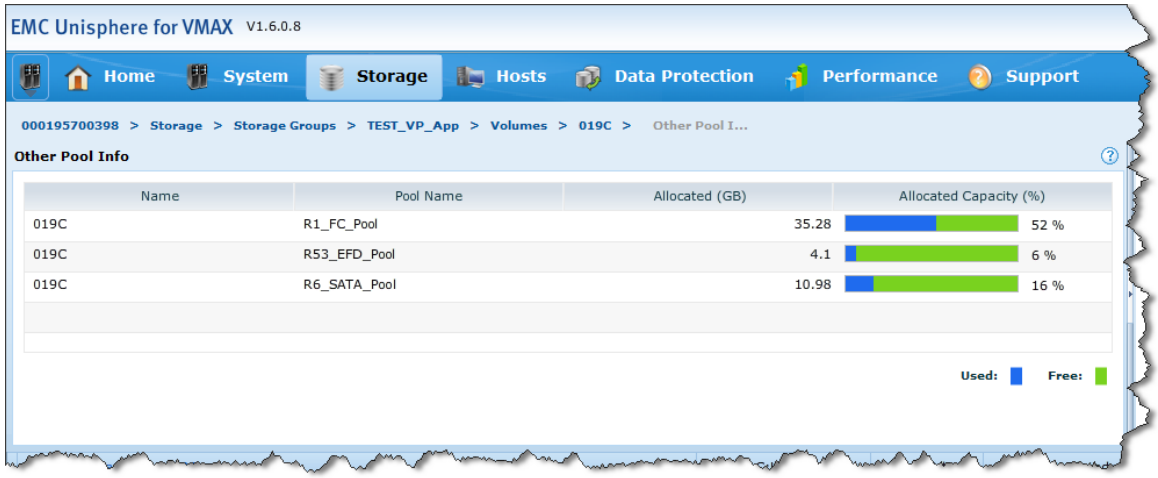
Double-clicking on the migration session name displays more detailed information on the migration,



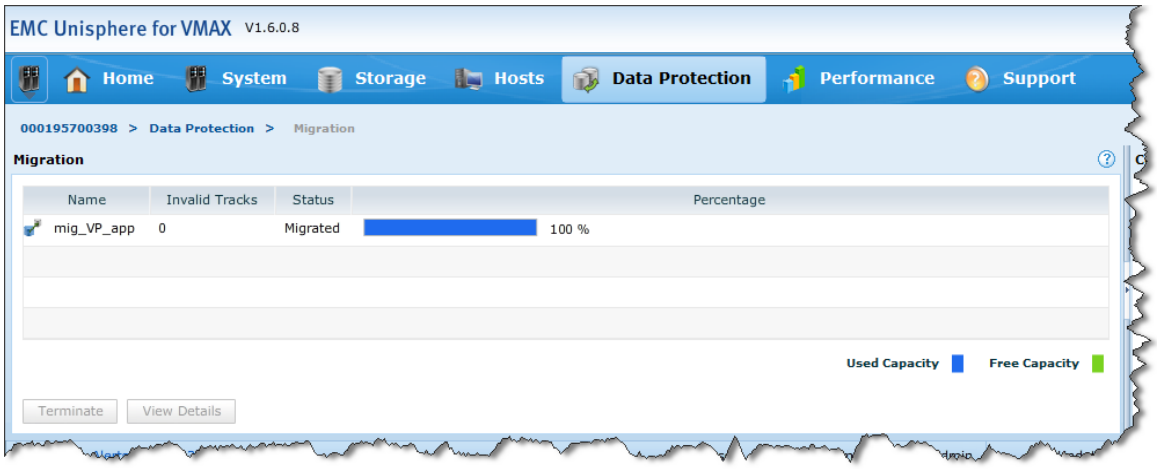
While the migration is in the SyncInProg state, the Properties view of one of the devices being migrated shows that the device is still bound to the R1_FC_Pool.



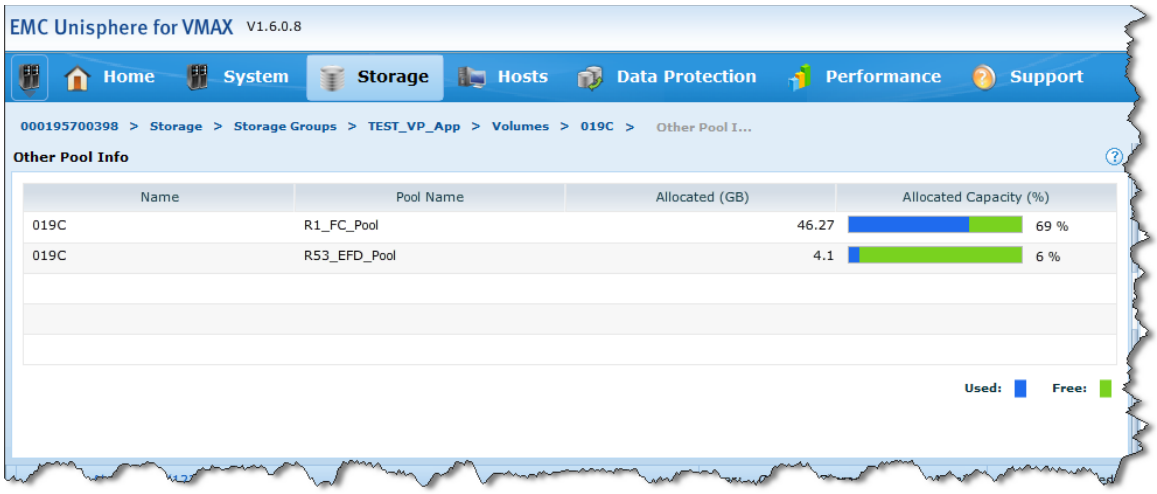
Looking at the Other bound pool information, the device still has allocations in all three pools. However, the allocations in the source SATA pool are decreasing, while those in the target FC pool are increasing.



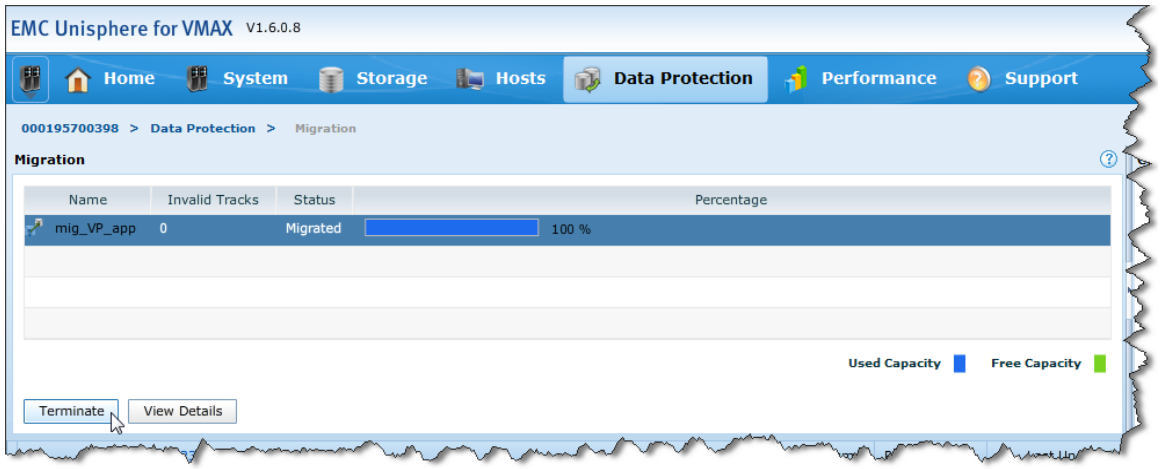
At the end of the migration, the migration session status shows as Migrated.



When the migration session has reached the Migrated state, the Properties view of one of the source devices shows that all of the extents for the device are now allocated in just two pools. Data is no longer allocated in the source SATA pool.



To complete the migration, and to remove the migration session from the Symmetrix array, select the migration and click Terminate.



The Virtual LUN migration is complete.

Conclusion

Virtual LUN technology for the Symmetrix VMAX Family enables transparent, nondisruptive data mobility among storage tiers within the same array and between RAID protection schemes without impacting local or remote replication. Organizations can respond more easily to changing business requirements when using tiered storage in the array.

Introduced in Enginuity 5874, Virtual LUN technology supports the migration of standard, non virtually provisioned, Symmetrix devices in both open system and mainframe environments and includes support for metavolumes.

Starting with Enginuity 5875, Virtual LUN VP Mobility supports the migration of Virtual Provisioning devices in open system environments.

Virtual LUN technology for standard devices offers two types of data movement: migration to unconfigured space and migration to configured space. Virtual LUN VP Mobility migrates virtually provisioned devices from one virtually provisioned storage pool to another. In this way, data can be moved between storage pools configured on different drive technologies and with different RAID protection types.

In each case, the migration provides users the ability to move data between high-performance drives and high-capacity drives, or to populate newly added drives, with full inter-RAID flexibility.

Appendix A: Minimum requirements

The following are the minimum requirements to perform a Virtual LUN migration for disk-group provisioned devices:

- Symmetrix VMAX array
- Enginuity 5874
- Solutions Enabler V7.0
- Symmetrix Management Console 7.0 (optional)
- Symmetrix Optimization license key

The following are the minimum requirements to perform a Virtual LUN migration for virtually provisioned devices:

- Symmetrix VMAX array
- Enginuity 5875
- Solutions Enabler V7.2
- Symmetrix Management Console 7.2 (optional)
- Symmetrix Optimization license key*

Note: The Symmetrix Optimization license key is not required at Enginuity 5876.

The following are the minimum requirements to perform a Virtual LUN source pool migration for virtually provisioned devices:

- Symmetrix VMAX array
- Enginuity 5876
- Solutions Enabler V7.4
- Unisphere for VMAX 1.0 (optional)

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