# Table of contents

- Introduction .................................................................................................................................................................................... 3
- Terminology used ......................................................................................................................................................................... 4
- Concepts .......................................................................................................................................................................................... 4
- Use cases ........................................................................................................................................................................................ 5
  - Appliance-less federated data migration .................................................................................................................................. 5
  - Granular federated array workload management .................................................................................................................. 5
  - Zero downtime technology refresh ........................................................................................................................................ 5
  - Nearly zero impact migration .................................................................................................................................................... 5
  - Choice between a graphical and a command line interface ............................................................................................... 6
  - Alignment of storage usage with cost ......................................................................................................................................... 6
- Comparing HP Storage Federation with traditional storage virtualization appliances ............................................................... 6
- New Peer Motion features introduced since HP 3PAR OS 3.1.3 ................................................................................................. 7
- Theory of operation ...................................................................................................................................................................... 8
- Feature overview ........................................................................................................................................................................... 9
  - Features common to Peer Motion wizard and Peer Motion Utility .......................................................................................... 9
  - Features specific to Peer Motion Management Console wizard ............................................................................................ 10
  - Features specific to Peer Motion Utility .................................................................................................................................. 10
- Technical prerequisites .............................................................................................................................................................. 11
  - HP 3PAR OS and host OS environment ...................................................................................................................................... 11
- Peer Motion workflow using HP 3PAR Management Console .................................................................................................. 12
  - Online migration ....................................................................................................................................................................... 12
  - Minimally disruptive migration .................................................................................................................................................. 22
  - Offline migration ........................................................................................................................................................................ 23
- Peer Motion workflow using Peer Motion Utility ...................................................................................................................... 24
  - Peer Motion Utility commands .................................................................................................................................................. 24
  - Peer Motion Utility migration stages ......................................................................................................................................... 24
- Scripting a Peer Motion Utility migration ................................................................................................................................... 26
Introduction

Over the last decade, storage systems have attained new levels of reliability. Much of this progress can be credited to internal and external redundancy features. Tier 1 arrays like HP 3PAR StoreServ Storage operate without interruption throughout maintenance operations such as the addition of more storage capacity, I/O interfaces, and controller nodes, or firmware upgrades of controllers and disks. HP 3PAR StoreServ Storage is designed for ultra-high availability, see HP 3PAR StoreServ Storage: designed for mission-critical high availability for additional information.

However, when moving data between storage devices (such as when migrating from a legacy storage array to a next-generation one), interrupted data access is still considered the norm. To overcome this shortcoming, HP introduced the concept of storage federation in the HP 3PAR StoreServ product family with the launch of HP 3PAR Peer Motion in August 2011.

Storage federation is the delivery of distributed volume management across self-governing, homogenous peer storage arrays. Federated data mobility allows live data to be moved easily and non-disruptively between HP 3PAR StoreServ Storage arrays. This allows handling unpredictable workloads in 24x7 multi-tenant environments while being able to reduce expenses, and manage overhead and risk to service levels. HP Storage Federation is available on the HP 3PAR StoreServ 7000 and 10000 systems including the HP 3PAR StoreServ 7450 All-Flash array.

Peer Motion on HP 3PAR StoreServ Storage is part of HP’s comprehensive storage federation strategy. Peer Motion raises agility and efficiency levels in your data center across the boundaries of a single storage system. HP 3PAR Peer Motion is the industry-first non-disruptive, do-it-yourself data migration software tool that brings data mobility for enterprise block storage across storage systems in the data center and the cloud.

To provide simple and foolproof data migration, HP offers a convenient software wizard operating within the HP 3PAR Management Console (MC) that orchestrates all stages of the HP 3PAR Peer Motion data migration lifecycle. At the same time, we made available the HP 3PAR Peer Motion Utility tool that executes the same migration steps from the command line. For nearly all host operating systems supported on HP 3PAR StoreServ, data migration occurs without downtime for applications. HP 3PAR Peer Motion brings agility to your data center heretofore unknown. HP 3PAR StoreServ Storage customers can load balance I/O workloads at a single virtual volume level across systems at will anytime, and perform a technology refresh seamlessly at a low CAPEX and OPEX cost expenditure for cost-optimized asset lifecycle management. And because HP 3PAR Peer Motion migration is so simple to activate and requires no external appliance, consultant services are not needed. HP 3PAR Peer Motion is available across the HP 3PAR StoreServ Storage portfolio.

This paper focuses on the operational side of HP 3PAR Peer Motion software. It describes the concepts, technical prerequisites, and the workflow of a Peer Motion migration and suggests a number of best practices for the wizard and command line orchestration of a migration when using HP 3PAR OS 3.1.3 or above. The paper assumes that the reader is familiar with HP 3PAR StoreServ and has read the HP 3PAR Peer Motion Guide. For additional information on HP 3PAR Peer Motion, go to hp.com/go/peermotion.

1 h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8316ENW.pdf
2 h20566.www2.hp.com/portal/site/hpsc/public/psi/manualsResults/?lang=en&cc=us&sp4ts.oid=5044394
**Terminology used**

Throughout this paper, we use the following terminology:

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source, source array, source system</td>
<td>The HP 3PAR StoreServ Storage system that contains the data to be migrated</td>
</tr>
<tr>
<td>Destination, destination array, destination system</td>
<td>The HP 3PAR StoreServ Storage system to which the data is migrated</td>
</tr>
<tr>
<td>Virtual Volume (VV)</td>
<td>A volume created on an HP 3PAR StoreServ Storage system</td>
</tr>
<tr>
<td>Virtual Volume set (VVset)</td>
<td>A logical group of virtual volumes on an HP 3PAR StoreServ Storage system</td>
</tr>
<tr>
<td>Host</td>
<td>The server whose Virtual Volumes are under migration from the source to the destination system</td>
</tr>
<tr>
<td>Virtual logical unit number (VLUN)</td>
<td>A Virtual Volume that is exported to a host</td>
</tr>
<tr>
<td>Storage area network (SAN)</td>
<td>A high-speed special-purpose network that interconnects storage devices with hosts</td>
</tr>
<tr>
<td>Zoning operation</td>
<td>The creation, modification, or deletion of a logical connection in the SAN between a Fibre Channel (FC) host bus adapter (HBA) in the host and one in the HP 3PAR StoreServ Storage system</td>
</tr>
</tbody>
</table>

**Concepts**

HP 3PAR Peer Motion migrates block data between two HP 3PAR StoreServ Storage systems without the use of an external appliance or utilizing host resources like in host-based mirroring. The HP 3PAR StoreServ Storage systems are interconnected via dual FC Peer links and redundant SAN switches that serve as the dedicated path for the data transfer between the source and the destination system. The destination system attaches to the source system as external storage through the Peer links making the source volumes under migration become visible to the destination and ready for import.

Depending on the host operating system, the migration of data into the destination system occurs in either an online, an offline, or a minimally disruptive mode. In the online mode, volumes exported to a host or cluster are migrated without the host(s) losing access to the migrating volumes. The minimally disruptive mode migrates volumes exported to a host or cluster but requires shutting down the host(s) for a short period for SAN zone changes. After the changes, the data transfer is started and the host(s) powered on. Access by the host(s) to the migrating volumes on the source now runs over the destination system. The offline mode migrates virtual volumes that are not exported to a host; no SAN zone changes or system shutdown is required. Note that all SAN zone and unzone operations during a Peer Motion operation are executed outside of the HP 3PAR MC or CLI using vendor-specific SAN switch management tools.

HP 3PAR Peer Motion can be staged from a tab within the HP 3PAR Management Console, the GUI for managing HP 3PAR StoreServ systems or from HP 3PAR Peer Motion Utility, a command line tool. The MC integrates a software wizard that coordinates the volume migrations between the host and the storage systems. The wizard walks the storage administrator through a series of steps to define the source and destination systems, determine the migration type, select the volumes for migration, start the data transfer and monitor it, and finally clean up after the migration has completed. The wizard informs the administrator when to make the SAN zone changes, if needed. The HP 3PAR Peer Motion Utility is a client/server tool that administers the migration steps from the command line. SAN zone changes are not flagged anticipating a good knowledge of HP 3PAR StoreServ administration and the concepts of migrations by the user of this tool.

The source volumes under migration continue to receive application writes during the entire migration process. After the migration ends, they are no longer updated and become stale on the source system.
Use cases

HP 3PAR Peer Motion and HP Storage Federation have a number of use cases that illustrate their business value. The most important use cases are highlighted as follows.

**Appliance-less federated data migration**

Many commercial solutions for data migration between storage systems require the installation of a third-party appliance that shares SAN bandwidth with other arrays and applications. Appliances brought into the data center, even for brief periods, are a concern for IT managers with respect to security, LAN and SAN connectivity, power, performance, planning, and management. HP 3PAR Peer Motion does not depend on new technology layers or extra tools, nor does it require complex planning. The source and destination arrays are interconnected in a peer fashion using a dedicated set of FC links between them. Consequently, there is no disruption to other SAN traffic or to the Ethernet networking environment during setup, data transfer, and removal of an HP 3PAR Peer Motion configuration.

**Granular federated array workload management**

Until recently, the limits of disk array technology centered on capacity, performance, and their footprint in the data center. HP 3PAR StoreServ Storage supports more than 2 PB of capacity and delivers industry-leading SPC-1 performance using high-capacity disk drives on rotating and solid-state media. The new challenge is managing unpredictable, dynamic workloads efficiently at the data center level on a 24x7 basis. Introducing this level of agility requires shifting workload data to a storage system that is less loaded, contains the right type of physical disks, or is part of a tech-refresh of the data center. Starting with HP 3PAR OS 3.1.3 and an ALUA-capable host OS, a single application on one or more Virtual Volumes can be relocated online to another HP 3PAR StoreServ system while keeping the other applications on the host operational. This single VV granularity means customers can balance their workloads across systems at will without downtime for their applications, resulting in cost-optimized asset lifecycle management.

**Zero downtime technology refresh**

Technology refreshes have always been a challenging activity. Customers face the choice of either staying on their old storage systems or refreshing their technology with forced downtime. Obviously, neither is a good solution.

HP 3PAR Peer Motion allows customers to move data from their current HP 3PAR StoreServ Storage systems to new ones in a non-disruptive manner for nearly all operating systems supported by HP 3PAR StoreServ Storage systems including Windows Server® 2008 (R2) and 2012 (R2) clusters. In a technology refresh, HP 3PAR Peer Motion offers significant time savings because there is no need to wait for planned server downtime to migrate to a new HP 3PAR StoreServ Storage system. Consult the [Single Point of Connectivity Knowledge](http://hp.com/storage/spock) (SPOCK) website for the list of host operating systems that support online migration.

**Nearly zero impact migration**

A popular approach for migrating data from one storage array to another is host-based mirroring. This technique uses an OS-native or third party logical volume manager for the file-by-file movement of data. While slow in the first place, this approach puts an additional burden on the host’s CPUs, its HBAs, and the SAN infrastructure degrading performance of the applications on the host during the migration. HP 3PAR Peer Motion is an array-to-array migration software that uses the HP 3PAR StoreServ Storage controllers as the data-moving engine. As Peer Motion uses a dedicated pair of FC links conveying the data between the arrays under migration, the impact of a migration on a host’s applications is nearly zero making it a more favorable method than host-based mirroring.

---

3 hp.com/storage/spock
Choice between a graphical and a command line interface

Some migration tools run entirely from a GUI and some run from the command line. HP 3PAR Peer Motion offers both. The GUI, implemented as a software wizard, operates from within the familiar environment of the HP 3PAR Management Console. With all the prerequisites at each step checked by the wizard in the background, storage administrators of all levels can experience ease of use when migrating data. The Peer Motion Utility drives the migration from the command line and is intended for storage administrators who have experience with migration projects.

Alignment of storage usage with cost

Gone are the days that IT purchased a storage system and granted access to the entire company without cost or limits. Today’s data center administration charges business units for the consumption of array resources. Parameters for the calculation of the cost/GB are the raw space in use (i.e., the usable volume space augmented by the RAID overhead), the disk media type (solid-state disk [SSD], FC, or nearline [NL]) and the overall performance of the storage system among others. Keeping data online after a project ended on the same fast storage tier as during the project is not cost-effective in a charge-back environment. Relocating the volumes of an application to a lower cost storage tier on the same or another HP 3PAR StoreServ Storage system saves money to a business unit. With its capability for online data migration between HP 3PAR StoreServ Storage systems at minimal effort, HP 3PAR Peer Motion enables the alignment of storage usage with cost.

Comparing HP Storage Federation with traditional storage virtualization appliances

Initially, HP 3PAR Storage Federation technology seems to compete with storage virtualization appliances to raise agility in the data center. Storage virtualization appliances deliver consolidated distributed volume management across a set of homogeneous or heterogeneous storage arrays, hiding the complexity of managing different brands of arrays behind the single user interface. This way pooling storage capacity becomes possible across the data center. However, deploying storage virtualization does not come without a few major drawbacks. Storage virtualization requires an expensive hardware appliance and expensive software and licenses, and you need a pair of each to achieve high availability. This makes the introduction of a storage virtualization appliance-based solution an uneconomical proposition. Because these appliances need to be installed in the data path between the host and the array, their deployment adds complexity in the form of more boxes, more cables, and more connections (see figure 1) leading to more mistakes incurring higher failure rates and eventually downtime for applications. The data center also becomes less green because of higher power, cooling, and rack-space consumption with storage virtualization appliances in place. In case the arrays were already serving data, taking them behind the storage virtualization unit means downtime if safe deployment is the goal. The presence of the storage virtualization appliance in the data path means that this path gets longer, which inevitably introduces performance penalties in the form of increased latencies.

Furthermore, the deployment and management of the storage virtualization appliances results in more administrative work in the data center. For example, volumes must be provisioned, presented, and managed in two places, instead of one: meaning twice the work compared to a direct array-to-host deployment. Finally, managing storage volumes on an array of a brand that is different from the storage virtualization appliance may render certain advanced or unique functions on the array inaccessible. As a result, the feature list of the array will be reduced with the use of a virtualization appliance. In general, virtualization-based storage solutions are mediocre at best in comparison to direct array-to-host deployments.

Based on this analysis, we conclude HP 3PAR Storage Federation technologies are superior to storage virtualization appliances as the way to introduce agility in the data center.

New Peer Motion features introduced since HP 3PAR OS 3.1.3

Non-disruptive migration of Windows® and Linux® clusters
Using the HP 3PAR Management Console or the Peer Motion Utility, Windows clusters with up to four members and Red Hat® Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) Linux clusters can be migrated online and without downtime between HP 3PAR StoreServ Storage systems.

Single Virtual Volume migration
A single virtual volume or a subset of all volumes exported to a host can be migrated online between HP 3PAR StoreServ systems without unzoning the host from the source system. This means that the volumes of a particular application can be moved to the destination system while keeping volumes of other applications accessible to the host from the source system.

Efficient Import
Enhancement for volumes that contain unwritten blocks: Disk blocks that were never written to on the source volume are not read from disk and hence not transferred over the Peer links.

More details on the new features can be found in the HP 3PAR Peer Motion Guide² and in the remaining part of this paper.
Theory of operation

This section discusses the case of the migration of volumes presented to a standalone host; the case of Windows clusters is treated at a later stage in this paper.

A Peer Motion migration starts by selecting the HP 3PAR source and the destination system. Next, the user picks the host, cluster, or volume(s) to be migrated, and selects the migration type to be online, minimally disruptive, or offline. When done, Peer Motion creates a new host on the source system that is in reality the destination HP 3PAR StoreServ connected to it via the FC Peer links. After exporting the volumes under migration to this new host, the migrating volumes become visible to the destination system. Next, the admit of these newly exported volumes on the destination system are executed creating the so-called Peer volumes. A Peer volume is a software structure inside HP 3PAR OS for a virtual volume with the Peer provisioning type. A Peer volume has a 1:1 relationship with a volume on the source system. Peer volumes are created with RAID 0 protection and have the same size and name as their counterpart volume on the source system. Initially, a Peer volume consumes no space on the destination HP 3PAR StoreServ, but will eventually hold the data from the source VV and become a thin or fully provisioned VV on the destination system with the desired RAID level. All migration types offer the opportunity to change the volume provisioning from full to thin, or the reverse and select Common Provisioning Groups (CPG) for the volume’s base and snapshot space on the destination system that have different characteristics than the originating ones on the source system.

Next, and if it does not yet exist, an identical entry for the host under migration is created on the destination system and the Peer volumes get exported to this new host. A rescan will be needed on the host to discover the additional paths to the volumes. The next step is to isolate the host from direct access to the volumes under migration on the source system and depends on the operating system version of the host, the source, and the destination system. If the source and destination are at HP 3PAR OS 3.1.3 or later and the host runs an ALUA-capable operating system and was defined with an ALUA persona on the source and destination, the ALUA status of the paths from the host to the source system are transitioned to “standby” effectively preventing the host from accessing the migrating volumes directly on the source. This results in an online migration with single volume capability. If the source system is at pre-HP 3PAR OS 3.1.3 and the destination is at HP 3PAR OS 3.1.3 or later, the host must be unzoned from the source system at this moment. The migration is online but there is no single volume migration capability.

Next, the import phase performing the actual data transfer is initiated from the destination system. Space for a destination VV is allocated across the physical disks included in the CPG intended for it. No additional temporary space beyond what is needed for the Peer volumes is allocated on the destination system during the migration.

The ALUA’s “standby” status for the paths from the host to the migrated source volumes stays in place after the migration ends as a means to protect the volumes from being mounted to the same or another host as these source volumes are no longer updated after the migration ends, rendering them stale in seconds. For source systems at pre-HP 3PAR OS 3.1.3, the selected volumes on the source HP 3PAR StoreServ receive a SCSI-3 reservation to prevent access to them from all hosts except the destination array. The migrated volumes do not have to be removed from the source array.

The granularity for a Peer Motion migration is an entire virtual volume. Data in volumes is moved in blocks of 256 KB. The migration commands are issued to the source and the destination arrays to set up and execute the migration transmit over an out-of-band path: meaning they are outside the data path between the host and the two arrays.

The transfer of every volume is managed by its own HP 3PAR task, which is created and started on the destination system. An unlimited number of migration tasks can be submitted, but only nine of them run in parallel. The other migration tasks are queued in the destination’s HP 3PAR OS. Whenever more than four migration tasks finish or when a single task moves a volume larger than 256 GB, a queued task for another volume starts automatically.

During data migration, all reads by the host from the migrating VVs are served by the source system accessed via the destination system. Writes by the host always go to the VVs on the source system over the destination to keep them updated in case the migration should halt for some reason. Writes also go to the VVs on the destination if the block for them is already migrated. The acknowledgement to the host for a successful write comes from the destination HP 3PAR StoreServ system.

The Worldwide Name (WWN) of a migrated volume on the destination array is identical to the original one on the source array. This way, the multi-pathing software on the host thinks it is still communicating to the volume located on the source array during, and after the migration.
Feature overview

An HP 3PAR Peer Motion migration can be executed from within the HP 3PAR Management Console or with the HP 3PAR Peer Motion Utility. This paragraph will discuss the features common to both tools and the ones private to each.

Features common to Peer Motion wizard and Peer Motion Utility

Migration types
Both the Peer Motion Management Console and the Utility support the online, minimally disruptive, and offline migrations of volumes. Please refer to the HP 3PAR Peer Motion Guide\(^2\) for details on these migration methods and to SPOCK\(^3\) for when they can be applied.

With HP 3PAR OS 3.1.3 or later on the destination system, Peer Motion offers the online migration for nearly all operating systems supported on HP 3PAR StoreServ systems. If the source system runs HP 3PAR OS 3.1.3 or later as well, no unzoning of the host from the source system is required removing the necessity to involve the company’s SAN fabric team. With this and the resulting single VV migration, the framework for storage federation is present. If the source system runs HP 3PAR OS 3.1.2 (any MU) or earlier, all volumes exported from the source system to the host must be migrated simultaneously to the destination along with an unzoning requirement.

Configurations not eligible for online migration are subject to minimally disruptive migration (MDM). During MDM, there is a temporary short disruption to the applications during which the host or the cluster is unzoned from the source system and zoned to the destination one. The host(s) can be powered on again when the migration has started; the actual data transfer occurs with the applications accessing the migrating volumes causing little downtime for them. In a minimally disruptive migration, all volumes exported to a host need to be migrated simultaneously.

Any host operating system running on a standalone host or clustered environment that is certified by the source and destination HP 3PAR OS supports offline Peer Motion migration. When the offline migration option is chosen, a single volume or multiple ones can be selected for migration. All migrating volumes must stay unexported from the host(s) during the entire migration.

No changes to the host are required for any type of migration. The boot volume of a host located over a SAN on the source HP 3PAR StoreServ system can be migrated online or in a minimally disruptive way to the destination HP 3PAR StoreServ system.

Integration with HP 3PAR software titles
Snapshots of a VV on the source system get transferred to the destination system, but the parent-child relationship to the parent VV is not maintained: the snapshots come across as new base volumes containing the data of the parent on the source system at the point in time the snapshot was created. Peer volumes cannot be subject to snapshots and Physical Copies and cannot become the primary or secondary volume of a Remote Copy operation until the migration has finished. When a volume is a member of a VVset on the source system, it is not migrated to that VVset on the destination, even if it exists. Transferring a volume to the VSet after the migration ends is a manual, online operation.

Volumes on the source system under HP 3PAR Dynamic Optimization or being converted online from full to thin or the reverse can be subject to a Peer Motion migration. A volume under HP 3PAR Adaptive Optimization (AO) whose regions are spread over multiple CPGs is migrated integrally to the destination CPG that was chosen during the migration setup. This is because the destination HP 3PAR StoreServ has no visibility of the tiered layout of the volume on the source system. A similar AO policy for the volume has to be recreated on the destination system.

Peer Motion is thin aware: Only the used space in a thin-provisioned volume is migrated from the source to the destination. Peer Motion is zeroes aware: Blocks of zeroes in fully provisioned source volumes will not be written to the destination disks if the destination volumes are thin provisioned.

Peer Motion is HP 3PAR domain aware: Volumes exported to a host in a domain on the source array will be placed in the same domain as the destination array, provided an identically named domain was created upfront on the destination HP 3PAR StoreServ. All volumes under migration must belong to the same domain.

Primary or secondary volumes in a Remote Copy configuration can be migrated to a new system using Peer Motion—consult appendix A of the HP 3PAR Peer Motion Guide\(^2\) for information on this.
Efficient Import is an optimization for Peer Motion for source systems on HP 3PAR OS 3.1.1 MU3 or later and destination systems on HP 3PAR OS 3.1.3 or later. Disk blocks never written to on the source volume are not read from disk and hence not transferred over the Peer links. The benefit is a faster volume migration, thanks to the reduced SCSI read requests. It applies to HP 3PAR thin provisioned source volumes that are at most 75 percent full. The destination volume can be thin or fully provisioned. Efficient Import works for any type of migration including single volume and Windows cluster migrations.

Features specific to Peer Motion Management Console wizard

The Peer Motion software wizard in the Management Console (MC) presents a sequence of dialog boxes that lead the storage administrator through a series of well-defined steps to complete a Peer Motion migration. The wizard supplies help information on each screen. The starting point for the wizard is the identification of the source and destination HP 3PAR StoreServ in the MC. Next, the wizard prompts the administrator to appoint two unused FC ports on the destination system, reconfigures them to so-called Peer ports, and establishes the Peer link connectivity between the source and the destination system.

The wizard can optionally copy storage settings like domains (and sets of them), hosts (and sets of them), users, and the configuration details for Lightweight Directory Access Protocol (LDAP), network time protocol (NTP), DNS, Syslog, and SNMP from the source to the destination system. Intuitive screens to select and migrate volumes facilitate the relocation of data to the destination system.

After the data migration starts, the Management Console can be closed and reopened some time later to review the progress of the data transfer. The Performance & Reports section of HP 3PAR Management Console contains a predefined chart showing the throughput for the Peer ports.

After the migration ends, the Peer Motion wizard cleans up the configuration and prepares itself for the migration of other volumes on the same or a different host. If no more migrations are envisioned in the near future, the wizard can reconfigure the Peer ports back to host ports; the zoning for the Peer links needs to be removed manually.

Features specific to Peer Motion Utility

Peer Motion Utility uses command line commands to control the migration of a host’s data from a source to a destination HP 3PAR StoreServ Storage system. The Utility has a client/server architecture with the client issuing commands to the server side using a RESTful application programming interface (API). HP 3PAR Peer Motion Utility is freely downloadable from HP Software depot. The Utility client command set is easy to use and can be integrated in scripts to automate migrations of volumes from one HP 3PAR StoreServ Storage systems to another. The Utility server is a stateless engine that processes requests from Windows and Linux Utility clients interchangeably. The Utility client can be closed at any stage of the setup or actual migration and reopened some time later to verify or continue the migration operation. The details about the selected source, destination, hosts, and volumes, and the submitted active and completed migrations are stored in XML files. These data are persistent across a reboot of the Peer Motion Utility server. The system running the Utility client does not store any migration configuration data.

Creating Peer ports is the responsibility of the storage administrator. Peer Motion Utility is for users who have good knowledge of HP 3PAR StoreServ Storage administration and migration workflow.

software.hp.com/
Technical prerequisites

HP 3PAR OS and host OS environment

The Peer Motion migration wizard was introduced with HP 3PAR Management Console 4.3, and it requires minimum HP 3PAR OS 3.1.2 on the destination HP 3PAR StoreServ system. Newer features introduced at a later stage may require a more recent version of the MC and HP 3PAR OS: the online migration of Microsoft® Windows clusters needs HP 3PAR OS 3.1.3 on the destination system; single volume migration needs HP 3PAR OS 3.1.3 on both the source and the destination system. The wizard is integrated in the MC; it does not require a separate installation. If the destination system is at HP 3PAR OS 3.1.1, we can use HP 3PAR Peer Motion Manager (PMM) graphical interface for the migration. Consult the HP 3PAR Peer Motion Manager 1.2.0 Software User’s Guide5 for technical prerequisites on PMM. The Peer Motion Utility requires minimum HP 3PAR OS 3.1.1 on the destination system. The HP 3PAR OS version of the destination system should be higher or equal to the one on the source system; the MU levels on the systems are ignored. The host needs to have the proper multi-pathing software installed before the migration can start—see the SPOCK3 website for a list of supported multi-pathing packages per host OS. Note that the round-robin path selection scheme is required. Consult SPOCK3 and the HP 3PAR Peer Motion Guide8 for the latest information on supported combinations of HP 3PAR OS on the source and destination system, HP 3PAR StoreServ model, the host OS, and its MPIO version for online, minimally disruptive, and offline migrations using the Peer Motion wizard and Utility.

Executing the Peer Motion wizard and the Utility requires the administrator to be logged on simultaneously to the source and destination HP 3PAR StoreServ systems with “Super” user rights. The host running the MC or the Utility server component should be able to communicate to the source and destination HP 3PAR StoreServ Storage systems over TCP/IP, see the HP 3PAR StoreServ Site Planning Manual7 for the TCP/IP port assignments for communicating to the various components of the MC.

The Peer Motion Utility consists of a server and a client component that communicate with each other over TCP/IP via ports 2390 and 2388—these port numbers can be changed if they are taken, consult the HP 3PAR Peer Motion Guide8 for this. The Utility server component must be installed on a Windows system; the client part can run on Windows or Linux; the server and client part can be installed on the same Windows system. The Utility client component uses an account local to the Windows system running the Utility server for authentication. The HP 3PAR Peer Motion Guide8 describes the installation and uninstallation of the Peer Motion Utility in detail. Consult SPOCK3 for the list of supported versions of Windows and Linux.

Peer Motion in the Management Console uses the Java software environment installed with the MC. The Peer Motion Utility client and server for Windows install and use their own, common version of Java. The Utility client on Linux uses the locally installed Java environment. Consult SPOCK3 for the minimum version of Java required.

The online migration without unzoning the host from the source system requires that the host be configured with an ALUA-capable host persona on both the source and destination systems and that the operating system on the host is enabled for ALUA. Consult SPOCK3 for the list of operating systems supported with an ALUA persona in HP 3PAR OS 3.1.3 or later.

Peer Motion permits only one source system to become engaged with one destination system. It is not supported to use another instance of the MC or the Utility to configure a second setup of Peer Motion using either array of the first Peer Motion layout. It is not supported to execute simultaneously a Peer Motion migration using the MC wizard and one using the Utility. You cannot submit a second Peer Motion migration when the first one has been defined and yet to be completed.

Peer ports and Peer links

HP 3PAR Peer Motion requires two unused FC ports on the destination HP 3PAR StoreServ system to be configured in the Peer connection mode. This configuration is executed by the Peer Motion wizard after the operator selects two eligible FC ports. After becoming a Peer port, the WWN of these ports changes from xx:xx:00:02:AC:xx:xx:xx to xx:xx:02:02:AC:xx:xx:xx (The change is underlined.). This changed WWN is the one that must be used in the SAN zoning of the Peer links. The SAN zones for the Peer links have to be set up manually using an appropriate SAN switch management tool. The physical FC ports for the Peer links must be on HBAs located in different, adjacent controller nodes (e.g., nodes 2/3 or 6/7). The host ports on the source system linking up the Peer ports must be on different nodes that do not need to be adjacent; the host ports can be shared with other hosts. Best practices prompt to select host and Peer ports taking HP 3PAR StoreServ Persistent Ports8 into account. The actual node pair numbers in use on the source and destination array can be unequal. The Peer links and the SAN zoning for them should stay in place until the data transfer has finished and the cleanup is completed. Peer ports can exist on the source system but cannot be in a Peer Motion relationship with

5 bizsupport2.austin.hp.com/bc/docs/support/SupportManual/c03253690/c03253690.pdf
7 7 h20195.www2.hp.com/v2/GetPDF.aspx%2F4AA4-4543ENW.pdf
another system. Having the Peer links in place days or weeks before the data migration takes place does not harm or induce a performance penalty to applications.

No dedicated HBA is required for the Peer ports on the destination array; the other FC ports on the HBAs of an HP 3PAR StoreServ T-Class, 7000, or 10000 can be used for host connectivity. On the HP 3PAR F-Class Storage system, the second port on the 2-port FC HBA must stay unused. Free ports on an HBA used for Remote Copy over Fibre Channel in HP 3PAR OS 3.1.2 and lower cannot be configured as Peer ports; this limitation is lifted on 3.1.3. The Peer links between the arrays are dedicated to the Peer Motion migration operation and run over a single or redundant pair of SAN switches; direct FC connectivity between the source and the destination systems is not supported. You can reuse the Peer ports after completing the migration by changing their type.

**Peer Motion workflow using HP 3PAR Management Console**

This section describes and illustrates the workflow of a Peer Motion migration for an online, a minimally disruptive, and an offline migration using the MC. The version of HP 3PAR operating system on the source and destination HP 3PAR StoreServ Storage system in this entire paragraph is HP 3PAR OS 3.1.3 or later. The MC has both arrays logged in using "Super" user credentials.

**Online migration**

Figure 2 sketches the evolution of the SAN zoning layout during an online migration in six stages. The host is depicted as a box with an “H” inside. The source and destination arrays are the boxes with “S” and “D.” The grey color in the disk icon in the boxes marks the amount of data in the volume to be migrated. An absent disk icon means the volume was not yet created or the volume was removed. The medium gray links represent the SAN zones between the host and the source and destination systems. The blue interconnects are the Peer link zones between the source and the destination.

**Figure 2.** SAN zoning evolution over time from left to right during an online Peer Motion migration

Figure 2a shows the starting situation with the host connected to the HP 3PAR source system and the destination array in place and initialized but unconnected. Figure 2b has the physical interconnection between the two arrays by FC cables in place. At this stage, the SAN zoning between the host ports on the source array and the Peer ports on the destination array is configured to create the Peer paths between the arrays. In figure 2c, the host has been zoned to the destination HP 3PAR as well. In this configuration the host sees the volumes to be migrated over four paths; the multi-pathing software on the host manages these paths. In figure 2d, the volume migration has started with the host still zoned to both arrays. In figure 2e, all data have been transferred to the destination array. Figure 2f has the Peer links and the source volume(s) removed in the cleanup. For this online Peer Motion migration, no host zoning changes are needed and no temporary shutdown of the host is required. This migration scenario without unzoning the host from the source system requires an ALUA persona for the host on the HP 3PAR source and destination systems.

We will outline these six stages in more detail in the next paragraphs.
Stage 1: Selecting and zoning the Peer ports
In the first, preparatory stage of a Peer Motion migration, the storage administrator identifies two unused FC ports on the destination to become Peer type ports. These two future Peer ports are physically connected by FC cables to a single or redundant pair of SAN switches and zoned over redundant SAN fabrics to two preselected host ports on the source array. It is assumed that the destination HP 3PAR StoreServ Storage system is in place, cabled, powered on, and initialized.

Stage 2: Creating the Peer link interconnection between the source and destination
In the second stage, we launch the wizard for Peer Motion in the HP 3PAR Management Console by selecting the “Peer Motion” tab in the Manager Pane of the MC, followed by clicking the “Create PM Configuration …” link in the Common Actions panel above it. Figure 3 shows the wizard startup link in blue in the Common Actions panel.

Figure 3. Starting the Peer Motion wizard from the Common Actions panel in the Management Console

The Management Console offers a graphical wizard to identify and select the source and destination array from the list of arrays logged in to. It applies the selection criteria that were described in the technical prerequisites section for choosing a source and destination system. Next, the wizard prompts to identify the two future Peer ports on destination system that were zoned upfront with the host ports on the source system. Upon the selection, the wizard reconfigures the ports to the Peer Connection Mode. This action takes the ports offline for a short time, halting all I/O over them. This has no impact because the Peer ports must be unused at the time of their selection. Assuming the cabling and the zoning for the Peer links are in place, the wizard will set up the Peer links between the source and the destination, and display connecting red lines between the zoned ports as shown in figure 4.
Stage 3: Migrating storage settings and configurations between the source and destination

In the third stage of a Peer Motion operation, you can optionally transfer settings and configuration information such as domains and users from the source to the destination system. This is done by clicking the option “Copy Storage Settings and Configuration ...” in the Common Actions panel for Peer Motion in the Management Console as shown in figure 5. This way, the destination system can be set up quickly, duplicating part or all of the source system settings. This transfer of settings and configuration information can be skipped.

Figure 5. Transferring storage settings and configurations from the Common Actions panel in the Management Console

If for some reason the Peer Motion operation is not continued, you can remove the setup by clicking “Remove PM Configuration ...” in figure 5. This will reconfigure the Peer ports back to host ports on the destination system. The SAN zones created for the Peer links must be removed manually using an appropriate SAN switch management tool. Any object created in stage 3 by the wizard on the destination array must be removed manually to revert to the original configuration.
Stage 4: Selection of the volumes to be migrated
Stage four of the Peer Motion migration selects the source volumes that will be migrated, and then executes the actual transfer of data also known as the “Import” of the volumes. This stage is started by clicking “Migrate Data ...” shown in figure 5. This brings up the screen shown in figure 6.

Figure 6. The wizard screen for selecting the migration type and the host

As a first step, the type of migration is selected near the top of the window; the default is “Online Migration,” which is the type discussed in this section. Next, pick the name of a host listed in the middle of figure 6. Note that the persona for the selected host greenland is 15, which has the required ALUA capabilities for the online migration of a Windows host without unzoning the host from the source system. All volumes exported to host greenland are displayed in the bottom part of the screen. In this particular migration, four fully provisioned volumes of 40 GB each exported to host greenland can be migrated online.

Clicking “Next” to proceed, figure 7 appears in which you can configure the allocation settings on the destination system for each volume or groups of them that will be migrated. The source volumes can land on the destination system with a different provisioning type (thin or full) and a different CPG for their base and snapshot space changing their RAID protection level and disk type (SSD, FC, or NL). Because the OS of the source and destination system is HP 3PAR OS 3.1.3 or later, you do not have to select all volumes shown in the top panel of figure 7. This effectively lets one pick a single volume or a subset of them for the migration. Select one or more volumes, fill out their appropriate details, and click the “Add” button in figure 7 to include them to the list of volumes to be migrated.
Figure 7. Selecting the allocation settings on the destination system per volume of group of volumes to be migrated

From figure 7, we see that volumes PM.0, PM.2, and PM.3 are selected for migration, while volume PM.1 is not included and will remain active on the source system. All three volumes will be converted from full to thin provisioned volumes during the Peer Motion migration process and land in the destination User and Copy CPG called FC_r5. If one of the arrays is not on HP 3PAR OS 3.1.3 or later, all volumes in the top panel need to be added to the bottom panel before the “Finish” button becomes active.

By clicking the “Finish” button, the Peer Motion wizard starts the preparation phase that precedes the actual data transfer. As the first part in this preparation phase, the wizard creates the Peer volumes on the destination system. For every volume on the source system that is to be migrated, a Peer volume is created on the destination system. The Peer volumes are created in RAID 0 with a provisioning type of Peer. The size and the name of a Peer volume on the destination system is the same as the volume under migration on the source system. At this point in the process, the Peer volumes do not contain any data.

As the next step in the preparation phase for the migration, the wizard checks the zoning layout between the host and both storage arrays. For the online migration type with both arrays running HP 3PAR OS 3.1.3 or later, no zone changes are required. In this stage, the following window may appear:

Figure 8. Warning message during online migration

This warning message comes up if not all volumes exported to the host were selected for migration (like in figure 7). If this is what was planned, click the “Yes” button to proceed. The wizard will now bring up the screen in figure 9. Make sure to execute steps 1–3 listed in the pop-up. After rescanning the host system for new disks, you will notice two or more extra paths for every volume under migration. These extra paths are the result of the exports of the Peer volumes to the host from the destination system. Next, click the “Verify” button to test the host-zoning layout.
Clicking the "Verify" button in figure 9 will bring up figure 10, which tells that the zoning of the host to the source and destination is correct.

**Figure 10.** SAN zoning verification

Click "OK" in figure 10 upon which figure 9 is displayed again.

**Stage 5: Starting the data migration and monitoring it**

Click "Continue" in figure 9 to proceed with the actual migration of the volumes selected earlier. At this moment, the ALUA management subsystem of the HP 3PAR source array will disable the paths between the source and the host for the volumes under migration. This situation is displayed in figure 11: volumes PM.0, PM.2, and PM.3 that are under migration get the ALUA "standby" status for their path between the host (greenland) and the source system (banana). This ALUA "standby" status means host I/O to these volumes on the source system are rejected although the SAN zones and cabling for the connection are still in place. Host reads and writes for these volumes now flow exclusively across the destination HP 3PAR StoreServ Storage system over the Peer links to the source system. This is inferred from the ALUA status of "active" for the volumes under migration for their path from the source system (banana) to the destination (split). Volume PM.1 retains its ALUA "active" state for the path from host greenland to source banana and hence stays accessible for applications on the host. This ALUA "standby" state persists after the migration and survives a reboot of the host or the source array.
The Peer links carry the traffic of the sequential reads for the migration of the data from the source to the destination next to the opposing reads and writes by the host to the migrating source volumes. The HP 3PAR Management Console has several options to monitor the data transfer throughput and progress. Instantaneous information about the Total Data Throughput per Peer port in an absolute number in KB/s and as a percentage of the Peer link speed is obtained by selecting the “Ports” entry in the Management Tree when selecting Peer Motion in the Management Pane. An example of this is in figure 12 near the bottom right.

Historical information on the throughput per Peer port in the Management Console can be obtained by selecting “Performance & Reports” in the Management Pane shown in figure 13 and clicking the “New Chart …” link in the Common Actions panel above it.
In the New Chart wizard that opens, select “Ports (Data)” followed by “Peer Ports—Total Throughput,” modify the name, description, and polling interval if desired and click the “Next” button near the bottom of the screen. Figure 14 shows a screenshot at this point in the chart configuration process.

Figure 14. Setting up the chart for “Peer Ports—Total Throughput” in the HP 3PAR Management Console

In the next step, select the destination system, highlight both Peer ports, click “Next,” and finish the New Chart wizard. The Peer links now carry the traffic of the sequential reads for the migration of the data from the source to the destination next to the opposing reads and writes by the host to the migrating source volumes. Figure 15 shows the graphs for both Peer ports over the course of a few minutes. The vertical axis in figure 15 shows the averaged data points in KB/s. The granularity of the data points is 5 seconds by default and can be changed to a larger value at the time of the chart creation (see figure 14). Each data point in the chart is the average over the selected polling interval.
Figure 15. Graphical representation of the historical throughput for the Peer ports on the destination system

Task information on the Peer Motion data migration is shown in the “Recent Tasks” tab at the bottom of figure 15. Every volume migration runs as a separate task inside the HP 3PAR OS on the destination system. The data transfer progress is shown as a percentage value as well as graphically by a horizontal blue bar in the “Progress” column. Upon migration completion, the Status column in figure 15 shows “Completed” for the task in the “Progress” column and a finish time and duration to the right of it. If the task gets removed from the “Recent Tasks” panel, its details can be viewed by clicking the “Tasks & Schedules” entry in the Management Pane.

The HP 3PAR CLI command `statport -peer` delivers this same information in numerical format and includes information about the queue length on the Peer ports, their service time and the number of I/Os per second, and their I/O size (fixed to 256 KB for Peer Motion). This information updates on screen every two seconds by default; its update frequency can be changed with the `-d` parameter. Figure 16 shows a screenshot of the output for this command.
Figure 16. Output of the HP 3PAR CLI command `statport -peer` showing information on the Peer ports

Throughput information can also be obtained by monitoring the ports on the switches in the data path of the Peer links. For Brocade switches, use the CLI command `portperfshow <port number>`; and for Cisco switches, use the CLI command `show interface <port number>`. Switch vendors also make port statistics available through a GUI.

Stage 6: Cleaning up

In the sixth and final stage of a Peer Motion migration, the wizard will assist in the cleaning up configuration action. This action is started by clicking the link for “Post Migration Cleanup …” in the Common Actions panel for Peer Motion shown in figure 17.

Figure 17. The entry for Post Migration Cleanup in the Common Actions panel

The cleanup process removes the export of the migrated volumes from the source to the destination host and removes the destination host from the source system. This cleanup is mandatory before another migration configuration can start. If no more volumes have to be migrated from the source system, you can remove the Peer links setup by clicking the “Remove PM Configuration …” entry in the Common Actions panel for Peer Motion in figure 17. This will reconfigure the Peer ports on the destination array into host ports. The SAN zoning between the host ports and the Peer ports can now be removed using tools external to the Management Console. The FC cables for the Peer links between the source and the destination arrays can be removed as well. The migrated volumes can be deleted from the source array at this time leading to the situation shown in figure 2f. When all volumes have been moved to their destination array, the array can be reinitialized for use or decommissioned.
Minimally disruptive migration

The SAN zoning layout steps for a minimally disruptive Peer Motion migration are depicted in figure 18. The boxes and the colored lines have the same meaning as in the online migration case.

**Figure 18.** SAN zoning evolution during a minimally disruptive Peer Motion migration

Figure 18a depicts the starting point: The host and the source array are zoned to each other over the SAN with the destination array initialized but unconnected. The volumes exported to the host have all their data on the source array as shown by the disk icon left of the “S” in figure 18a. In figure 18b, the interconnection between the two arrays by FC cables and the Peer zoning between the host ports on the source array and the Peer ports on the destination array is laid out. In figure 18c and 18d, the host has been shut down temporarily (represented by the dashed outline) to safely change the zoning of the host from the source to the destination system. In figure 18e, the volume migration has started and the host is powered on again executing applications. I/O is now served with the destination array as a proxy. Figure 18f marks the end of the data transfer upon which the Peer links and the migrated volume(s) get removed as shown in figure 18g. The disruption for the applications on the host happens for a short time during the zone changes (figure 18c and 18d). The actual data transfer happens online with the applications up and running (figure 18e).

When operating the Peer Motion wizard for a minimally disruptive migration, stages 1–3 are identical to the online type. In the fourth stage, we select "minimally disruptive migration" (middle option in figure 6) for the migration type. All volumes exported to the host will have to be moved over in one migration pass. This means all volumes in the top panel of figure 6 will have to be added to the bottom panel before proceeding with the migration setup. During stage 4 of the migration, the window in figure 19 comes up requesting that the zoning of the host have to be changed from the current one. The "Continue" button is unavailable in the figure until the constraint stated in the red text is resolved.

**Figure 19.** SAN zone layout verification window

Clicking the "Verify" button in figure 19 will pop up the window in figure 20 stating what to do to continue.
Once the host has been shut down, the SAN zoning has to be modified from figure 18c to 18d. When the host is rezoned correctly, the “Verify” button in figure 19 will confirm the zoning is correct and the “Continue” button below it will become active. Clicking this button will start the actual data transfer. After the start of the migration, the host can be powered on again and applications restarted while the physical data transfer is ongoing. The Peer Ports Throughput chart and the other tools to monitor the throughput and progress for a minimally disruptive migration are the same as discussed earlier in the fifth stage of the online migration case—see figures 14 to 16.

The sixth phase on cleanup of the migration at completion and eventually of the Peer Motion setup is identical to the online migration case—see figure 17 for launching this action.

**Offline migration**

In an offline Peer Motion migration, no source volumes can be exported to the host for the entire duration of the migration. This type of migration is selected as the right option “Offline Migration” in figure 5. Figure 21 depicts the changes in the SAN zoning for an offline migration. The boxes and the colored lines have the same meaning as in the online migration case.

Figure 21a and 21b are identical to the online and the minimally disruptive migration. In figure 21b, all volumes get unexported from the host and stay that way until the migration is finished and the host is zoned to the destination system (figure 21f). The host does not need to be powered off or unzoned during an offline migration. As a last step, the Peer links and the migrated volume(s) can be removed (figure 21g).

When operating the Peer Motion wizard for an offline migration, stages 1–3 are identical to the previously described online migration type. In the fourth stage, we select in figure 6 the rightmost option “Offline Migration” for the migration type. One, a subset or all volumes in the top panel of figure 7 can be added to the bottom panel for migration. Clicking the “Finish” button will start the data migration immediately; no pop-up like figures 9 or 19 will appear. The cleanup of the migration, the removal of the migrated volume(s) on the source, and eventually the removal of the Peer Motion setup are identical to the online and minimally disruptive migration cases—see figure 17.
Peer Motion workflow using Peer Motion Utility

HP 3PAR Peer Motion Utility is a tool that orchestrates the migration of a host or a cluster and its data from a source HP 3PAR StoreServ system to a destination HP 3PAR StoreServ system from the command line in an online, minimally disruptive, or offline fashion. No changes are required to the host’s configuration. The SAN zone evolution diagrams in figures 2, 18, and 21 for each of the migration types apply to Peer Motion Utility as well.

Peer Motion Utility commands

Peer Motion Utility counts 12 commands carrying a suggestive nomenclature to set up, provide details, execute, and remove a Peer Motion migration. Below are the commands that create and remove a particular object:

- addsource
- removesource
- adddestination
- removedestination
- createmigration
- removemigration

The commands that tell more about a created Peer Motion Utility object are:

- showsource
- showdestination
- showmigration
- showmigrationdetails
- showconnection

The command that spawns the actual migration is:

- startmigration

These commands can be specified in the Utility client in lowercase or capitals or any mix of them. An extensive explanation of every command and its options is available on the HP 3PAR Peer Motion Guide or by appending –help to the command in the Utility client environment. Scripts for the unattended migration of volumes can be created using these commands.

Peer Motion Utility migration stages

We can observe five stages in a Peer Motion Utility migration operation. We describe these stages as follows. The commands are executed from within the Peer Motion Utility environment. All three migrations types are discussed.

Stage 1: Selecting, configuring, and zoning the Peer ports

In the first stage, one needs to select two host ports (can be shared) on the source system and two unused FC ports on the destination system. The configuration of the host ports to Peer Connection Mode on the destination needs to be executed outside of the Peer Motion Utility environment. You can use the HP 3PAR MC or CLI for this. Note that the Peer ports get a new WWN after the reconfiguration. Next, zone these Peer ports with their new WWN to the host ports on the source system.
Stage 2: Define the source and destination system

In the second stage, we define the source and destination system for the migration. Below are the steps that add the HP 3PAR StoreServ systems with IP addresses 10.1.1.1 and 10.1.1.2 to a Peer Motion Utility setup:

```plaintext
addsource -mgmtip 10.1.1.1 -user user1 -password pass1 -type 3PAR
adddestination -mgmtip 10.1.1.2 -user user2 -password pass2 -type 3PAR
```

The credentials specified need to have “Super” user rights.

Stage 3: Creating the migration definition

In the third stage, volumes on the source system get selected and the migration definition gets created using the createmigration command. Following is an example where volumes VV1 and VV2 on the source system are selected for an online migration. VV1 lands on the destination system in thin provisioning in a CPG called Gold, while VV2 ends up fully provisioned in CPG Silver.

```plaintext
createmigration -sourceuid 2FF70002AC0009A7
-srcvolmap [{"VV1","thin","Gold"},{"VV2","full","Silver"}]
-migtype online -singlevv
```

The previously mentioned command should be typed on one line. The -migtype option defines the migration type; the default type is offline. When specifying the online or minimally disruptive migration type, every volume that is exported to the same host(s) the explicitly named volume(s) in createmigration is (are) exported to is implicitly added to the list of volumes to be migrated. This behavior is overruled by the -singlevv option: with this option, only the explicitly named volumes will be migrated. The argument of -sourceuid is the array’s Node WWN as shown in the output of the command showport. Consult the help within the Peer Motion Utility client or the HP 3PAR Peer Motion Guide for the list of options for the command createmigration. If the command syntax and the parameters are correct, the createmigration command completes with the generation of a unique 13-digit identifier written on screen for referencing the migration in other commands. No data transfer is initiated from this command.

Peer Motion Utility does not inform the user when a zone change should be made for online migrations that require one or for minimally disruptive migrations. The diagrams in figures 2, 18, and 21 help deciding when to make a zone change during a Peer Motion Utility migration.

If for some reason a defined migration needs to be cancelled, use the following command to purge it:

```plaintext
removemigration -migrationid xyz
```

In the above command xyz is the unique identifier from the output of createmigration. The command deletes the Peer volumes created on the destination, unexports the source volume(s) under migration from the destination host on the source system, and removes the destination host. The definition of the source and destination systems are kept intact.

Stage 4: Starting the data migration and monitoring it

The data transfer described in the migration definition is started by the command:

```plaintext
startmigration -migrationid xyx
```

with xyx the unique identifier from the output of createmigration. In the online migration case with HP 3PAR OS 3.1.3 or later on both systems, the migrating volumes remain exported from the HP 3PAR source system to the host but the paths between the host and the source transition to the “standby” status for their ALUA state—see figure 11 for a screenshot of this situation. This ALUA “standby” status means host writes to these volumes on the source system are rejected; host writes flow over the destination HP 3PAR StoreServ Storage system to the volumes on the source as long as the migration takes.

The commands showmigration and showmigrationdetails -migrationid xyz can be used to monitor the progress of the migration. Besides, all methods for monitoring the data transfer described for Peer Motion with the Management Console are applicable for a migration using Peer Motion Utility as well.
**Stage 5: Cleaning up**

After a successful migration, the execution of the `removemigration` command cleans up the following objects:

- Export of source volumes to destination host on source system
- Destination host on source system
- Migration definition on Peer Motion Utility server

If no more volumes need to be transferred between the defined source and destination systems, you can use the following commands to remove them from the Peer Motion Utility environment:

```
removesource -uid <3PAR Node WWN> -type 3par
removedestination -uid <3PAR node WWN>
```

As a last step, you can reconfigure the Peer ports back into host ports on the destination system and remove the SAN zoning and the physical FC wiring for the Peer links.

**Scripting a Peer Motion Utility migration**

Using the 12 commands available in Peer Motion Utility, we can script the migration of a standalone host, host set, cluster, or individual volumes in an online, minimally disruptive, and offline fashion. The example in the next paragraph is for use with the Peer Motion Client, installed on a Linux system. The Peer Motion Utility version in use is 1.1.0.201.061114.

The following command line command logs in to the Peer Motion Utility server environment installed at IP address 10.1.1.44 and adds a source HP 3PAR StoreServ system to it using the specified credentials:

```
cat addsource.data | java -jar /opt/hewlett-packard/hp3parpmu/oiucli-1.0.0-jar-with-dependencies.jar -IPADDRESS 10.1.1.44 -USERNAME Meg -PASSWORD JustDoIt 2>&1 addsource.out
```

This command should be entered on one line. The `jar` file contains the Java classes that perform the login to the Utility server. The username and password specified are for a local Windows account on the Utility server. With the Utility server connection open, the command feeds the text file `addsource.data` to the Utility environment. The contents of this file are:

```
addsource -mgmtip 10.1.1.1 -user PM_Utility -password m1grat3 -type 3PAR exit
```
The file counts two lines. The username and password specified are for logging in to the HP 3PAR StoreServ Storage system with "Super" user rights. The output of the entire command is written to the file addsource.out ready for parsing. After a successful login, the output file contains this information:

```
CLI Version : 1.1.0
Connected to server version : 1.1.0.201.061114
>Successfully logged in
>>>SUCCESS: Added source storage system.
>
```

The outcome of parsing this file for the string `>>>SUCCESS: Added source storage system` determines if we proceed with the remainder of the script or exit. A similar input file with the adddestination command and a similar Java command registers the destination HP 3PAR StoreServ to the Utility server. The migration definition is entered in the same way by feeding an input file with the desired content into the Utility server. Below is an example content for this input file:

```
createmigration -sourceuid 2FF70002AC0009A7 -migtype online
        -srchost host1 -destprov thin -destcpg FC_r5
```

The syntax and the values for the different parameters of this command are checked in the Peer Motion Utility server, and if accepted, the resulting output will contain the 13-digit number that should be parsed:

```
>SUCCESS: Migration job submitted successfully. Please check
status/details using showmigration command.
    Migration id: 1400254873916
```

After the migration definition was created successfully, the Utility server starts the preparation work to admit the VV(s) and create the Peer volume(s) on the destination. This takes between 30 and 90 seconds and its completion is signaled by the presence of the expression `preparationcomplete (100%)` when parsing the output of the showmigration command. When completed, create the file with this content:

```
startmigration -migrationid xyz
```

with `xyz` the unique identifier from the output of createmigration and feed it into the Utility server in the way shown before to initiate the data migration. The actual migration now starts and may takes minutes or hours. Next, parse the output of showmigration for the word "success", this will mark the end of the data transfer. When the migration ended, execute the removemigration command followed by removewhere and removedestination, each with their appropriate parameters to clean up.
Online migration of Windows clusters

Starting from HP 3PAR OS 3.1.3 and later, Peer Motion permits the online migration of Windows clusters. The next paragraphs highlight its fundamentals, prerequisites, and workflow. The case for the Peer Motion wizard and the Peer Motion Utility is treated jointly.

Theory of operation

The online Peer Motion migration of a Windows cluster runs largely along the same lines as for a standalone Windows host. With the source and destination systems both at HP 3PAR OS 3.1.3 or later, access by the hosts to the migrating volumes on the source is blocked in the admit phase by changing the ALUA status for the paths between the hosts and the source volumes to “Standby.” As a result, applications performing I/O to the migrating source volumes have to pass over the destination. Volumes on the source not under migration continue to communicate directly to the hosts. The ALUA implementation in Peer Motion obviates the need to unzone the hosts from the source during import enabling online Windows cluster migration and single volume capability.

Windows 2008 (R2) and 2012 (R2) cluster hosts emit SCSI-3 commands to the volumes under migration and to the quorum disk if present. When in the admit phase, these commands travel over the destination to the source. Each host needs a unique path between the source and the destination for this traffic. To this end, Peer Motion creates for every physical Peer port a number of virtual Peer ports using N_Port ID Virtualization (NPIV). These virtual Peer ports get zoned to the host ports on the source system creating virtual Peer links. A virtual Peer link is an isolated path between the source and the destination system that carries SCSI-3 traffic for a particular cluster host during the admit phase. In the import phase, the traffic runs over the physical Peer links.

If the destination system is at HP 3PAR OS 3.1.3 or later and the source is at pre-3.1.3, ALUA is not available; hence single volume migration is not possible and the hosts must be unzoned from the source in a Windows cluster migration.

Technical prerequisites

Consult the HP 3PAR OS 3.1.3 Release Notes9, the SPOCK3, and the HP 3PAR Peer Motion Guide2 for the latest information on supported combinations of HP 3PAR OS on the source and destination system, HP 3PAR StoreServ models, and host OS and MPIO version for online migration of Windows clusters using the Management Console and Peer Motion Utility.

All cluster hosts must be defined with ALUA persona 15 for Windows on the source and destination system. Each member of the Windows cluster needs its own set of virtual Peer ports per physical Peer port. The virtual Peer port count for a two-, three-, and four-member cluster is 8, 12, and 16 respectively. With maximum eight virtual Peer ports per physical Peer port possible, Peer Motion can support the online migration of Windows clusters with up to four hosts. The physical and the virtual Peer ports on the destination system need to be zoned with the source array host ports upfront before starting the Peer Motion wizard or the Utility.

The virtual Peer ports can be created within the Peer Motion wizard in the Management Console. Figure 4 shows the “NPIV port count” box that accepts an even number between 0 and 8 included. A value of 0 will remove any existing virtual Peer ports. The HP 3PAR CLI command `controlport` has the new option `-virt_ports <number>` to create the virtual Peer ports; `<number>` is an even integer between 0 and 8; specifying 0 removes the virtual Peer ports. The physical Peer port has to be offline to execute this command. The command `showport -peer` lists the physical and virtual Peer ports. Figure 22 displays example output for this command for a 2-node Windows cluster.

---

9 h20565.www2.hp.com/portal/site/hpsc/template.PAGE/public/psi/manualsResults/?javax.portlet.begCacheTok=com.vignette.cachetoken&javax.portlet.endCacheTok=com.vignette.cachetoken&javax.portlet.prp_e97ce00a6f76d36cc859bfebeb53ce001=wire-navigationalState%3Daction%253Dmanualslist%257Cviewall%25257Ctrue%25257Clang%253Den&javax.portlet.tpsl=e97ce00a6f76d36cc859bfebeb53ce001&sp4ts.oid=5043394&ac.admitted=140687055957.87644892.492883150
Figure 22. Output of the command `showport -peer` in the case of a 2-node Windows cluster

![Command Output](image)

The virtual port index (VPI) in figure 22 is 0 for the physical Peer port and 1-4 for the virtual ones. The VPI number is present in the WWN of the virtual Peer ports in nibble 6 (counting from the right, starting with 1). Virtual Peer ports also have the typical `02:02:AC` signature in their WWN.

**Workflow**

The workflow for the online migration of a Windows cluster is similar to the one described in this paper for the online migration of volumes exported to a standalone host. In figure 6 the radio button for “Linked Hosts” should be chosen to view the host names of the Windows cluster members.

Refer to figure 23 for the SAN zoning evolution for the cluster members of a 2-node Windows cluster to the source and destination array with the source and the destination on HP 3PAR OS 3.1.3 or later. The two cluster member hosts have “H1” and “H2” in their boxes. The source system is indicated by “S” and the destination system by “D.” The grey color in the disk icon in the boxes marks the amount of data in the volume to be migrated. An absent disk icon means the volume was not yet created or the volume was removed. The medium gray and dark gray links represent the SAN zones between the hosts, the source, and destination systems. The thick blue lines are the physical Peer links between the source and the destination; the thin ones are the virtual Peer links.

Figure 23. SAN zoning evolution over time during an online Peer Motion migration of a 2-node Windows cluster

![SAN Zoning Evolution](image)

Figure 23a depicts the starting point: the hosts and the source array are zoned to each other over the SAN with the destination array initialized but not yet connected to the hosts. The volumes exported to the hosts have their data on the source array as shown by the disk icon left of the “S” in the figure. In figure 23b, the hosts get interconnected over the SAN to the destination array. Figure 23c lays out the SAN zones for the physical and virtual Peer links: for a 2-node cluster, we
need four virtual Peer links per physical one. In figure 23d, the data migration is ongoing and it finishes in figure 23e; all data are now located on the destination array. Figure 23f marks the final situation with the Peer links between the source and the destination systems and the migrated volumes on the source removed. The SAN connectivity of the hosts to the source system is still present, but the paths to the migrated volumes are in ALUA “standby.”

**Best practices**

**Common to Peer Motion Management Console wizard and Peer Motion Utility**

**Volumes and migration**

The Peer volumes created on the destination HP 3PAR StoreServ carry the same name as their counterpart VVs on the source system. The preparation phase fails if a volume on the destination system has the same name as a source volume that is under migration. The name of the volume has to be changed on the source or the destination system; this is not disruptive to I/O. Companies that identify volumes by including an identification for the storage system in the name of their VVs can change the name of the destination VVs online after the migration is completed.

The LUN ID of the migrated volume on the destination is the same as the one on the source system. The preparation phase fails when the LUN number of a source volume is in use on the destination system. The LUN number has to be changed on the source or the destination system but that is disruptive to I/O.

The size of a migrated volume is the same as that on the source system; the volume can be expanded after the migration for it ends. This expansion is non-disruptive to I/O on the HP 3PAR StoreServ but may be disruptive depending on the host operating system.

The WWN of a migrated volume on the destination array is identical to the one on the source array. Having the last four characters of the WWN of a migrated volume point to the Serial Number of the source array is not a problem on the destination array from a technical perspective. You can change the WWN of the imported volumes to reflect the S/N of the destination array, but that is a disruptive operation to I/O. To avoid this problem, the WWN can be changed during planned downtime. The WWN of a volume created on a system running HP 3PAR OS 3.1.2 and later is 16 bytes long; for earlier versions of HP 3PAR OS, it is only 8 bytes long; having volumes with short and long WWNs in one HP 3PAR StoreServ system is supported.

The host definition on the destination HP 3PAR StoreServ system is created automatically during the preparation phase of a Peer Motion data transfer and does not need to be set up manually. If the host definition is already present, the creation step for it will be skipped. If the host did not yet exist on the destination system, it will be created with the same persona as the source system, which may not be the recommended persona value for the operating system of the HP 3PAR StoreServ. This situation occurs when volumes get migrated from a source system on HP 3PAR OS 3.1.2 or earlier to a destination on 3.1.3 or later since some persona values change between these two versions. HP recommends adjusting the persona value after the migration is completed. This can be completed with the host online and active for some changes; consult the Implementation Guides\(^\text{10}\) for the host operating system for more details. If the host exists on both systems with a different persona value, neither the Peer Motion wizard nor the Peer Motion Utility will adapt the persona of the destination system to the source one or vice versa.

For single volume migration, the host(s) need to run an ALUA-capable operating system and must be configured on the source and destination system with a host persona that is ALUA capable. Hosts with the Windows operating system must be converted on the destination system to host persona 15 for ALUA support.

You can take advantage of Peer Motion to convert fully provisioned volumes on the source HP 3PAR StoreServ to thin volumes on the destination system during the migration process. Blocks of zeroes in fully provisioned volumes on the source system are intercepted by the HP 3PAR ASIC on the destination system and are not written to disk for thin destination volumes. For migration to thin volumes, you will need the HP 3PAR Thin Provisioning Suite license. It is also possible to convert thin to full volumes during a Peer Motion migration.

Snapshots of a VV on the source system get transferred to the destination system, but the parent-child relationship to the parent VV is not maintained: the snapshots come across as base volumes containing the data of the parent on the source system at the point in time the snapshot was created. If a large number of snapshots get recreated as base volumes on the destination system, you may need a lot of space for storing them. HP recommends to estimate upfront the impact of this and take a decision if the snapshot tree should get migrated or not.

\(^{10}\) h20565.www2.hp.com/portal/site/hpsc/template.PAGE/public/psi/manualsResults/?spdfs.idir=5044394&spdf_p.test=psiContentResults&spdf_p.psiContentResults=wsrp-navigationalState%3Daction%253Dmanualslist%253Cviewall%253Dtrue%253Cclang%253Den&js.portlet.begCacheTok=com.vignette.cachetoken&javax.portlet.begCache Tok=com.vignette.cachetoken
To improve the performance of the participating arrays in an online or minimally disruptive migration, HP recommends migrating hosts first with the least number of volumes or the smallest total volume size to reduce the impact time of the migrations on other hosts and to free up controller resources for migrations of larger hosts and volumes.

HP encourages active monitoring of the data transfer throughput either from the HP 3PAR Management Console, from the HP 3PAR CLI, or from the switches in the data path of the Peer links. The data migration continues while the Management Console application or the Utility client is closed or while other work is executed in them. You can reopen either application to view the progress of the migration.

Volumes migrated to the destination system may not show up until a rescan of the SCSI busses on the host. In the case of an online migration, you need to verify that the disks on the destination system are visible and online on the host before starting the migration. In a minimally disruptive or offline migration, the disks may stay offline after the host reboot until brought online manually; this is in particular the case on Windows with the SAN policy set to “offline.” This means that applications that start at boot time of the host won’t find their disks and fail their startup. This potentially results in a major alert to a log host triggering action by the application support team. To avoid this, it is recommended to disable the automatic startup of the application(s) on a host whose volumes are migrated using the minimally disruptive or offline method. When the host has rebooted and the disks are online, the applications can be restarted manually.

Peer ports, Peer links, and SAN zones

HP 3PAR Peer Motion requires two physical FC ports on the destination system with their Connection Mode configured to Peer to set up the Peer links. The configuration of these ports is handled by the software wizard in the Management Console. The administrator should not conduct this configuration upfront before starting the wizard. The wizard determines and displays (see figure 4) the ports on the destination system that are eligible to become Peer ports. In the selection algorithm, ports of the following type are included in the list as candidates to become Peer ports:

- Ports in the Free state with an FC cable connected to a switch
- Ports in the Free state with no FC cable connected to a switch (loss_sync)
- Ports of the Host type that have no host connected
- Ports of the Disk type that have no disk chassis connected

The state of an HP 3PAR port can be determined from the type column in the output of the HP 3PAR CLI command showport.

Best practice is to use host ports on the source system that are on adjacent nodes and are partner ports as well to take advantage of the HP 3PAR OS Port Persistence feature. In this concept, if a node on the source array goes down, the surviving partner node will configure an NPIV port on the partner port with same port WWN as the down port, so the host thinks the port came back online.

HP recommends carefully coordinating with other storage administrators before selecting Peer ports. For example, disk ports without a disk chassis connected may have been configured this way recently to prepare for connectivity to one in the near future. The two host ports on the source system to which the Peer ports will be connected to are not configured by the Peer Motion wizard or the Utility and need to be set up manually upfront this way.

HP recommends that you cable and zone the host ports on the source system to the future Peer ports on the destination system before starting the Peer Motion wizard. If the SAN zoning between two host ports on the source system and two Peer ports on the destination system is not established, the screen shown in figure 4 will not display the red interconnecting lines between the host and the Peer ports. If this situation occurs, click the “Cancel” button in figure 4, create, or review the FC cabling and SAN zoning between the host and the Peer ports of choice, and restart the configuration of the Peer Motion environment from figure 3. You can also choose to run this process to find out the modified WWN of the Peer ports you have chosen for zoning purposes. Configuring the Peer ports and establishing their zoning to the source system host ports does not incur any performance penalty to the application on the source system. We suggest setting up the Peer links some time (hours or days) before the planned start of the data transfer to make sure that the zoning for them is operational.

The impact of a Peer Motion migration may be non-negligible in case multiple hosts share the endpoint host ports of the Peer links on the source system. Neither the HP 3PAR Management Console nor the Peer Motion Utility contains a native option to throttle the throughput of the Peer links. HP 3PAR Priority Optimization on the destination system cannot be used because a quality of service (QoS) rule does not operate on Peer Motion traffic. Configuring the system rule with the all_others target on the destination system also does not manage traffic over the Peer links. HP 3PAR Priority Optimization can however be used on the source system: define a QoS rule for the temporary VVset made up of all volumes migrating to the destination system to manage the Peer link throughput. Creating more than one such VVset for the migrating volumes on the source system enhances the granular control of the Peer Motion throughput.

As an alternative, you can reduce the speed of the small form-factor pluggables (SFPs) of the FC ports for the Peer links on the destination HP 3PAR StoreServ system; do this before changing the ports to Peer mode. Reducing the SFP speed of the host ports of the Peer links on the source system is possible too but undesirable if other hosts make use of these ports as well. Another way is to reduce the speed of the SFPs of the FC ports for the Peer links on the SAN switches or use the QoS subsystem on them.

HP recommends single initiator—single target zoning for all SAN zones created for Peer Motion. This improves performance, security, and fault isolation, and decreases troubleshooting time. For the virtual Peer links, we recommend creating just two zones. Each zone should have one physical Peer port WWN, all the virtual Peer port WWNs for that physical Peer port, and the source array host port WWN that the Peer ports are zoned to. Figure 23 shows one zone per physical and virtual Peer port but only for clarity.

HP 3PAR Peer Motion requires the setup of SAN zones and changes to them between stages in the migration for some online and for minimally disruptive migrations. If the person carrying out the volume migration does not have access to the zoning tools, make sure you can contact a SAN zone administrator who can execute these changes. The required SAN zones should be created upfront to obviate last-minute work to retrieve WWNs, create aliases, and assemble zones from them. Activating and deactivating the SAN zones when required during the migration process can be done in minutes.

Miscellaneous
The online and minimally disruptive migration of a SAN boot disk is supported, but it requires changing the boot configuration of the HBAs on the host to point to the new boot disk on the destination array. HP recommends that you plan for this change soon after the migration has completed to help ensure that any unplanned reboot occurs smoothly.

Peer Motion Management Console wizard

Volumes and migration
HP recommends that you inspect with the customer the list of volumes that are scheduled for migration and which are shown in the bottom part of figures 6 and 7 to ensure that all volumes that must be migrated are included in the list and that no volumes are listed that should not be migrated. If a particular exported volume should not be transferred in an online or minimally disruptive migration, it must be unexported before the migration wizard is launched.

Every screen of the wizard contains a “Cancel” button that stops the Peer Motion setup process. If a migration was canceled, the Peer volumes created on the destination system will stay in place for an indefinite period of time if they were created already. If the volumes were admitted already on the destination system, you can resume the migration any time later by clicking the “Import Volumes ...” link in the Common Actions panel for Peer Motion. When the migration must be definitively canceled, click the “Remove Peer Volumes ...” link in the Common Actions panel to delete the Peer volumes created on the destination system. Also, click the “Post Migration Cleanup ...” link in the same panel to remove other objects that were set up for the migration. If domains, users, or particular settings were created on the destination array in stage 3, you must remove these manually. As a last step, you can remove the Peer port configuration by clicking the link for “Remove PM Configuration ...”.

Once the data transfer has started, Peer Motion cannot be stopped. You must complete a configured Peer Motion migration before you can create and start a new migration. You cannot define a second migration while the first one is still ongoing in the Management Console. In addition, you should not launch another instance of the Management Console to define a second Peer Motion migration while another one is ongoing.

SAN zones
When pursuing a minimally disruptive migration, the window shown in figure 19 will pop up, marking the right time to zone the host to the destination system and unzone it from the source system. This pop-up offers the last opportunity to exit from a Peer Motion migration if for some reason the zoning changes cannot be made at this particular time.

Miscellaneous
Once the data transfer has started, the migration cannot be stopped. You must complete a configured Peer Motion migration before you can create and start a new migration. You cannot define a second migration while the first one is still ongoing in the same Management Console. In addition, you should not launch another instance of the Management Console to define a second Peer Motion migration while another one is ongoing.
Peer Motion Utility

Volumes and migration
If a volume selected for a migration is part of a volume set (VVset), all member volumes of the set are implicitly added to a migration definition. If a volume is a member of multiple sets, all members of these multiple sets are implicitly added. The same holds if a host selected is a member of a host set or multiple host sets.

Peer Motion Utility offers the command `showmigrationdetails -migrationid xyz` to show and inspect the explicitly and implicitly added volumes during the `createmigration` command. This list can be written to a file using the `-filewrite` option of `showmigrationdetails`. HP recommends to create this file for easy inspection of the list of volumes scheduled for migration with the customer. If in an online migration a particular exported volume should not be transferred, use the `-singlevv` option of `createmigration` to exclude it.

The `createmigration` command from Peer Motion Utility supports three ways to specify the volumes to be migrated:
- `-srchost <host>`: name of the host whose volumes on the source system are to be migrated
- `-srcvolmap <list>`: explicit listing of all volumes by name to be migrated with, optionally, their provisioning type and destination CPG
- `-volmapfile <file>`: file containing the listing of all volumes by name to be migrated, optionally followed by their provisioning type and destination CPG name; the destination CPG and provisioning type may be specified as command line parameters governing all VVs present in the file as well

The name of the host specified in the `-srchost` option is the name listed in the `showhost` output on the HP 3PAR source system which may be different from the DNS name for the host. The `-volmapfile` option points to a file on the file system accessible by the host executing the Utility client software. This file can be on the local directory or preceded by a relative or absolute path; for Windows, use a double backslash (`\`) to separate directories in this path.

When specifying the online or minimally disruptive migration type, every volume that is exported to the host(s) that the explicitly named volume(s) in `createmigration` is (are) exported to is implicitly added to the list of volumes to be migrated. The complete list of explicitly and implicitly selected volumes is shown in the output of the `showmigrationdetails` command. Review this list with the customer to help ensure that all volumes that must migrate are in the list while volumes that have to stay on the source system are not in the list.

Once a migration is launched using the `startmigration` command, it cannot be aborted. Peer Motion Utility does not prevent one to specify exported and unexported volumes within a single `createmigration` command, but this combination is not supported.

Peer ports, Peer links, and SAN zones
HP 3PAR Peer Motion Utility requires two physical FC ports on the destination system with Connection Mode configured to Peer to set up the Peer links. The configuration of these ports in to Peer mode must be handled outside of the Utility. You can use the Management Console or the HP 3PAR CLI for this.

The administrator executing the migration does not get informed by the Peer Motion Utility when a SAN zone change needs to be executed if any.
**Miscellaneous**

Once the data transfer has started, the migration cannot be stopped. You must complete a started Peer Motion Utility migration before you can create and start a new migration. You cannot define a second migration while the first one is still ongoing in the Peer Motion Utility server. In addition, you should not launch another instance of the Peer Motion Client to define a second migration while another one is ongoing.

The Utility server is a stateless, RESTful API-based engine that processes requests from Windows and Linux Peer Motion Utility clients interchangeably. You can, for example, use a Linux script to add the source and destination arrays to the Peer Motion Utility, use the Windows Utility client to create the migration definition, revert to the Linux Utility client to start the migration, and finally remove the source and destination from the Peer Motion Utility setup using a script on Windows.

The Peer Motion Utility server software should not be installed on a Windows host whose volumes will be migrated with Peer Motion. In the case of a minimally disruptive type of migration, this Windows host must be shut down, precluding access to the Utility server to issue and execute commands for the migration.

**Logging and reporting**

Detailed information about past migrations by the Peer Motion wizard and the Utility can be filtered out of the HP 3PAR Event Log by executing the CLI command `showeventlog -min <minutes> -msg import`. Because the migration is driven by the destination system, you need to execute this command from that system. The `-min` parameter, expressed in minutes, indicates how long to go back in time to find matching events. Figure 24 shows the output of this command that found two events for the specified conditions:

*Figure 24. Extracting information from the HP 3PAR Event log on Peer Motion migrations*

```
HP 3PAR CLI 313
split click
split click showeventlog -min 180 -msg import
Severity : Informational
Type : CLI command executed
Message : (Parvanda super all ((0 8)) -1 15.56.192.44 29016) (importuw FC_r6 New)

Severity : Informational
Type : Task completed
Message : Task 3942 (type 'import_uw', name 'New') has completed.
```

Each event in the figure is spread over four lines with the relevant information in the last line. The first entry reveals the name of the migrated volume (`New`) and the CPG (`FC_r6`) it was created in on the destination system. The second entry confirms the migration of the volume `New` completed successfully mentioning the task number that was in use. The `-oneline` option for this command summarizes each matching event on one line. The command `showeventlog -min <minutes> -msg New` shows very detailed information about the migration of the volume named `New`. Other detailed information can be obtained with `showtask -d <task number>` using the task number obtained earlier. The output of these commands can be added to the document that summarizes the migrations for the customer.

The HP 3PAR Management Console has a set of rotating log files named `InFormMC.log.x` on the system it is installed on. For Windows, this file is located at `C:\Users\<userID>\InFormMC\log`. Consult these files for detailed information about a Peer Motion migration executed within the Management Console.

For Peer Motion Utility, the location of the log files is `C:\Program Files\Hewlett-Packard\hp3parpm\OIUTools\tomcat\32-bit\apache-tomcat-7.0.37\logs`. These are located on the Utility server system. These log files contain information about the migrations in great detail.

Peer Motion does not provide a permanent location where all past migrations, successful or not, are listed. The XML files at `C:\Program Files\Hewlett-Packard\hp3parpm\OIUData\data` for Peer Motion Utility contain info about the current migration but they disappear when the source and the destination arrays are removed from the Utility configuration. You need to save the XML files before removing the source and destination systems in the Utility client.
Licensing

You must have a valid license installed on the destination HP 3PAR array to run Peer Motion in the Management Console and from the Utility. No license is needed on the source array. Consult your HP representative or HP partner for licensing information.

Delivery model

HP has designed the HP 3PAR Peer Motion with ease of use in mind. As a result, the preparation, the actual migration, and the cleanup can be executed by customers. Assistance with the migration from HP Technical Services Consulting is available as well. Peer Motion can be part of a packaged data migration or a custom data migration service. Each type of service will bring in expertise, best practices, and automation to deliver a successful end-to-end migration solution. Consult your HP representative or HP partner for more information about this service.

Troubleshooting

The HP 3PAR Peer Motion Guide contains a section at the end of the document on troubleshooting a number of problematic situations that can occur while executing the Peer Motion. Refer to that section for help in case the wizard or the Utility fails.

Peer Motion Utility

When more details are needed in the log file, Peer Motion Utility can have its logging level increased for more entries that are verbose. To this end, edit the file C:\Program Files (x86)\Hewlett-Packard\hp3parpmcli\OIUTools\tomcat\32-bit\apache-tomcat-7.0.37\webapps\oiuweb\WEB-INF\classes\applicationConfig.properties and change its second line to:

    log4j.rootCategory=ALL, DebugLogAppender

Next, restart the HP 3PAR Peer Motion Utility service on the Utility server system to enable the logging detail changes.

Learn more at hp.com/go/3PAR