3PAR Multipath I/O for Microsoft Windows 1.0.17 User's Guide for Microsoft Windows (IA64, x64, x86)

3PAR Inc.
4209 Technology Drive
Fremont, CA 94538 USA

320-1471-02
November 2007

Revision Notice
This is the second release of this manual. A complete revision history is provided at the end of this document.

Changes
The material in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, 3PAR Inc. assumes no liability resulting from errors or omissions in this document or from the use of the information contained herein.
3PARdata reserves the right to make changes in the product design without reservation and without notification to its users.

Updates to the Documentation at 3PAR Central
Any updates to this document, or to other 3PAR technical documents, can be found by logging on to 3PAR Central's Document Control System from 3PAR's Support page at http://www.3par.com/support/index.html

3PAR Technical Support and Services
Contact your local service provider for technical support and services.

Sales and Ordering Information
For sales and ordering information, contact:
3PAR Inc.
4209 Technology Drive
Fremont, CA 94538 USA
Telephone: 510-413-5999
Fax: 510-413-5699
Email: salesinfo@3PAR.com

Reader Comments and Suggestions
Please email your comments and suggestions about this document to ReaderComments@3PAR.com.

Copyrights
© 2007 3PAR Inc. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of 3PAR Inc., 4245 Technology Drive, Fremont, CA 94538. By way of exception to the foregoing, the user may print one copy of electronic material for personal use only.

Trademarks
3PAR, InServ, InForm, InSpire and Serving Information are registered trademarks of 3PAR Inc.
Microsoft, Windows, and Windows NT are either registered trademarks or trademarks of Microsoft Corporation.
UNIX is a registered trademark of The Open Group.
All other trademarks and registered trademarks are owned by their respective owners.

Federal Communications Commission Radio Frequency Interference Statement
WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of FFC Rules. Operation is subjected to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Table of Contents

1 Introduction

1.1 Overview 1.2

1.2 Audience 1.2

1.3 Related Documentation 1.3

1.4 Organization 1.4

1.5 Typographical Conventions 1.5

1.6 Advisories 1.5

2 Overview and Features

2.1 Overview 2.2

2.2 About Microsoft Multipath I/O 2.2

2.3 About 3PAR Multipath I/O for Microsoft Windows 2.2

2.4 CD Contents 2.3

2.5 Features 2.4

2.6 System Requirements 2.6

2.7 Special Considerations 2.7

3 Installation, Deinstallation and Upgrade

3.1 Overview 3.2

3.2 Installing 3PAR MPIO for Microsoft Windows **3.2**

3.2.1 Before You Begin **3.3**

3.2.2 Software Installation **3.4**

3.2.3 Verifying Installation **3.5**

3.3 Additional Instructions for Remote Booting **3.8**

3.4 Upgrading **3.8**

3.5 Deinstalling **3.10**

3.6 3PAR MPIO and MSCS Environments **3.12**

3.6.1 Fresh Installation (MSCS Environments) **3.12**

3.6.2 Deinstalling MPIO Software (MSCS Environments) **3.15**

3.6.3 Online Upgrade of MPIO Software (MSCS Environments) **3.18**

4 Using the 3PAR MPIO CLI

4.1 Overview of the 3PAR MPIO CLI **4.1**

4.2 mpiocli Command **4.2**

4.3 Using the 3PAR MPIO CLI **4.6**

4.3.1 Getting Setting Information **4.6**

4.3.2 Setting Load Balance Policy **4.6**

4.3.3 Setting Registry Values **4.7**

RH Revision History

1 Introduction

In this chapter

1.2 Audience 1.2

1.3 Related Documentation 1.3

1.4 Organization 1.4

1.5 Typographical Conventions 1.5

1.6 Advisories 1.5

1.1 Overview

This guide provides information for installing and using 3PAR Multipath I/O for Microsoft® Windows®.

3PAR Multipath I/O for Microsoft Windows is used to support Microsoft MPIO technology for hosts connecting to 3PAR InServ® Storage Servers.

1.2 Audience

This guide is for Microsoft Windows administrators who are responsible for maintaining the Windows operating environment and who understand the InServ Storage Server and the following operating systems:

- for x86 - Windows Server™ 2003.
- for x64 - Windows Server 2003, Enterprise Edition for Intel® Xeon™ Processor-64 and AMD Opteron-based systems.
- for IA64 - Windows Server 2003, Enterprise Edition for Itanium-based systems.

1.3 Related Documentation

The following documents also provide information related to InServ Storage Servers and the InForm Operating System:

For information about…	Read the…
Online upgrade support of 3PAR MPIO, specific Windows OS platforms and 3PAR InForm OS version requirements, and a list of hot fixes from Microsoft	*3PAR InForm OS Configuration Matrix* (PN 320-200008), which can be found on the Document Control System (DCS)
S400/S800 Storage Server hardware configurations, component numbering and layout, and system cabling	*3PAR InServ S400/S800 Storage Server Physical Planning Manual*
E200 Storage Server hardware configurations, component numbering and layout, and system cabling	*3PAR InServ E200 Storage Server Physical Planning Manual*
Identifying storage server components and alerts.	*3PAR Messages and Operator's Guide*
CLI commands and their usage.	*3PAR InForm Command Line Interface Reference*
Configuring and managing InServ Storage Servers and using the InForm Graphical User Interface (GUI)	*3PAR GUI Administrator's Guide*
Configuring and managing InServ Storage Servers and using the InForm Command Line Interface (CLI)	*3PAR CLI Administrator's Guide*
Using 3PAR Remote Copy	*3PAR Remote Copy User's Guide*

1.4 Organization

This guide is organized as follows:

- Chapter 1, *Introduction* (this chapter), provides an overview of this guide, including information on audience, related documentation, and typographical conventions.
- Chapter 2, *Overview and Features*, gives an overview of Microsoft Multipath I/O (MPIO) and 3PAR Multipath I/O for Microsoft Windows, including features and system requirements.
- Chapter 3, *Installation, Deinstallation and Upgrade*, describes how to install, verify, and deinstall 3PAR Multipath I/O for Microsoft Windows when working with hosts running Windows 2003.
- Chapter 4, *Using the 3PAR MPIO CLI*, provides reference information and describes how to use the 3PAR Multipath I/O for Microsoft Windows CLI.

This guide also contains a revision history describing the major changes for each version.

1.5 Typographical Conventions

This guide employs the following typographical conventions:

Typeface	Meaning	Example
ABCDabcd	Used for dialog elements such as titles, button labels, and other screen elements.	When prompted, click **Finish** to complete the installation.
`ABCDabcd`	Used for paths, filenames, and screen output.	Open the file `\gui\windows\setup.exe`

1.6 Advisories

To avoid injury to people or damage to data and equipment, be sure to observe the cautions and warnings in this guide.



NOTE: Notes are reminders, tips, or suggestions that supplement the procedures included in this guide.



CAUTION: Cautions alert you to actions that can cause damage to equipment, software, or data.

2
Overview and Features

In this chapter

2.1 Overview **2.2**

2.2 About Microsoft Multipath I/O **2.2**

2.3 About 3PAR Multipath I/O for Microsoft Windows **2.2**

2.4 CD Contents **2.3**

2.5 Features **2.4**

2.6 System Requirements **2.6**

2.7 Special Considerations **2.7**

2.1 Overview

This chapter provides an overview of Microsoft Multipath I/O (MPIO) and 3PAR Multipath I/O for Microsoft Windows.

2.2 About Microsoft Multipath I/O

In September of 2002, Microsoft introduced MPIO technology to enable increased levels of system availability and performance through load-balancing and inter operability of third-party storage products. MPIO is enabled through third-party storage solutions providers such as 3PAR and supported by Windows 2003.

The introduction of Microsoft MPIO has delivered a standard and interoperable path for communication between storage products and the Windows 2003 Server. MPIO is a technology that enables the use of more than one physical path to access a storage device. By offering fault tolerance and/or load balancing of I/O traffic, multipathing provides improved system reliability and availability.

2.3 About 3PAR Multipath I/O for Microsoft Windows

3PAR is among the first enterprise storage vendors to endorse Microsoft MPIO by developing products that utilize this new technology.

3PAR MPIO for Microsoft Windows addresses the following requirements:

- Dynamic configuration of the multipath bus driver and disks based on installed adapters and devices and dynamic response to events occurring on the system. This dynamic configuration capacity extends to boot and page file devices.
- Transparent system architecture that relies on plug-and-play capabilities and maintains compatibility with existing driver stacks.
- Support for dynamic load balancing properties.
- Support for the Microsoft Cluster Service (MSCS) clustered environment.

2.4 CD Contents

The 3PAR MPIO for Microsoft Windows application is provided on the CD in the following folders:

Table 2-1. 3PAR MPIO for Microsoft Windows Drivers

Folder	Contents
x64	for x64 based installations
x86	for x86 based installations
IA64	for IA64 based installations
Patch	Patch files for internal use only

2.5 Features

3PAR MPIO for Microsoft Windows provides the following system features and enhancements:

- Fan Topology - 3PAR MPIO for Microsoft Windows enables support for "fan" topology through a fabric switch. That is, a single Microsoft Windows host initiator can now see multiple InServ Storage Server host ports when connecting over a SAN environment. See Figure 2-1.

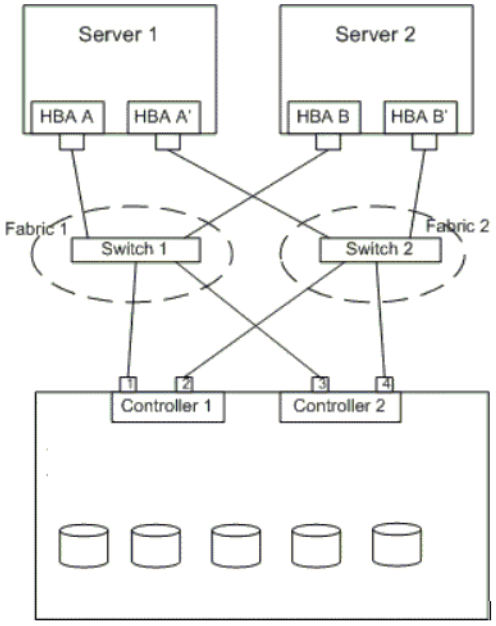


Figure 2-1. Fan Topology

- Multiple paths to a 3PAR device - 3PAPR MPIO for Microsoft Windows provides multiple path support from a host to an InServ Storage Server for enhanced system performance and reliability. For specific path support information, see the *3PAR InForm OS Configuration Matrix* (PN 320-200008), which can be found on the Document Control System (DCS).
- Multiple virtual volume exports to a host - 3PAR MPIO for Microsoft Windows includes support for up to 255 virtual volumes exported to each host.
- Dynamic load balancing policies - 3PAR MPIO for Microsoft Windows provides a dynamic load balancing mechanism to distribute read/write requests across multiple available paths.

Properties include: Fail Over Only, Round Robin, Round Robin with a subset of paths, Least Weighted Path, and Least Queue Depth.

- Fail Over Only - This type of load balance policy is also called Active/Passive, though no actual load balancing is performed. Only one single active path can send I/O; all other paths are standby paths. If the active path fails, then one of the standby paths is used. If the formally active path is reconnected, it will become active and the standby path that was active returns to standby.
- Round Robin - In this type of load balancing, all paths are active paths and are used for sending I/O in a round robin fashion. This is the default setting.



NOTE: Round Robin is the only supported load balancing policy for a quorum disk device within a Microsoft Cluster environment.

- Round Robin with a subset of paths - In this type of load balancing, a set of paths are configured as active, and a set of paths are configured as standby. I/O is sent in a round robin fashion over the active paths. If all of the active paths fail, one of the standby path is used. If any of the formerly active paths become available again, the formerly active paths are used and the standby path that was active becomes a standby path again.
- Least Queue Depth - With this type of load balancing, the path with the fewest number of requests queued is the one where the I/O is sent.



NOTE: All paths associated with the device drive are active.

- Least Weighted Path -With this type of load balancing, each path is assigned a weight and I/O is sent on the path with the lowest weight. If the path with the lowest weight fails, the path with the next lowest weight is used.



NOTE: The path with the least weight is the only active path to the device drive. More than one path may have the same weight, ranging from 0 to 99, and a default weight of 0. New paths are assigned the default weight.

- Automatic error handling and failover recovery - 3PAR MPIO for Microsoft Windows evaluates I/O status to determine whether an I/O request requires retry or failover and communicates this information to the Windows operating system.

If one path reports failure, 3PAR MPIO for Microsoft Windows moves all I/O requests to other available paths. When the failed path becomes available again, the driver automatically redirects I/O requests to the recovered path.

- Automatic discovery - 3PAR MPIO for Microsoft Windows can detect and remove a device that is physically exported to or removed from a host. 3PAR MPIO for Microsoft Windows builds or removes the path depending on the device's updating status.
- MSCS clustered environment support - 3PAR MPIO for Microsoft Windows can coexist with MSCS cluster environments.
- Online upgrade support - The online upgrade of InServ Storage Servers is supported when the host is running 3PAR MPIO for Microsoft Windows.

2.6 System Requirements

3PAR MPIO is supported on x86, x64, and IA64 platforms. For specific Windows OS platforms and 3PAR InForm OS version requirements, and a list of hot fixes from Microsoft, refer to the InForm OS Configuration Matrix (PN 320-200008).

2.7 Special Considerations

While using 3PAR MPIO for Microsoft Windows, please observe the following considerations:

- Due to the power and flexibility of the InServ Storage Server and the InForm OS management software, it is possible to export a large number of VLUNs in a very short period of time. However, the Windows Disk Manager may not be capable of handling such a large number of disks at once. Therefore, it is recommended that you close the Windows Disk Manager application until the Windows Device Manager can see all disk devices. Once all the disks are visible, you can open the Windows Disk Manager to perform disk management operations such as formatting disks and assigning drive letters or mount points.
- When using 3PAR MPIO for Microsoft Windows, always use a Windows management console for disk device configuration, including installing and deinstalling 3PAR MPIO for Microsoft Windows.
- In order for 3PAR MPIO software to work correctly in a Microsoft Cluster Service environment, all host cluster nodes must have the same version of the 3PAR MPIO software.
- For IA64 and x64 only: 3PAR MPIO only supports the Storport driver from QLogic and Emulex HBA vendors. Please refer to the appropriate 3PAR Implementation Guide (or Best Practice document) for supported HBA driver information.
- For x86 only: Microsoft has encountered a problem with deinstalling earlier versions of 3PAR MPIO. This issue has been addressed in 3PAR MPIO for Microsoft Windows, version 1.0.10. However, for all versions prior to version 1.0.10 of the 3PAR MPIO software, you must use the `install.exe` file included with 3PAR MPIO for Microsoft Windows in order to deinstall the product.

3 Installation, Deinstallation and Upgrade

In this chapter

3.1 Overview **3.2**

3.2 Installing 3PAR MPIO for Microsoft Windows **3.2**

3.3 Additional Instructions for Remote Booting **3.8**

3.4 Upgrading **3.8**

3.5 Deinstalling **3.10**

3.6 3PAR MPIO and MSCS Environments **3.12**

3.1 Overview

This chapter describes how to install and verify installation of 3PAR MPIO for Microsoft Windows. Instructions for deinstalling the software are also provided in this chapter.



CAUTION: Attempting to update HBA drivers or firmware concurrently with the upgrade, installation, or deinstallation of 3PAR MPIO software, may lead to unpredictable results. HBA driver or firmware upgrades should be completed either before or after 3PAR MPIO software upgrades. Follow the HBA manufacture's documentation for driver or firmware upgrades. Refer to the 3PAR Implementation Guide (or Best Practice document) for the Microsoft Windows and HBA combination being upgraded for supported HBA driver versions.



NOTE: Installation and deinstallation of 3PAR MPIO software differs when working with cluster nodes running in a MCSC environment. See *3PAR MPIO and MSCS Environments* on page 3.12 for specific instructions.

3.2 Installing 3PAR MPIO for Microsoft Windows

The following section includes preinstallation and installation instructions for 3PAR MPIO for Microsoft Windows.

3.2.1 Before You Begin



CAUTION: Before installing 3PAR MPIO for Microsoft Windows on a host, you must remove any Dynamic Multipathing (DMP) drivers provided by other vendors. In addition, 3PAR MPIO for Microsoft Windows is not supported in a configuration where the 3PAR software would be required to co-exist with MPIO software supplied by other vendors. If the host is currently running MPIO software supplied by another vendor, installing the 3PAR software will overwrite the Microsoft MPIO driver package. This is a Microsoft requirement.



NOTE: For a list of possible hot fixes for MPIO from Microsoft, see the *3PAR InForm OS Configuration Matrix.*



NOTE: 3PAR MPIO for Microsoft Windows includes support for up to 255 virtual volume exports per host.



NOTE: The number of LUNs on the system may affect the installation time for 3PAR MPIO for Microsoft Windows.

Before installing 3PAR MPIO for Microsoft Windows:

- Verify that the host computer is running the appropriate operating system:
  - (for x86) - Microsoft Windows 2003.
  - (for x64) - Microsoft Windows Server 2003, Enterprise Edition, for Intel Xeon Processor-64 and AMD Opteron-based systems.
  - (for IA64) - Microsoft Windows Server 2004, Enterprise Edition, for Itanium-based systems.

  To view your service pack level, right click the **My Computer** desktop icon and then click **Properties**. Click the **General** tab to see information about the operating system and service pack level. For more information, see the InForm OS Configuration Matrix (PN 320-200008) which is available through DCS.

- Verify that the Windows .NET framework is installed on the host computer. The 3PAR software will not install correctly without the .NET framework present. The .NET framework can be obtained from the following site:

  http://msdn2.microsoft.com/en-us/netframework/default.aspx

- Remove any multipathing drivers provided by other vendors. Refer to the vendor's documentation for removal instructions.

  After removing any multipathing drivers provided by other vendors, you must also remove and reinstall all HBA drivers provided by that vendor.

- For the host machine initially installing 3PAR MPIO software, only a single I/O path connection between the host machine and the InServ Storage Server, is allowed.

- (Optional). To expedite installation, remove all VLUNs except VLUN 0.

- The Windows Computer Management application should remain closed at all times during the 3PAR MPIO installation.

3.2.2 Software Installation

To install 3PAR MPIO for Microsoft Windows:

1. Log on to the host as **Administrator**.
2. Insert the *3PAR Multipath I/O for Microsoft Windows* CD, P/N 780-1033, into a CD-ROM drive.
3. Open **Windows Explorer** and double click the icon for the CD-ROM drive that holds the 3PAR software CD and expand the appropriate folder, (IA64, x64 or x86).
4. Double-click the **MSMPIO.msi** icon.
5. Follow the instructions in the **3PAR Multipath I/O for Microsoft Windows** installer window (Figure 3-1 on page 3.5).



NOTE: The **Disk Cost** button analyzes the amount of available storage space and compares it to the amount required for the 3PAR MPIO installation.

The default option is to install for **Everyone** which creates the necessary program folder and desktop icon for everyone who has access to the system. Accept the default settings.

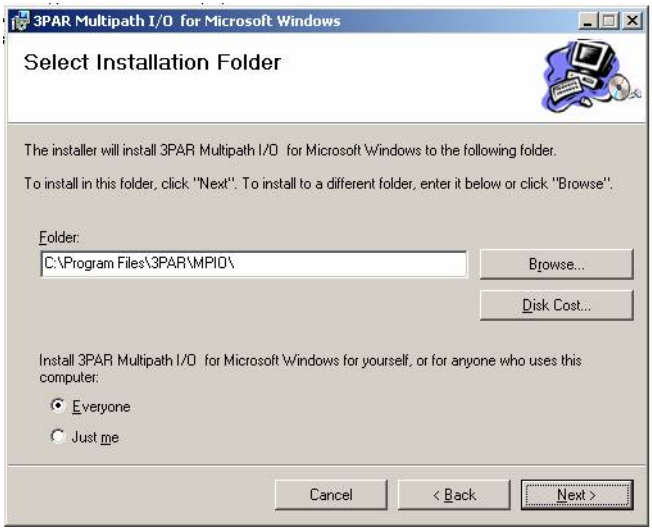


Figure 3-1. Installing 3PAR MPIO for Microsoft Windows

6 When finished, click **Finished** and then reboot the host computer.

3.2.3 Verifying Installation

To verify installation of 3PAR Multipath I/O (MPIO) for Microsoft Windows:

1 If necessary, log on to the host as **Administrator**.

2 On the Windows desktop, right click **My Computer** and then click **Manage**.

3 Verify the following components:

a In the left pane tree control, click **Device Manager**.

b In the right pane tree, click to expand **Disk Drives**.

Depending on your configuration, you should see at least one 3PARdata VV Multi-Path Disk Device icon and at least one 3PARdata VV SCSI Disk Device icon in the window's right pane.

c In the left pane tree control, click **Device Manager**.

d In the right pane tree, click to expand **SCSI and RAID Controllers**.

You should see **Multi-Path Support** in the window's right pane.

e In the left pane tree control, click **Device Manager**.

f In the right pane tree, click to expand **System Devices**.

You should see **3PAR Multi-Path Device Specific Module** in the window's right pane.

g Click the **3PAR Multi-Path Device Specific Module** icon and then click the **Driver** folder tab. This tab should contain the Microsoft Windows Hardware Quality Labs (WHQL) certification statement

CAUTION: After installing 3PAR MPIO for Microsoft Windows, the TargetDir registry key appears under:

`HKEY_LOCAL_MACHINE/Software/3par/MPIO/TargetDir`

to record the location of the install package files (Figure 3-2).
Do not try to edit the registry key value as this will cause driver removal to fail.

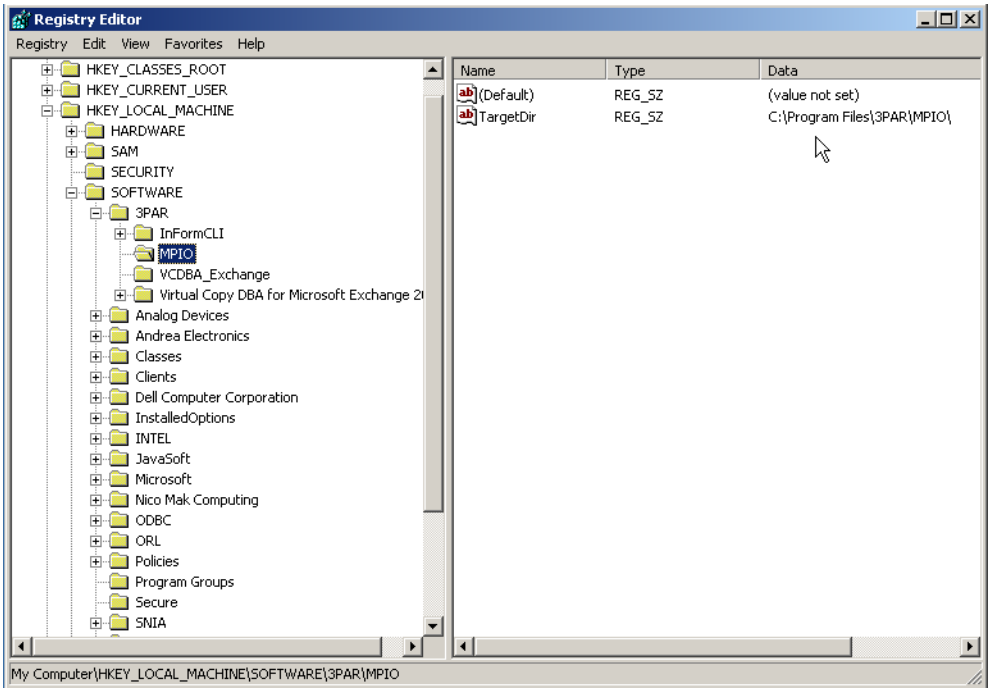


Figure 3-2. Windows Registry Key

After installing 3PAR MPIO for Microsoft Windows, a detailed driver registry key appears in: **HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\tpddsm**

The registry key parameters are as follows:

- **DsmPersistentReservationKey**: A unique key generated by the 3PAR MPIO installation engine based on the **TPDM** prefix plus the system IP address. Modification of this key is prohibited. If the system IP address is reassigned after installing 3PAR MPIO software, you must run the `install.exe` program using the `-r` option in order to re-generate this key value. This program can be found under the 3PAR MPIO install directory.
- **DsmUsePersistentReservation**: 3PAR MPIO as well as 3PAR InServ Storage Server device supports SCSI-3 Persistent Reservation.



NOTE: The key value for **DsmPersistentReservationKey** is used for SCSI reservations within MSCS environments. Therefore, it must be unique for all host cluster nodes. If you create a new system by cloning from another host cluster node within the same MSCS environment, the cloned system may contain the same **DsmPersistentReservationKey** as the original. You must run `install.exe` with the `-r` option on all cloned systems to generate a unique key for each. This same effort is required if the system does not contain a static IP address prior to the 3PAR MPIO installation.

- **EventLogLevel**: Used to display the event log to the System Event Viewer, increase the maximum log size when necessary. Settings are as follows:
  - **0** error events only
  - **1** warning events in addition to error events
  - **2** informational events in addition to warning and error events (default)
- **SupportedDeviceList**: 3PAR-supported device identification.
- **TimeOut**: Time-out value for SCSI driver pass-through command (10 is the default).
- **Version**: Version number of the currently installed 3PAR MPIO for Microsoft Windows software.



NOTE: Any changes to the above parameters will require a system reboot in order to take effect.



NOTE: At this point you can install additional paths by physically connecting additional paths from the host to the InServ Storage Server.

3.3 Additional Instructions for Remote Booting

The following special instructions apply to enable remote booting of the Windows® 2003 operating system from a 3PAR InServ Storage Server when using 3PAR Multipath I/O (MPIO) for Microsoft Windows.

1. Install the appropriate Windows operating system with a single path connected, referring to the HBA vendor's installation documentation for instructions on installing the remote booting device.
2. Before installing 3PAR MPIO for Microsoft Windows on the host computer, make sure the appropriate Windows operating system is functioning correctly with a single path connected. For complete details, refer to the Implementation Guide (or Best Practice document) for information on the remote booting of Windows hosts from a 3PAR InServ Storage Server.



NOTE: Once 3PAR MPIO for Microsoft Windows is successfully installed and the host computer has been rebooted, additional paths can be connected. However, before deinstalling 3PAR MPIO for Microsoft Windows, you should make sure that you have only a single path connected.



NOTE: Refer to the appropriate *3PAR Implementation Guide (or Best Practice document) for* detailed instructions.

3. Make sure that the BIOS for all HBAs are enabled.

3.4 Upgrading

To upgrade 3PAR MPIO for Microsoft Windows, from release 1.0.16 or later, follow the same procedure as for installing. Refer to *Installing 3PAR MPIO for Microsoft Windows* on page 3.2.

These instructions are only applicable to a standalone system when upgrading from version 1.0.16. For upgrading within a MSCS cluster environment, refer to *3PAR MPIO and MSCS Environments* on page 3.12.



NOTE: If you have previously installed 3PAR Multipath I/O (MPIO) for Microsoft Windows release 1.0.10 or earlier, you must remove it first and reboot the host server before installing the latest release. (Refer to *Installing 3PAR MPIO for Microsoft Windows* on page 3.2.



NOTE: You do not have to maintain the single-path connection from the host server to the InServ Storage Server during the upgrade process.

3.5 Deinstalling

Deinstall 3PAR MPIO for Microsoft Windows, as follows. Note that you must copy `install.exe` from the current version package to the prior installed location for any version prior to 1.0.10.



CAUTION: Before deinstalling 3PAR MPIO for Microsoft Windows, make sure you have only a single path connected between the host and the InServ Storage Server and that data transfer from the host to the storage server has been quiesced. This is required to ensure successful deinstallation/installation of 3PAR MPIO software and to prevent accidental data loss that can occur if volumes are exported simultaneously over multiple paths without multipathing software installed on the host.



NOTE: When deinstalling 3PAR MPIO for Microsoft Window from a boot or pagefile device, Windows will notify you of an error the first time you attempt to remove this software. This is because the driver is currently in use by the operating system. After rebooting the host computer, follow the deinstallation procedure again to complete removal of the entire driver package.

1. Log on to the host as **Administrator**.
2. To deinstall 3PAR MPIO, version 1.0.10 or later, skip to step 3 on page 3.11.
   a. Click **Start**, point to **Run**, type `regedit`, and press **ENTER**.

      The **Registry Editor** window appears.

   b. In the left pane of the **Registry Editor**, click the **MPIO** icon nested under **My Computer**>**HKEY_LOCAL_MACHINE**>**SOFTWARE**>**3PAR** (Figure 3-3).

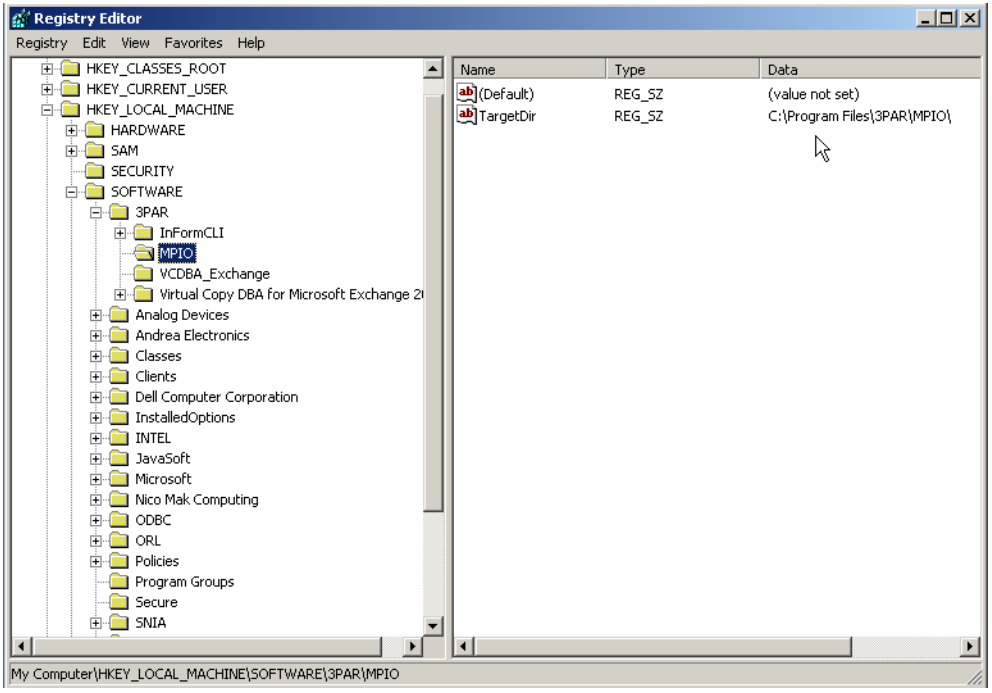


Figure 3-3. Windows Registry Editor

c In the right pane, find the package location for **TargetDir** (for example, `C:\Program Files\3PAR\MPIO`).

d Copy the file `install.exe` from the package subdirectory on the *3PAR Multipath I/O for Microsoft Windows* CD, version 1.0.17, to the package location determined above in order to overwrite the existing `install.exe` in the package subdirectory.



CAUTION: You must copy `install.exe` from the current version package (1.0.17) to the prior installed location for prior version removal.

3 Click **Start** > **Settings** > **Control Panel** > **Add/Remove Programs**.

The **Add/Remove Programs** window appears.

4 Select **3PAR Multipath I/O for Microsoft Windows**.

5 Click **Remove**.

6 Reboot the host computer.

7 If you received an error when you clicked **Remove** in step 5, repeat step 1 through step 6 to complete the removal of the entire software package.

3.6 3PAR MPIO and MSCS Environments

The process for installing and deinstalling 3PAR MPIO software differs for environments where servers are running in a cluster with MSCS. This section includes specific instructions for working with MSCS clustered environments.



CAUTION: Before installing 3PAR MPIO for Microsoft Windows, make sure you have only a single path connected.

3.6.1 Fresh Installation (MSCS Environments)

Use the following procedure to perform a fresh installation of 3PAR MPIO for Microsoft Windows on cluster nodes in a MSCS environment:



CAUTION: For fresh installations of 3PAR MPIO software, you must take the same precautions recommended by Microsoft when establishing a new Microsoft Cluster Services Cluster. Permitting more then one non-clustered host server access to disks may cause data corruption. Follow the fresh install directions precisely.



CAUTION: Installing 3PAR MPIO software onto an MSCS node will cause temporary inaccessibility of the cluster resources from the client. Therefore, downtime is required to complete the following procedure.

1 Designate one cluster node to use as the first node on which to install the 3PAR MPIO software.

2 Move all cluster resources to the designated cluster node as follows:

   a On the cluster node's Windows desktop, click **Start** > **Programs** > **Administrative Tools**. Click **Cluster Administrator** > **Manage**.

b In the left pane tree control of the **Cluster Administrator** window, right-click the cluster group name and then click **Move Group** (Figure 3-4).

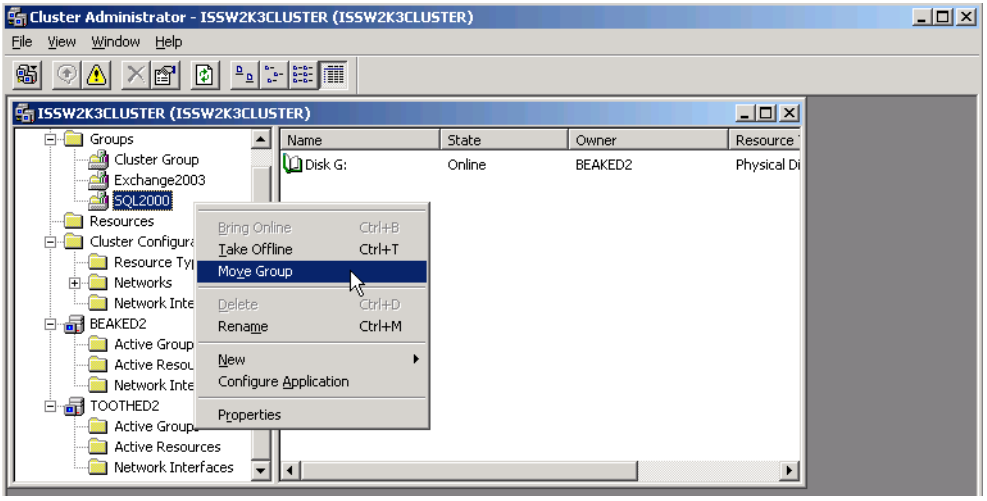


Figure 3-4. Moving a Group in the Cluster Administrator Window

c If necessary, choose the designated cluster node as the destination for the move group operation.

d For each additional resource group, repeat steps b and c.

Resources are moved to the designated cluster node.

3 On all other cluster nodes, set startup type to **Manual** as follows:

a On the cluster node's Windows desktop, right click **My Computer** and then click **Manage**.

a In the left pane tree control, click **Services and Applications**.

b In the right pane, double-click **Services**, right-click **Cluster Service** and then click **Properties**.

c In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Manual** (Figure 3-5 on page 3.14).

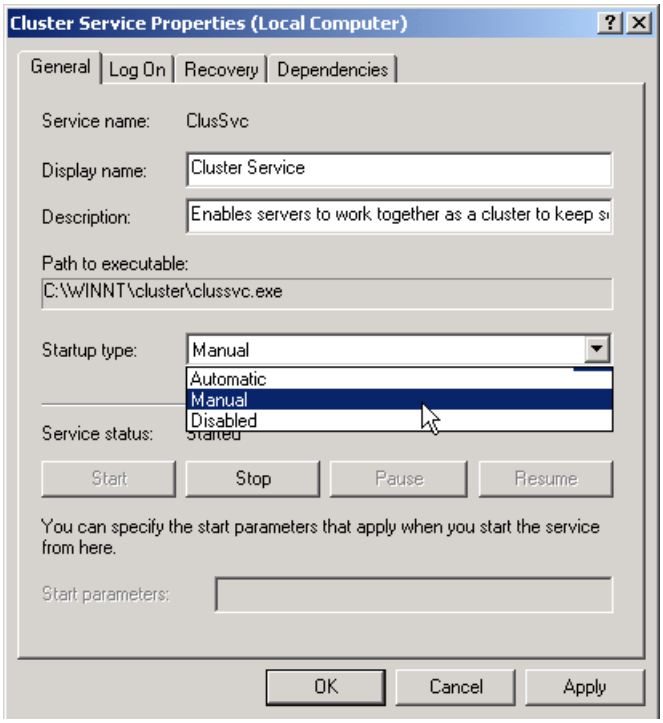


Figure 3-5. Setting Startup Type to Manual

d Click **OK**.

4 Shut down all cluster nodes for which you have set **Startup type** to **Manual**. Do not shut down the cluster node that you have designated as the first node on which to install 3PAR MPIO software.

5 On the designated cluster node, perform the following:

a Stop the cluster service by clicking **Stop** in the **Cluster Service Properties** dialog box.

b Telnet to the InServ Storage Server and check the reservations on that host by issuing the `showrsv` command (see the 3PAR CLI Reference for details). A message stating **No reservations found** should be returned.

c Install the 3PAR MPIO software on the designated cluster node and then reboot the host cluster node. Refer to *Installing 3PAR MPIO for Microsoft Windows* on page 3.2 for detailed instructions.

6 If desired, add additional paths to the designated cluster node.

7 For each of the shut down cluster nodes:

   a Start the cluster node.

   b Install 3PAR MPIO software and then reboot the cluster node. Refer to *Installing 3PAR MPIO for Microsoft Windows* on page 3.2 for detailed instructions.

8 For each of the cluster nodes that were rebooted at the end of step 7, set **Startup type** to **Automatic** and start cluster service as follows:

   a On the cluster node's Windows desktop, right click **My Computer** and then click **Manage**.

   b In the left pane tree control, click **Services and Applications**.

   c In the right pane, double-click **Services**, right-click **Cluster Service** and then click **Properties**.

   d In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Automatic** and then click **Start**.

   e Click **OK**.

   Repeat this process for each cluster node until the cluster service is started on all cluster nodes.

9 If necessary, redistribute the groups to reflect the configuration in use prior to installing 3PAR MPIO software.

3.6.2 Deinstalling MPIO Software (MSCS Environments)

Use the following procedure to deinstall 3PAR MPIO for Microsoft Windows on nodes in a MSCS environment:



CAUTION: When deinstalling 3PAR MPIO software, you must take the same precautions recommended by Microsoft when establishing a new Microsoft Cluster Services Cluster. Permitting more then one non-clustered host server access to disks may cause data corruption. Follow the deinstallation directions precisely.

CAUTION: Deinstalling 3PAR MPIO software from an MSCS cluster node will cause temporary inaccessibility of the cluster resources from the client. Therefore, downtime is required to complete the following procedure.

1. Choose a cluster node to deinstall the 3PAR MPIO software and move all cluster resources off of this node and on to alternate cluster nodes.
2. On all cluster nodes, (except the cluster node chosen in step 1), set the startup type to **Manual** as follows:
   a. On the Windows desktop, right click **My Computer** and then click **Manage**.
   a. In the left pane tree control, click **Services and Applications**.
   b. In the right pane, double-click **Cluster Service**, right-click **Service**, and then click **Properties**.
   c. In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Manual** (Figure 3-6).

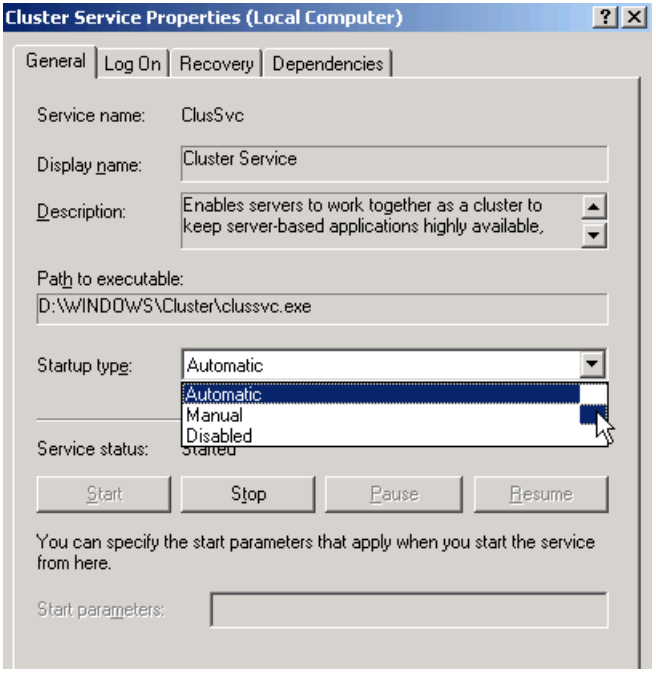


Figure 3-6. Setting Startup Type to Manual

d Click **OK**.

3 On the designated cluster node chosen in step 1, set the startup type to **Automatic** and stop cluster service.

To stop cluster service, in the **Cluster Service Properties** dialog box, set **Startup type** to **Automatic** and then click **Stop**.

4 Deinstall existing 3PAR MPIO software from the stopped cluster node. See *Deinstalling* on page 3.10 for details.

5 Shut down all other cluster nodes on which 3PAR MPIO software is installed. Do not shut down the cluster node from which you deinstalled 3PAR MPIO software in step 4.

6 Reboot the stopped cluster node.

7 After rebooting the stopped node, confirm that cluster services are running and that **Startup type** is set to **Automatic**.

8 Boot one of the cluster nodes that was shut down in step 5 and deinstall 3PAR MPIO software. After deinstalling the software, be sure to reboot the cluster node and then follow the instructions in step 9 to set **Startup type** to **Automatic** and start cluster service.

9 On the cluster node from which you deinstalled 3PAR MPIO software in step 4, set **Startup type** to **Automatic** and start cluster service as follows:

a On the Windows desktop, right click **My Computer** and then click **Manage**.

a In the left pane tree control, click **Services and Applications**.

b In the right pane, double-click **Cluster Service**, right-click **Service**, and then click **Properties**.

c In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Automatic** and then click **Start**.

d Click **OK**.

10 Repeat step 8 for each of the remaining cluster nodes until all cluster nodes have 3PAR MPIO software deinstalled and cluster service is restarted on all.

11 If necessary, redistribute the groups to reflect the configuration in use prior to installing 3PAR MPIO software.

3.6.3 Online Upgrade of MPIO Software (MSCS Environments)

Use the following procedures to upgrade 3PAR MPIO software on a cluster node where 3PAR MPIO for MSCS has been previously installed.

CAUTION: As part of the online upgrade of 3PAR MPIO software, you must actually perform the upgrade of the 3PAR MPIO software on the cluster node within the MSCS environment. The active cluster node still provides access to the client during this procedure, but this accessibility will be disrupted for a brief period while cluster resources are moving between cluster nodes.

1. Designate an idle cluster node to use in performing the software upgrade.
2. On the cluster node to be upgraded, move all cluster resources out from the current cluster node and shut down cluster service as follows:
   a. On the cluster node's Windows desktop, click **Start**, point to **Programs** and then **Administrative Tools**. Click **Cluster Administrator** and then click **Manage**.
   b. In the left pane tree control of the **Cluster Administrator** window, right-click the cluster group name and then click **Move Group** (Figure 3-7).

      The system moves the cluster resources from the active to an idle cluster mode, making the cluster node idle.

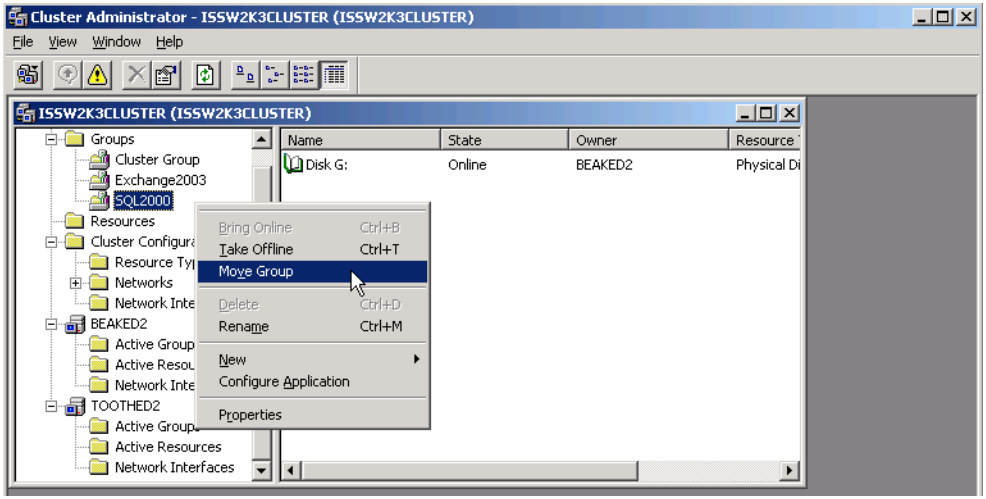


Figure 3-7. Moving a Group in the Cluster Administrator Window

c On the cluster node's Windows desktop, right-click **My Computer** and then click **Manage**.

d In the left pane tree control, click **Services and Applications**.

e In the right pane, double-click **Services**, right-click **Cluster Service**, and then click **Properties**.

f In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Manual** and then click **Stop** (Figure 3-8).

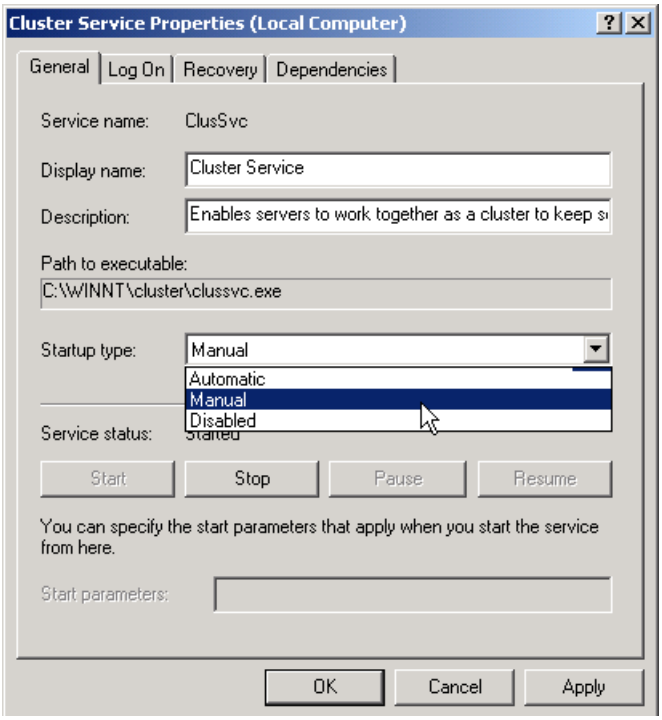


Figure 3-8. Setting Startup Type to Manual

g Click **OK**.

3 Upgrade existing 3PAR MPIO software from the idle cluster node as described in *Upgrading* on page 3.8.

4 Reboot the idle cluster node if this has not been done in step 3.

5 Start cluster service on the idle cluster node (so that it joins the cluster) and set **Startup type** to **Automatic** as follows:

a. On the idle cluster node's Windows desktop, right click **My Computer** and then click **Manage**.

b. In the left pane tree control, click **Services and Applications**.

c. In the right pane, double-click **Services**, right-click **Cluster Service** and then click **Properties**.

d. In the **Cluster Service Properties** dialog box that appears, set **Startup type** to **Automatic** and then click **Start**.

e. Click **OK**.

6. Move all the cluster resources from the active cluster node to the cluster node with the upgraded 3PAR MPIO software. **This makes the node with the newer version of 3PAR MPIO software the only active node**.

7. For each additional cluster node, repeat step 1 on page 3.18 through step 5 on page 3.19, skipping step 2 on page 3.18 (moving the cluster resource).

8. If necessary, reset the active cluster node after all cluster nodes have been upgraded with the new software.

4
Using the 3PAR MPIO CLI

In this chapter

4.1 Overview of the 3PAR MPIO CLI 4.1

4.2 mpiocli Command 4.2

4.3 Using the 3PAR MPIO CLI 4.6

4.3.1 Getting Setting Information 4.6

4.3.2 Setting Load Balance Policy 4.6

4.3.3 Setting Registry Values 4.7

4.1 Overview of the 3PAR MPIO CLI

`mpiocli.exe` is included in the 3PAR Multipath I/O for Windows package. The path environment will be set when 3PAR Multipath I/O for Windows is installed.

4.2 mpiocli Command

COMMAND

`mpiocli`

DESCRIPTION

This is the command line utility command for 3PAR Multipath I/O for Microsoft Windows.

SYNTAX

`mpiocli [options <arg>]`

OPTIONS

`-help`

Displays online help for 3PAR Multipath I/O for Microsoft Windows.

`-f [<filename>]`

Specifies the name of the output file. Required with the `-info` option. If `<filename>` is not specified, the default filename `mpiocli.log` is used. The filename is located under the windows system directory.

`-d <Physical_Disk_Number>`

Specifies the physical disk number to set. If this option is not used, all devices in the system are set to the same load balance policy.

`-info [-f <filename>]`

Displays 3PAR MPIO settings and system information.

`-setevt <levels> [-f <filename>]`

Sets the Windows system event log level as follows (rebooting is required once the level is specified):

- 0 - Only display error messages.
- 1 - Display warning messages plus level 0.
- 2 - Display information messages plus level 0 and level 1.

`-setlb <lbmode> [-p <Path_ID>] [-w <Path_Weight>] [-d <Physical_Disk_Number>]`

This option sets the device load balance policy as follows:

<lbmode>	Definition	Required Arguments
1	Fail Over Only	`-p <Path_ID>` - Specifies the active path.
2	Round Robin	none. All paths are active paths.
3	Round Robin Subset	`-p <Path_ID>...` Specifies the active paths.
4	Least Queue Depth	none.
5	Least Weight	`-p <Path_ID> -w <Path_Weight>...` Assign a weight to each path. The path with the lowest number will be assigned I/O.

SPECIFIERS

None.

RESTRICTIONS

None.

EXAMPLES

Example of `mpiocli -info:`

```
cli% mpiocli -info
E:\Program Files\3PAR\MPIO>mpiocli -info

3PAR MPIO Command Line Utility, Version 1.0.0
Copyright (C) 2006 3PARdata, Inc. All rights reserved.


3PAR MPIO SETTING
------------------
TargetDir:   E:\Program Files\3PAR\MPIO\
Version:   1.0.17.3
EventLogLevel:   2
DsmUsePersistentReservation:   1
DsmPersistentReservationKey:   5450444dc0a8038d

ADAPTER INFORMATION
-------------------
AdapterName                   PortWWN            PortName       PathId
com.emulex-LP9002-0
                           10000000c94ad73d     \\.\Scsi2:    0x33020001
                                                              0x33020000

com.emulex-LP11002-M4-1
                           10000000c956e5ca      \\.Scsi3:
com.emulex-LP11002-M4-2
                           10000000c956e5cb      \\.Scsi4:

DEVICE INFORMATION
------------------------
Disk MntPoints   SerialNumber LoadBalance      PathId       PathState    PathWeight
  0  C:\ F:\
  1  E:\
  2  H:\
                 FCDC0219     2(RoundRobin)   0x33020000      Active        n/a
                                              0x33040000      Active        n/a

  3  G:\
                 FD250219     2(RoundRobin)   0x33020000      Active        n/a
                                              0x33040000      Active        n/a

  4  J:\
                 CC690219     2(RoundRobin)   0x33020000      Active        n/a
                                              0x33040000      Active        n/a

  5  K:\
                CC6A0219     2(RoundRobin)   0x33020000      Active        n/a
                                             0x33040000      Active        n/a

  6  C:\testmnt2\
                 CC6B0219     2(RoundRobin)   0x33020000      Active        n/a
                                              0x33040000      Active        n/a
```

Example of `mpiocli -setlb`:

```
E:\Program Files\3PAR\MPIO>mpiocli -setlb 1 -p 33020000

Setting all 3PAR devices to FailOverOnly load balancing,
With path 0x33020000 as active (y/n) y
Set physical disk 2, Load Balance to (FailOverOnly), done.
Set physical disk 3, Load Balance to (FailOverOnly), done.
Set physical disk 4, Load Balance to (FailOverOnly), done.
Set physical disk 5, Load Balance to (FailOverOnly), done.
Set physical disk 6, Load Balance to (FailOverOnly), done.

E:\Program Files\3PAR\MPIO>mpiocli -setlb 2

Setting all 3PAR devices to RoundRobin load balancing (y/n) y
Set physical disk 2, Load Balance to (RoundRobin), done.
Set physical disk 3, Load Balance to (RoundRobin), done.
Set physical disk 4, Load Balance to (RoundRobin), done.
Set physical disk 5, Load Balance to (RoundRobin), done.
Set physical disk 6, Load Balance to (RoundRobin), done.

E:\Program Files\3PAR\MPIO>mpiocli -setlb 3 -p 33020000

Setting all 3PAR devices to RoundRobin with a Subset of paths.
With path  0x33020000 as active set (y/n) y
Set physical disk 2, Load Balance to (RRWithSubset), done.
Set physical disk 3, Load Balance to (RRWithSubset), done.
Set physical disk 4, Load Balance to (RRWithSubset), done.
Set physical disk 5, Load Balance to (RRWithSubset), done.
Set physical disk 6, Load Balance to (RRWithSubset), done.

E:\Program Files\3PAR\MPIO>mpiocli -setlb 4

Setting all 3PAR devices to Least Queue Depth load balancing (y/n) y
Set physical disk 3, Load Balance to (LeastQueue), done.
Set physical disk 4, Load Balance to (LeastQueue), done.
Set physical disk 5, Load Balance to (LeastQueue), done.
Set physical disk 6, Load Balance to (LeastQueue), done.

E:\Program Files\3PAR\MPIO>mpiocli -setlb 5 -p 33020000 -w 1 -p 33040000 -w 2

Setting all 3PAR devices to Least Weighted Path load balancing.
With path 0x33020000 weight 1, With path 0x33040000 weight 2,  (y/n) y
Set physical disk 2, Load Balance to (LeastWeight), done.
Set physical disk 3, Load Balance to (LeastWeight), done.
Set physical disk 4, Load Balance to (LeastWeight), done.
Set physical disk 5, Load Balance to (LeastWeight), done.
Set physical disk 6, Load Balance to (LeastWeight), done.
```

NOTES

None.

4.3 Using the 3PAR MPIO CLI

This section describes how to use the 3PAR MPIO CLI `mpiocli` command. For specific details, see: *mpiocli Command* on page 4.2.

4.3.1 Getting Setting Information

You can query the current 3PAR device for information on each device, including registry settings, adapter information, and device load balance policies as follows:

```
C:\>mpiocli -info [-d <Physical_Disk_Number>]
```

4.3.2 Setting Load Balance Policy

For a description of each policy, see *Features* on page 2.4.

- To set the device load balancing to Fail Over Only:

```
C:\>mpiocli -setlb 1 -p <Path_ID> -d <Physical_Disk_Number>
```



NOTE: If `-d <Physical_Disk_Number>` is not specified, all devices are set to failover only. The active path is `<Path_ID>`; all others are passive.

- To set the device load balancing to Round Robin:

```
C:\>mpiocli -setlb 2 -d <Physical_Disk_Number>
```

- To set the device load balancing to Round Robin with a subset of paths:

```
C:\>mpiocli -setlb 3 -p <Path_ID>... -d <Physical_Disk_Number>
```

- To set the device load balancing to Least Queue Depth:

```
C:\>mpiocli -setlb 4 -d <Physical_Disk_Number>
```

- To set the device load balancing to Least Weight:

```
C:\>mpiocli -setlb 5 -p <Path_ID> -w <Path_Weight>
-p <Path_ID> -w <Path_Weight>... -d <Physical_Disk_Number>
```



NOTE: The path with the least weight is the only active path to the device drive.

It is recommended to set each path with a different weight, though more than one path may have the same weight.

The program randomly choose a healthy path to send I/O if more than one path contains the same least weight.

The range of weight that can be assigned is from 0 to 99, with a default weight of 0. New added paths are always assigned to the default weight.

4.3.3 Setting Registry Values

- To set registry values for 3PAR MPIO:

```
C:\>mpiocli -setevt <level> [-f <filename>]
```



NOTE: Rebooting is required when setting registry values.

Revision History

Release level	Revision summary
320-1471-01 June 2007	First release of this manual to support the release of 3PAR Multipath I/O for Microsoft Windows, version 1.0.17, concurrent with InForm OS release 2.2.3. This release consolidates previous versions of the following documents: ■ 3PAR Multipath I/O for Microsoft Windows User's Guide for Windows 2003 (IA64) (320-1337) ■ 3PAR Multipath I/O for Microsoft Windows User's Guide for Windows 2003 (x64) (320-1339) ■ 3PAR Multipath I/O for Microsoft Windows User's Guide for Windows 2003 (x86) (320-1130) ■ 3PAR Multipath I/O for Microsoft Windows Management Tool User's Guide (320-1409)
-02 November 2007	Second release of this manual, updated as follows: ■ Removed Microsoft Windows 2000 as a supported platform. ■ Updated the *Software Installation* section in Chapter 3, *Installation, Deinstallation and Upgrade*. The icon to double-click to start installation is **MSMPIO.msi** not **setup**. ■ Clarified the *Deinstalling* section in Chapter 3, *Installation, Deinstallation and Upgrade*. ■ Content edited.