EMC²

RELEASE NOTES

EMC PowerPath
for Linux
Version 4.5 and Point Releases

Release Notes
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These release notes contain information about features, system requirements, and limitations in PowerPath 4.5 and 4.5.1 for Linux.

Product Description

EMC® PowerPath® for Linux software is a server-resident, performance and application availability enhancing software solution. PowerPath combines multiple path I/O capabilities, automatic load balancing, and path failover functions into one integrated package. PowerPath operates on Red Hat Enterprise Linux, SuSE Linux Enterprise Server, and Asianux servers connected to EMC and third-party storage systems in standalone and clustered configurations. PowerPath supports Fibre Channel and iSCSI environments.

PowerPath Support for Linux 2.6 and 2.4 Kernels

EMC® PowerPath® 4.4.0 and 4.5.x only support the Linux 2.6 kernel. PowerPath 4.3.x only supports the Linux 2.4 kernel.

◆ If you run the RHEL 4.0, Asianux 2.0, or SLES 9.0 operating systems, you must use PowerPath 4.4.0 or higher.

Note: Upgrades from PowerPath 4.3.x to PowerPath 4.4 or higher require Linux 2.6 kernel upgrades.

Refer to for more kernel-specific information.

◆ RHEL 3.0, SLES 8, Asianux 1.0, United Linux, and Miracle Linux are currently available for the Linux 2.4 kernel, which requires PowerPath 4.3.x.

Refer to *Environment and System Requirements* in the *PowerPath 4.3 and Point Releases for Linux Release Notes* for more kernel-specific information.

New Features and Changes

PowerPath 4.5.x has the following new features and changes.

- PowerPath 4.5.1 for Linux supports:
  - RHEL 4.0 Update 3.
  - largesmp kernels on RHEL for EM64T hosts only.
  - SLES 9 SP3.
  - VERITAS Volume Manager (VxVM) 4.1 MP2.
  - EMC CLARiiON AX150 and AX150i storage systems.
- PowerPath 4.5.0 for Linux supports:
  - EMC Invista systems.

    Note: PowerPath 4.5.0 supports EMC Invista devices. A new class, INVISTA, lets you manage Invista devices using the powermt utility. Refer to the *PowerPath 4.5 Product Guide* for more information.

  - Hitachi TagmaStore storage systems

    Note: The existing HITACHI class lets you manage Hitachi TagmaStore devices using the powermt utility. Refer to the *PowerPath 4.5 Product Guide* for more information.

  - HP StorageWorks XP12000 storage systems

    Note: The existing HPXP class lets you manage HP StorageWorks XP12000 devices using the powermt utility. Refer to the *PowerPath 4.5 Product Guide* for more information.

  - CLARiiON iSCSI storage systems.
  - Asianux 2.0.
  - Booting from Symmetrix and CLARiiON storage systems.
  - Localized versions of the PowerPath installer available in Brazilian Portuguese, French, German, Italian, Korean, Japanese, Latin American Spanish, and simplified Chinese.

Discontinued Features in PowerPath

This section includes information about discontinued features in PowerPath.

EMC HighRoad The next release of PowerPath (post-4.5) will not include intrinsic disk protection for EMC HighRoad® disks on Symmetrix storage systems. This is a change from PowerPath 4.5 and earlier, in which disk protection for HighRoad disks on Symmetrix systems is included in the PowerPath software.

Effective with HighRoad version 4.0, disk protection for Symmetrix is included in the HighRoad software. If you are using PowerPath 4.5 or earlier with HighRoad 4.0 or earlier, you do not need to take any action at this time. In the future if you want to upgrade to a version of PowerPath later than 4.5 (and you have HighRoad 3.2 or earlier), you will need to upgrade first to HighRoad version 4.0 or later before upgrading PowerPath.

End-of-Life Announcement **CLARiiON FC 4700**
As of PowerPath 4.5.0, EMC announced end-of-life (EOL) for CLARiiON FC 4700 support. Effective with the release of PowerPath 4.5.0 for Linux, PowerPath will no longer support CLARiiON FC 4700 storage systems.

Fixed Problems

Table 1-1 lists problems fixed in PowerPath 4.5.x reported as known problems in earlier versions of PowerPath.

Table 1-1   Fixed Problems in PowerPath 4.5

Description	Found in Version	Fixed in Version
233087 The `navicli -lunmapinfo` command does not display any pseudo (emcpower) devices, even though pseudo devices are configured on the host.	4.5.1	4.5.1
233033 PowerPath does not load on an IBM x460 server that 1) has internal RAID controllers and 2) runs the largeSMP kernel.	4.5.1	4.5.1
232828 Changing a native device's block attributes on a PowerPath host causes a kernel panic.	4.5.0	4.5.1
229488 PowerPath attempts to configure a USB storage device as a SCSI device.	4.5.0	4.5.1
229247 PowerPath uninstallation throws error message `PowerPath could not unload module emcp` if any `powermt` command (for example, `powermt watch`) is running.	4.4.1	4.5.1
228079 When PowerPath is installed on hosts with the hugemem kernel, block IOCTLs fail.	4.5.0	4.5.1
227536 Running `sg_map` and `dd` against a native INVISTA device fails on a PowerPath host.	4.5.0	4.5.1

226557
The `/var/log/messages` file displays the following messages:
`Primitives cleanup failure.`
`PowerPath base driver waves goodbye.`
	4.5.0	4.5.1

225836 The `PowerPath start/stop` script may cause a kernel panic on Asianux 2.0 hosts running iSCSI.	4.5.0	4.5.1
224874 Unexpected SP reboot of an iSCSI CLARiiON storage system may cause PowerPath to panic.	4.5.0	4.5.1

Table 1-1   Fixed Problems in PowerPath 4.5 (continued)

Description	Found in Version	Fixed in Version
221248 Sequential I/O performance degrades on a host with PowerPath 4.5.0 installed.	4.4.0	4.4.1, 4.5.0 HotFix 1, 4.5.1
217670 After installing PowerPath, I/O to partitions is significantly slower.	4.5.0	4.5.1
216862 After upgrading a RHEL host with PowerPath 4.4 installed to RHEL 4.0 Update 1, running the `rpm` command to refresh the PowerPath package fails.	4.4.0	4.5.0
216584 Using native device names to create a file system on a partition that was created using a PowerPath pseudo name returns the following error: `Could not stat <device> --- No such file or directory`	4.4.0	4.5.0
213948: During PowerPath installation and whenever `powermt config` is run, the following message is logged for each new native device: `kernel: Setting invalidated flag for dev <device#>`	4.4.0	4.5.0
212485: Removing the QLA2300 driver while PowerPath is running may cause the host to crash.	4.4.0	EMC/QLogic document updated.
212189 When you create a partition by running the `fdisk` command on a PowerPath pseudo device, the partition list in the `/proc/partitions` file does not get updated for the native device.	4.4.0	4.5.0
212329 PowerPath pseudo device names are not displayed on the Navisphere Manager even after starting naviagent on the host.	4.4.0	4.5.0
210522 The PowerPath stop script and uninstall program (which calls the stop script) fail on a RHEL host with active LVM2 logical volumes.	4.4.0	4.5.0
209697 Opening a native device succeeds with all paths are down, which prevents an application from detecting if the device is ready by sending an open and then a close.	4.4.0	4.5.0
204464 Running `powermt` after reconfiguring the QLogic driver without failover support causes a segmentation fault.	4.4.0	Updated QLogic installer package.

Environment and System Requirements

Before you install PowerPath, or whenever you make changes to the host or storage environment where PowerPath operates, consult the following resources:

◆ *EMC Support Matrix*

◆ EMC host connectivity guide for your operating system (CLARiiON and Symmetrix systems only)

These resources, which are described in this section, will help you configure an environment in which all components, including PowerPath, can operate optimally.

◆ **EMC Support Matrix (all storage systems)**
The *EMC Support Matrix* provides detailed information about the hardware, software, and networked storage components that are tested and compatible with both EMC storage systems and third-party storage systems. (For information about third-party storage systems, refer to the chapter entitled *Non-EMC Storage*.) The *EMC Support Matrix* describes supported host models, operating system revisions, host bus adapters, and connectivity devices.

The *EMC Support Matrix* is updated every month and published on the Powerlink website at http://Powerlink.EMC.com.

The support matrix is available in two formats:

• The EMCLink E-Lab™ Navigator (formerly ESN Builder) link is a Web-based, searchable database configurator.

• The Interoperability Matrices link lets you download the *EMC Support Matrix* as an Adobe .pdf file.

◆ **EMC host connectivity guides (EMC storage systems only)**
The EMC host connectivity guides describe the features and setup procedures for host interfaces to EMC Symmetrix and CLARiiON systems. Host connectivity guides are updated quarterly and are published on the Powerlink website.

Consult the *EMC Support Matrix* (and, for CLARiiON or Symmetrix systems, the EMC host connectivity guide for your operating system) before you install PowerPath. In addition, since changing any system component can change the way PowerPath manages storage paths, you should consult these resources before you undertake any of the following common system or network management tasks:

- Upgrade or change the host OS, or the host bus adapter. (Refer specifically to the Application Software chapter for your storage system model.)

- Change the model of the system that hosts PowerPath.

- Change or replace a host bus adapter type, or adapter cable on the system that hosts PowerPath.

- Change components (for example, switches) of your network configuration.

- Change the storage network zoning or device assignments.

- Change the array or storage system connected to the host.

The information in the following sections is accurate at the time of publication. However, information about qualified hardware and software is revised and published monthly in the *EMC Support Matrix* and quarterly in the EMC host connectivity guides. ***In the event of discrepancies, information in the EMC Support Matrix or host connectivity guide for your platform takes precedence over the information in these sections.***

Host Requirements

PowerPath 4.5.x supports the Linux host configurations shown in the following tables. EMC recommends that all hosts have at least 2 GB of memory and 120 MB of free disk space in the root partition.

Note: Refer to the *EMC Support Matrix* for the latest host supported configurations. Information in the *EMC Support Matrix* supersedes the following information.

Table 1-2 PowerPath 4.5.1 Host Configurations

Distribution	Processor	Kernel	Configurations
RHEL 4.0 U3 AS/ES	X86 uniprocessor	2.6.9-34	configs/kernel-2.6.9-i686.config
	X86 multiprocessor		configs/kernel-2.6.9-i686-smp.config confgis/kernel-2.6.9-i686-hugemem.config
	IA64		configs/ia64.config
	Opteron AMD64		configs/kernel-2.6.9-x86_64-smp.config
	EM64T		configs/kernel-2.6.9-x86_64-smp.config configs/kernel-2.6.9-x86_64-largesmp.config
SLES 9.0 SP3	X86 multiprocessor	2.6.5.7-244	i386/defconfig.bigsmp
	IA64		ia64/defconfig
	EM64T, Opteron AMD64		x86_64/defconfig.smp
Asianux 2.0	X86 uniprocessor	2.6.9-11.19AX	configs/i686.config
	X86 multiprocessor		configs/i686-smp.config
	EM64T, Opteron AMD64		configs/x86_64-smp.config

> **Note:** Refer to the *EMC Support Matrix* for the latest host supported configurations. Information in the *EMC Support Matrix* supersedes the following information.

Table 1-3 PowerPath 4.5.0 Host Configurations

Distribution	Processor	Kernel	Configurations
RHEL 4.0 U2 AS/ES	32-bit X86 uniprocessor	2.6.9-22	configs/kernel-2.6.9-i686.config
	32-bit X86 multiprocessor		configs/kernel-2.6.9-i686-smp.config confgis/kernel-2.6.9-i686-hugemem.config
	IA64		configs/ia64.config
	EM64T, Opteron AMD64		configs/kernel-2.6.9-x86_64-smp.config
SLES 9.0 SP2	X86 multiprocessor	2.6.5-7.201	i386/defconfig.bigsmp
	IA64		ia64/defconfig
	EM64T, Opteron AMD64		x86_64/defconfig.smp
Asianux 2.0	X86 uniprocessor	2.6.9-11.19AX	configs/i686.config
	X86 multiprocessor		configs/i686-smp.config
	EM64T, Opteron AMD64		configs/x86_64-smp.config

Supported HBAs and Drivers

PowerPath 4.5.x for Linux has been tested and qualified for use on Symmetrix and CLARiiON arrays with the HBA drivers shown in Table 1-4 below.

Note: Refer to the *EMC Support Matrix* for the latest HBA and driver requirements. Information in the *EMC Support Matrix* supersedes the following information.

Table 1-4   **HBA Driver Requirements for Symmetrix and CLARiiON Arrays**

Linux Distribution	QLogic HBA Driver[a]		Emulex HBA Driver[a]
	Fibre Channel	**iSCSI**	**Fibre Channel**
RHEL 4.0 U3 AS/ES	8.01.02-d4	5.00.04	8.0.16.18
RHEL 4.0 U2 AS/ES	8.01.00[b]	5.00.04	8.0.16.17
SLES 9 SP3	8.01.02-sles	5.00.04	8.0.16.18
SLES 9 SP2	8.01.00[b]	5.00.04	8.0.16.6_p3
Asianux 2.0	8.00.00.3b-1	Not supported.[c]	8.0.16.6_x2

a. Included in kernel (unless noted below).

b. Available in the EMC approved section of the QLogic website.

c. PowerPath supports iSCSI data channels on Asianux 2.0 hosts with the software driver only.

PowerPath 4.5.x for Linux has been tested and qualified for use on third-party arrays with the HBA drivers shown in Table 1-5.

Table 1-5   HBA Driver Requirements for Third-Party Arrays

Linux Distribution	QLogic HBA Driver	Emulex HBA Driver[a]
RHEL 4.0 U3 AS/ES[b]	IBM ESS: 8.01.02-d4 Hitachi Lightning: 8.01.02-d4[c] HP StorageWorks xp and EVA: 8.01.02-d4	Hitachi TagmaStore: 8.0.16.18 HP StorageWorks XP12000: 8.0.16.18
RHEL 4.0 U2 AS/ES	IBM ESS: 8.01.00 Hitachi Lightning: 8.01.00[d] HP StorageWorks xp and EVA: 8.01.00	Hitachi TagmaStore: 8.0.16.17 HP StorageWorks XP12000: 8.0.16.17
SLES 9 SP3[b]	IBM ESS: 8.01.02-sles Hitachi Lightning: 8.01.02-sles[c] HP StorageWorks xp and EVA: 8.01.02-sles	Hitachi TagmaStore: 8.0.16.18 HP StorageWorks XP12000: 8.0.16.18
SLES 9 SP2	IBM ESS: 8.01.00 Hitachi Lightning: 8.01.00[d] HP StorageWorks xp and EVA: 8.01.00	Hitachi TagmaStore: 8.0.16.17 HP StorageWorks XP12000: 8.0.16.17

a. The Emulex HBA driver was qualified on EM64T systems only. It was not qualified on AMD64 or IA64 systems.

b. Driver available in kernel.

c. Hitachi Lightning arrays are only supported on the 32-bit versions of RHEL 4.0 U3 and SLES 9.0 SP3.

d. Hitachi Lightning arrays are only supported on the 32-bit versions of RHEL 4.0 U2 and SLES 9.0 SP2.

Note: If HBA drivers other than the QLogic qla2300 driver are used for StorageWorks EVA, EMA, or MA devices, expect unnecessary reassignments at times (for example, at boot time). Consequently, PowerPath cannot guarantee that the current owner remains the same after a reboot. Unnecessary reassignments can destroy non-persistent snaps on HSG80 based arrays (MA8000, EMA12000, and EMA16000).

Storage System Configuration

Refer to the EMC host connectivity guide for your operating system for information on setting up connections for Symmetrix and CLARiiON systems. For information on setting up connections for third-party storage systems, refer to your vendor's documentation.

Symmetrix Storage Systems

Refer to the *EMC Support Matrix* for Symmetrix storage systems supported with PowerPath 4.5.x.

CLARiiON Storage Systems

Refer to the *EMC Support Matrix* for CLARiiON storage systems supported with PowerPath 4.5.x.

To properly install PowerPath on a host with a CLARiiON CX-series array, refer to the *EMC Installation Roadmap for CX-Series and FC-Series Storage Systems.* There you will find step-by-step instructions for installing PowerPath and other CLARiiON software. The latest versions of CLARiiON CX-series documentation are available the Powerlink website at http://Powerlink.EMC.com.

CLARiiON AX-series installation, planning, and troubleshooting documents are located on the AX-series support website. For information on accessing the site, refer to the support documentation that shipped with your storage system. Refer only to these documents for prescribed installation information when using AX-series storage systems.

IBM ESS Storage Systems

PowerPath 4.5.x supports the following IBM ESS systems.

Make	Model	Qualified Array Code/Firmware	Maximum Paths/Device
IBM	2105 F10/F20	2.2.0.593	32
	800/800T	2.3.0.465	

Hitachi Lightning Storage Systems

PowerPath 4.5.x supports the following Hitachi Lightning systems.

Make	Model	Qualified Array Code/Firmware	Maximum Paths/Device
Hitachi	9970V/9980V	21-05-27 (or higher)	32
	9910/9960	01-19-26 (or higher)	

Note: Hitachi Lightning arrays are only supported on the 32-bit versions of RHEL 4.0 U2 and SLES 9.0 SP2.

Hitachi TagmaStore PowerPath 4.5.x supports the following Hitachi TagmaStore system.

Make	Model	Qualified Array Code/Firmware	Maximum Paths/Device
Hitachi	USP1100	50-03-69-00/00 50-03-71	32

Hewlett-Packard StorageWorks Systems PowerPath 4.5.x supports the following HP StorageWorks systems.

Make	Model	Minimum Array Code/Firmware	Maximum Paths/Device
HP	HP StorageWorks Disk Array xp 128/1024	21-05-27	32
	HP StorageWorks Disk Array xp 48/512	01-17-26	
	HP StorageWorks EVA 3000/5000	VCS3.0, 3.010	
	HP StorageWorks EMA 12000/16000		
	HP StorageWorks MA 8000		
	HP StorageWorks HPXP12000	50-03-69	

Connectivity Requirements

Refer to the *EMC Support Matrix* for information on Fibre Channel and iSCSI components and configurations supported by PowerPath.

Note: Install HBAs, supported firmware versions, and other network components using the manufacturer's directions and the settings specified in the *EMC Support Matrix*. Using improper settings can cause erratic failover behavior or extended response time for system I/O.

File System Support

Table 1-6 displays the file systems supported by PowerPath.

Table 1-6 **File System Support**

Platform	File System			
	ext2	ext3	Reiserfs	XFS
RHEL 4.0 U2, U3	✔	✔		
SLES 9.0 SP2, SP3	✔	✔	✔	✔
Asianux 2.0	✔	✔	✔	✔

LVM2 Support

PowerPath 4.50 and higher support the Sistina LVM2 on the RHEL 4.0 U2, U3 and SLES 9 SP2, SP3 platforms. LVM2 interoperability is supported for the native boot device as well as PowerPath pseudo devices.

VxVM Support

PowerPath 4.5.1 supports VxVM MP2.

Note: Use native names to ensure that PowerPath-managed devices on third-party storage systems work properly with VxVM.

Cluster Support

Refer to the *EMC Support Matrix* for the current information on cluster support.

Known Problems and Limitations

This section describes the known problems and limitations in PowerPath 4.5.x for Linux.

Known Problems

The following problems have been reported for PowerPath 4.4.x and 4.5.x for Linux.

Table 1-7   Known Problems in PowerPath

Description	Found in Version	Workaround
231632 On SLES 9 SP3, running the OracleASM start/scandisks/stop commands may panic the host after 20-30 iterations of the loop.	4.5.1	None.
230036 SCSI 3 PGR-based I/O fencing does not work on a PowerPath host in a VCS cluster. PowerPath 4.5.x does not work correctly with any application that uses SCSI-3 persistent register/reserve/preempt commands. Refer to "Limitations" on page 18.	4.5.0	None.

229447
VxVM 4.1 pseudo device mappings (emcpower mappings) may become inconsistent with PowerPath pseudo device mappings. Circumstances that may cause inconsistencies include:
• VxVM 4.1 is uninstalled and reinstalled after a LUN configuration change. VxVM maps pseudo devices based on device information saved before the uninstall, and these mappings may differ from the current PowerPath mappings and configuration.
• A pseudo device instance is renamed using emcpadm, which causes VxVM 4.1 to lose the pseudo device mapping.
	4.5.0	To fix inconsistent device mappings:
		1. Enter:
		`cp /etc/vx/disk.info /etc/vx/disk.info.old`
		2. Enter:
		`echo > /etc/vx/disk.info`
		3. Enter:
		`vxconfigd -k`

227570 Uninstalling PowerPath does not remove the emcpower files from the /dev directory.	4.4.1	Manually remove the files.

Table 1-7   Known Problems in PowerPath (continued)

Description	Found in Version	Workaround

227536
Certain SCSI-based IOCTLs (for example, `SCSI_GET_IDLUN`) and applications that use these IOCTLs (for example, `sg_map`) may not work correctly for devices on active-active arrays (Symmetrix, for example) set to the `bf` (Basic Failover) policy. In such instances, you may see the following errors:
`device /dev/sdp failed on scsi ioctl(idlun), skip:`
`No such device or address`
`device /dev/sdr failed on scsi ioctl(idlun), skip:`
`No such device or address`
	4.5.0	Use the `powermt set policy` command to change the policy to `so` (Symmetrix Optimized) for Symmetrix devices or to `ad` (Adaptive) for other active-active devices. Rerun the application.

226467 Starting PowerPath on a SLES 9 host with a qla4xxx iSCSI driver may generate the following message: `qla4xxx: invalid ioctl magic number received.`	4.5.0	Ignore the message.
226387 PowerPath uninstallation may fail on a host where I/O had been running for an extended period.	4.5.0	Refer to EMC KnowledgeBase solution emc123149 for more information.
225724 Running the `powermt remove` command to remove a PowerPath pseudo device causes a trespass if I/O is inflight to the pseudo device and the last path of that pseudo is a passive.	4.5.0	None.
224770 Uninstalling PowerPath can fail in any of the following scenarios: • When a dump device is configured on an array native device (for example `/dev/sdx`, where `sdx` is a Symmetrix, CLARiiON, or third-party array device). • Any device that is opened before or after PowerPath is loaded.	4.5.0	• Remove the dump device or reconfigure it to point to an internal disk. • Close the open device.
223760 Repeatedly using `parted` to create and delete partitions causes the host to run out of memory.	4.5.0	None.
223441: If you stop PowerPath and the device configuration changes when you restart PowerPath, you may see a message that PowerPath failed to start.	4.5.0	Ignore the message. PowerPath restarts successfully despite the message.
218291: In RHEL4 U2, the existing `parted` version (`parted-1.6.19-1.EL`) does not work correctly on pseudo devices.	4.5.0	• Use the `fdisk` utility instead of `parted` to create partitions using pseudo devices. • Upgrade to `parted` version parted-1.6.21 series or later.

Table 1-7   Known Problems in PowerPath (continued)

Description	Found in Version	Workaround
214659: Symmir will not establish a BCV mirror using the PowerPath pseudo name of a Symmetrix metavolume.	4.4.0	Use the native volume name.
212513: After installing PowerPath 4.4 on a RHEL 4.0 with Emulex HBAs, the following message is displayed during boot and no devices are visible: `Unknown IOCB command Data`	4.4.0	1. Uninstall PowerPath 4.4. 2. Upgrade the HBA firmware to 3.92a2 (available on the Emulex web site: http://emulex.com/ts /docoem/framemc.htm) 3. Re-install PowerPath.
211431: Manually editing the `/etc/emc/mpaa.lams` file (that is, for generic LAM support) to change the status of a LAM that has configured devices causes the `powermt config` command to return an error.	4.4.0	The error is benign; ignore it.
208594: On SLES 9 hosts, the Naviagent CLI (version 6.17, 6.18, and 6.19 for the Linux 2.6 IA64 kernel) startup script fails when CLARiiON LUNs are attached to the host.	4.4.0	None.

Limitations   PowerPath 4.5.x for Linux has the following limitations:

◆ PowerPath 4.5.x for Linux does not support:

   • RHEL 3.0, SLES 8 or SLES 9 SP1, United Linux, Asianux Linux 1.0 (Red Flag or Miracle Linux).

   • IA64 with 32-bit operating systems.

   • Write throttling.

◆ PowerPath 4.5.x does not work correctly with any application that uses SCSI-3 persistent register/reserve/preempt commands (for example, VCS DB/AC).

◆ On IA64 host, PowerPath cannot start properly if the `/usr` file system is mounted on a separate partition. EMC recommends that `/usr` be built as part of the root file system, as specified in the default Linux installation.

Technical Notes

This section contains additional information on PowerPath not covered in the core documents.

Supporting More Than 256 Storage Devices

Complete the following steps to support more than 256 storage devices on a host.

On RHEL and SuSE Hosts

If using Emulex HBAs on a SuSE or RHEL host:

1. Edit the `/etc/modprobe.conf` file (RHEL) or the `/etc/modprobe.conf.local` file (SuSE) and set the `lpfc_max_luns` parameter to `1024`. For example:

   ```
   options lpfc lpfc_nodev_tmo=10 lpfc_max_luns=1024
   ```

   Note: Refer to Chapter 1, "Installing PowerPath," in the *PowerPath 4.5 for Linux Installation Guide* for more information on setting HBA parameters, including `lpfc_nodev_tmo`, for PowerPath.

2. Create a new RAM disk and reboot the host.

On SuSE Hosts

If using Emulex or Qlogic HBAs on a SuSE host:

1. Issue the `chkconfig boot.udev on` command.

2. Edit the `/etc/sysconfig/hotplug` file and set the `HOTPLUG_USING_SUBFS` parameter to `no`:

   ```
   HOTPLUG_USE_SUBFS=no
   ```

3. Reboot the host.

Linux iostat Command

The Linux `iostat` command does not display I/O statistics for EMC pseudo devices.

iSCSI Devices

Take note of the following issues regarding native iSCSI devices using the software initiator in a PowerPath environment.

Stopping iSCSI on a PowerPath Host

Always stop PowerPath before stopping iSCSI on a host with iSCSI devices under PowerPath control. Use the following sequence of commands to first stop PowerPath, and then stop iSCSI:

```
/etc/init.d/PowerPath stop
/etc/init.d/iscsi stop
```

Adding or Removing iSCSI Devices

You must stop iSCSI before you perform any operation that involves adding or removing iSCSI devices. Examples of such operations include adding or removing iSCSI devices from a CLARiiON device group, or rebooting a CLARiiON SP that contains iSCSI devices visible to the host. As mentioned above, you must stop PowerPath before stopping iSCSI.

Issue the following commands to stop first PowerPath and then iSCSI prior to any operation that involves adding or removing iSCSI devices:

```
/etc/init.d/PowerPath stop
/etc/init.d/iscsi stop
```

After completing the operation that involved adding or removing iSCSI devices, first restart iSCSI and then restart PowerPath. Issue the following commands to restart iSCSI and PowerPath:

```
/etc/init.d/iscsi start
/etc/init.d/PowerPath start
```

Placing Celerra iSCSI Devices under PowerPath Control

PowerPath treats Celerra iSCSI devices as generic devices. Enable generic Loadable Array Module (LAM) support so that PowerPath can recognize and manage Celerra iSCSI devices.

Note: The generic LAM does not support SCSI-3 PGR.

Managing Celerra iSCSI Targets

To place Celerra iSCSI devices under PowerPath control:

1. Add the following line to the `/etc/emc/mpaa.lams` file:

   `managed:generic:EMC:Celerra`

2. Run the `powermt init` command.

3. Run the `powermt config` command.

4. Run the `/etc/init.d/PowerPath stop; /etc/init.d/PowerPath start` command sequence to restart PowerPath or reboot the host.

Unmanaging Celerra iSCSI Targets

To remove Celerra iSCSI devices from PowerPath control:

1. Remove the following line from the `/etc/emc/mpaa.lams` file:

   `managed:generic:EMC:Celerra`

2. Run the `powermt init` command.

3. Run the `powermt config` command.

4. Run the `/etc/init.d/PowerPath stop; /etc/init.d/PowerPath start` command sequence to restart PowerPath or reboot the host.

PowerPath and the CLARiiON admsnap Utility

Take note of the following if you use the CLARiiON `admsnap` utility with PowerPath devices.

◆ For all versions of the `admsnap` utility, set the `PP_SHOW_CLAR_OWNING_SP` environment variable to false to suppress the display of default and current SP data:

```
PP_SHOW_CLAR_OWNING_SP=false
```

◆ For `admsnap` utility version 2.4.0.0.3 or less:

• Set the `PP_DEFAULT_STORAGE_SYS` environment variable to clariion to restrict the class of devices displayed by the `powermt` utility to CLARiiON devices:

```
PP_DEFAULT_STORAGE_SYS=clariion
```

• Use a native PowerPath name (for example, `/dev/sde`) to start or activate an `admsnap` session when a file system is mounted on a PowerPath device. You cannot use a PowerPath pseudo device name (for example, `/dev/emcpowere`) to start or activate a session when a file system is mounted on a PowerPath device.

Documentation

This section provides a list of the documentation that supports PowerPath for Linux.

PowerPath Documentation

The following table lists the PowerPath for Linux documentation set; all manuals are available from EMC Corporation.

Part Number	Name
300-002-834	*PowerPath 4.5 Product Guide*
300-002-835	*PowerPath 4.5 Quick Reference*
300-002-837	*PowerPath 4.5 for Linux Guide*
300-002-840	*PowerPath 4.5 for Linux Release Notes*

Electronic versions of all PowerPath manuals are available on the Powerlink website at http://Powerlink.EMC.com. These manuals are updated periodically on the Powerlink website.

Related Documentation

If your environment includes Symmetrix storage systems, refer to the EMC host connectivity guides, available on the Powerlink website.

If your environment includes CLARiiON storage systems, refer to the following manuals:

◆ EMC host connectivity guides

◆ *EMC Installation Roadmap for CX-Series and FC-Series Storage Systems.* The latest versions of CLARiiON CX-series documentation are available on the Powerlink website.

◆ CLARiiON AX-series installation, planning, and troubleshooting documents, located on the AX-series support website. For information on accessing the site, refer to the support documentation that shipped with your storage system. Refer only to these documents for prescribed installation information when using AX-series storage systems.

◆ *EMC Navisphere Manager Version 6.X Administrator's Guide*

If your environment includes other vendors' storage systems, refer to the appropriate documentation from your vendor.

Software Media, Organization, and Files

This section describes the contents of the EMC PowerPath 4.5.1 for Linux package (P/N 953-001-862 A06).

Media

The PowerPath 4.5.1 for Linux package includes the following items:

Part Number	Description
053-001-712 A01	v4.5.1 software CD The PowerPath 4.5 for Linux software CD contains both the 4.5.1 and 4.3.4 releases.
053-001-713 A01	v4.5.1 documentation CD

Organization

Software CD   The PowerPath 4.5.1 and 4.3.4 for Linux software CD has the following structure:

```
/LINUX
   /2.4
      /pp4.3.4
            EMCpower-LINUX-4.3.4-004.rpm
            EMCpower.LINUX.4.3.4.Patch.GA.tar.gz
   /2.6
      /pp4.5.x
      EMCpower.LINUX.4.5.1.022.tar.gz
         /rhel
            EMCpower.LINUX-4.5.1-022.rhel.i386.rpm
            EMCpower.LINUX-4.5.1-022.rhel.ia64.rpm
            EMCpower.LINUX-4.5.1-022.rhel.x86_64.rpm
         /sles
            EMCpower.LINUX-4.5.1-022.sles.i386.rpm
            EMCpower.LINUX-4.5.1-022.sles.ia64.rpm
            EMCpower.LINUX-4.5.1-022.sles.x86_64.rpm
```

Documentation CD   The PowerPath 4.5.1 documentation CD contains the following documents:

Part Number	Name
300-002-834	*PowerPath 4.5 Product Guide*
300-002-835	*PowerPath 4.5 Quick Reference*
300-002-837	*PowerPath 4.5 for Linux Installation Guide*

Installation

Refer to the *PowerPath 4.5 for Linux Installation Guide*,
P/N 300-001-837, for complete instructions on installing PowerPath.

Troubleshooting and Getting Help

For additional information on EMC products and services available to customers and partners, refer to the EMC Powerlink website at
http://Powerlink.EMC.com

The Powerlink website contains current information, such as:

❑ PowerPath documentation — We update PowerPath documentation when we release new features with a patch or when documentation errors are reported.

❑ Patches and upgrades — You can download PowerPath patch software from Powerlink. Review the patch ReadMe files to determine which patches (if any) you want to install after PowerPath, and whether those patches have any added prerequisites that must be met before you install PowerPath. To obtain patches: on Powerlink, click **Support** > **Downloads and Patches** > **Downloads D-R > PowerPath for Linux**.

❑ EMC Issue Tracker— EMC Issue Tracker is an application that allows you to search for known problems and defects in EMC software. To access Issue Tracker, on Powerlink click **Support** > **Self-Help Tools** > **Issue Tracker Information** > **Issue Tracker**. You can use Issue Tracker to find:

• Descriptions of PowerPath bugs existing on any PowerPath-supported host platform

• Workarounds for existing bugs

We update this database regularly between scheduled releases and patch releases.

Reporting a Problem

If you find a problem in PowerPath 4.5.x, run the emcgrab utility, and submit the generated tar file, along with any other supporting material, to EMC Customer Support. You can download emcgrab from the Powerlink website.

Choose the following links: **Community** > **Customer** > **Tools** > **Service Tools** > **EMC Grab Utilities**.