

HP-UX 11i December 2003 Release Notes

HP-UX Servers and Workstations

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Publication History

The manual publication date and part number indicate its current edition. The publication date will change when a new edition is released. The manual part number will change when extensive changes are made.

To ensure that you receive the new editions, you should subscribe to the appropriate product support service. See your HP sales representative for details.

- First Edition: December 2000, B3920-90091, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Second Edition: June 2001, 5971-2229, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Third Edition: September 2001, 5185-6522, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Fourth Edition: December 2001, 5185-4304, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Fifth Edition: March 2002, 5185-4391, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)

- Sixth Edition: June 2002, 5187-0172, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Seventh Edition: September 2002, 5187-1361, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Eighth Edition: December 2002, 5187-1841, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Ninth Edition: March 2003, 5187-2255, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Tenth Edition: June 2003, 5187-2783, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Eleventh Edition: September 2003, 5187-3612, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)
- Twelfth Edition: December 2003, 5187-4505, (HP-UX 11i), CD-ROM (Instant Information), and Web (<http://docs.hp.com>)

Conventions

We use the following typographical conventions:

<i>audit</i> (5)	An HP-UX manpage. The name is <i>audit</i> and 5 is the section in the <i>HP-UX Reference</i> . On the web and on the Instant Information CD, it may be a hot link to the manpage itself. From the HP-UX command line, you can enter “man audit” or “man 5 audit” to view the manpage.
<i>Book Title</i>	The title of a book. On the web and on the Instant Information CD, it may be a hot link to the book itself.
KeyCap	The name of a keyboard key. Note that Return and Enter both refer to the same key.
<i>Emphasis</i>	Text that is emphasized.
Emphasis	Text that is strongly emphasized.
Term	The defined use of an important word or phrase.
ComputerOut	Text displayed by the computer.
UserInput	Commands and other text that you type.
Command	A command name or qualified command phrase.
<i>Variable</i>	The name of a variable that you may replace in a command or function or information in a display that represents several possible values.
[]	The contents are optional in formats and command descriptions. If the contents are a list separated by , you must choose one of the items.
{ }	The contents are required in formats and command descriptions. If the contents are a list separated by , you must choose one of the items.

...

The preceding element may be repeated an arbitrary number of times.

|

Separates items in a list of choices.

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What's in This Chapter?

This chapter helps you use these *Release Notes* most effectively.

- Where Do I Begin? (see page 18)
- What's in This Document? (see page 19)
- How Is Release Information Identified? (see page 20)
- What's in the Remaining Chapters? (see page 21)

Where Do I Begin?

The *HP-UX 11i Release Notes* describes what is new, has changed, or has become obsolete for HP-UX 11i version 1.0 (B.11.11) since the initial release of HP-UX 11.0.

As with other HP-UX release notes, the *HP-UX 11i Release Notes* does not completely document all the features of the latest 11i version 1.0 release. Instead, it contains high-level information and pointers to more detailed operating system and product-specific documentation. Where appropriate, it also notes changes in the support of products.

Table 1-1 Finding HP-UX 11i Documents

If you need to . . .	Go to . . .	Located at . . .
find out what has changed since HP-UX 11.0	<ul style="list-style-type: none"> <i>HP-UX 11i Release Notes</i> (you are here) 	<ul style="list-style-type: none"> HP Instant Information media http://docs.hp.com <code>/usr/share/doc/</code> directory^a
find out what changed between 10.x and 11.0	<ul style="list-style-type: none"> <i>HP-UX 11.x Release Notes</i> 	<ul style="list-style-type: none"> HP Instant Information media http://docs.hp.com <code>/usr/share/doc/</code> directory
install HP-UX 11i or update from 10.x or 11.0 to 11i ^b	<ul style="list-style-type: none"> <i>Read Before Installing or Updating to HP-UX 11i</i> <i>HP-UX 11i Installation and Update Guide</i> 	<ul style="list-style-type: none"> CD-booklet with the Operating Environment (OE) media Media Kit (supplied with the OE) HP Instant Information media http://docs.hp.com
administer an HP-UX Operating Environment	<ul style="list-style-type: none"> <i>Managing Systems and Workgroups: A Guide for HP-UX System Administrators</i> <i>HP System Partitions Guide: Administration for nPartitions</i> 	<ul style="list-style-type: none"> HP Instant Information media http://docs.hp.com
find a white paper	<ul style="list-style-type: none"> See listings in http://docs.hp.com and <code>/usr/share/doc/</code> for the topic you want to read about. 	<ul style="list-style-type: none"> http://docs.hp.com (most white papers can be found here) <code>/usr/share/doc/</code> directory (a few white papers can be found here)
develop code on HP-UX	<ul style="list-style-type: none"> <i>HP-UX Software Transition Kit</i> 	<ul style="list-style-type: none"> http://devresource.hp.com/STK

a. The `/usr/share/doc` directory contains only the original release note for 11i. For up-to-date release notes, see the Instant Information CD and <http://docs.hp.com>.

b. If you are *updating* to HP-UX 11i (as opposed to *cold-installing*), your system must first be running either HP-UX 11.0 or 10.20.

What's in This Document?

The *HP-UX 11i Release Notes* describes what is new, has changed, or has become obsolete with HP-UX 11i version 1.0 since the initial release of HP-UX 11.0. It applies only to features that are included in the HP-UX operating system or one of the five Operating Environments (discussed in Chapter 3, “HP-UX 11i Version 1 Release Overview,” on page 49).

The *HP-UX 11i Release Notes* describes these changes made to HP-UX:

- Changes introduced after the initial release of HP-UX 11.0 as part of Extension Packs and/or ACE releases. (These changes were subsequently incorporated into HP-UX 11i.)
- Changes introduced at the initial release of HP-UX 11i version 1.0.
- Changes introduced subsequent to the initial release of HP-UX 11i version 1.0.

Additional product-specific release notes files are located in the `/opt` directory, in sub-directories named `/opt/product_name/newconfig/RelNotes`, where *product_name* represents the name of the product to which those release notes apply. (For example, Distributed Computing Environment [DCE] release notes are located in the `/opt/dce/newconfig/RelNotes` directory.) Further product-specific information can also be found at individual product web sites and at <http://docs.hp.com>. Check corresponding sections in the *HP-UX 11i Release Notes* for specific URLs.

For overviews of current releases of the Operating Environments, Application Releases, and Support Plus, as well as up-to-the-minute software announcements and discontinuance information, visit the Software Support Web site at <http://www.software.hp.com/RELEASES-MEDIA/>.

How Is Release Information Identified?

Throughout these *Release Notes*, the current release might be referred to as “HP-UX 11i as of December 2003,” “HP-UX 11i version 1,” “HP-UX v1,” “HP-UX 11i,” or just “11i.”

Generally, the newest release information is listed first, followed by information about previous releases. This information is then followed, if applicable, by pointers to the most current documentation on the individual product.

Release information is identified as follows:

- | | |
|--|---|
| new (or updated) for December 2003 | This material covers features that have been introduced or updated with the current release. |
| new (or updated) for September 2003 | This material covers features that were introduced or updated in the September 2003 version of HP-UX 11i version 1.0. |
| new (or updated) for June 2003 | This material covers features that were introduced or updated in the June 2003 version of HP-UX 11i version 1.0. |
| new (or updated) for March 2003 | This material covers features that were introduced or updated in the March 2003 version of HP-UX 11i version 1.0. |
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| new (or updated) for June 2002 | This material covers features that were introduced or updated in the June 2002 version of HP-UX 11i version 1.0. |
| new (or updated) for March 2002 | This material covers features that were introduced or updated in the March 2002 version of HP-UX 11i version 1.0. |
| new (or updated) for December 2001 | This material covers features that were introduced or updated in the December 2001 version of HP-UX 11i version 1.0. |
| new (or updated) for September 2001 | This material covers features that were introduced or updated in the September 2001 version of HP-UX 11i version 1.0. |
| new (or updated) for June 2001 | This material covers features that were introduced or updated in the June 2001 version of HP-UX 11i version 1.0. |
| new at 11i original release | This material covers features that were newly introduced with the original release of HP-UX 11i version 1.0 in December 2000. |

What's in the Remaining Chapters?

Here is a listing of the remaining chapters of these *Release Notes*:

- Chapter 2, “What’s New at a Glance,” provides a quick overview of the changes to HP-UX first introduced in the initial release of HP-UX 11i and in subsequent updates to the release.
- Chapter 3, “HP-UX 11i Version 1 Release Overview,” introduces the HP-UX 11i release with an overview of the Operating Environments and other features.
- Chapter 4, “nPartition (Hard Partition) Systems,” describes Hewlett-Packard’s new high-performance HP-UX server environment.
- Chapter 5, “Workstation/Server Specific Information,” presents information on which platforms support the 11i release, as well as other platform-specific information.
- Chapter 6, “HP-UX 11i Version 1.0 Operating Environment Applications,” presents information on each of the five Operating Environments, including the new “Minimal Technical Operating Environment.”
- Chapter 7, “Networking and Mass Storage Drivers,” describes cards and drivers.
- Chapter 8, “Installation,” describes new and changed aspects of installation.
- Chapter 9, “General System Administration and Performance Monitoring,” describes changes which may be of particular interest to system administrators.
- Chapter 10, “Process, Threads, Memory, and Kernel Parameters,” describes a variety of topics in these areas.
- Chapter 11, “New and Changed Disk and File Management Features,” includes changes to striping, mirroring, JFS, and NFS.
- Chapter 12, “Internet and Networking Services,” includes changes to `sendmail`, `BIND`, `FTPD`, `STREAMS/UX`, and other services.
- Chapter 13, “Security,” presents new security features such as GSS API, executing protected stacks, and Kerberos Client software.
- Chapter 14, “Compatibility,” describes various compatibility issues between HP-UX 11.0 and 11i.
- Chapter 15, “Programming,” covers a variety of changes that are of particular interest to programmers.
- Chapter 16, “Internationalization,” provides information that will be of interest to localizers or international users of HP-UX.
- Chapter 17, “Licensing Products,” covers impending changes to LicensePower/iFOR and LSSERV.

What's in This Chapter?

This chapter gives you a quick overview of the changes to HP-UX first introduced in the initial release of HP-UX 11i version 1 and in subsequent updates to the release. Details of the changes are given in other chapters, which are cross-referenced.

- What's New in the December 2003 Release? (see page 24)
- What's New in the September 2003 Release? (see page 26)
- What's New in the June 2003 Release? (see page 28)
- What's New in the March 2003 Release? (see page 30)
- What's New in the December 2002 Release? (see page 31)
- What's New in the September 2002 Release? (see page 33)
- What's New in the June 2002 11i Release? (see page 35)
- What's New in the March 2002 11i Release? (see page 37)
- What's New in the December 2001 11i Release? (see page 39)
- What's New in the September 2001 11i Release? (see page 40)
- What's New in the June 2001 11i Release? (see page 42)
- What's New in the Original 11i Release? (see page 43)

What's New in the December 2003 Release?

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- Hard Partitions now supported on rp8420, rp7420, and Superdomes SD16A, SD32A, and SD64A. (See Chapter 4, “nPartition (Hard Partition) Systems,” on page 55.)
- Partition Manager updated to version B.11.11.01.07 to incorporate a defect fix. (See “Partition Manager (parmgr)” on page 62.)

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Program updated install kernels to support Rock Ridge extension for ISO-9660 format; enabled support for new PA-8800 servers; qualified support for new slim optical devices for J6X00 workstations; enabled correct density and compression for several tape drives; added support for new I/O cards. (See “Hardware Enablement” on page 75.)
- Supported systems now include hp 9000 rp3440 server, hp 9000 rp4440 server, hp 9000 rp8420 server, hp 9000 rp7420 server, hp 9000 Superdome SD16A, hp 9000 Superdome SD32A, hp 9000 Superdome SD64A. (See “Supported Systems” on page 70.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- Codeword iCOD added as an always-installed product. (See “Codeword iCOD” on page 106.)
- Enterprise Cluster Master (ECM) Toolkit updated to version B.02.00 with additions and enhancements. (See “Enterprise Cluster Master (ECM) Toolkit” on page 128.)
- GlancePlus Pak updated to version C.03.72.00 to incorporate defect fixes. (See “GlancePlus Pak” on page 124.)
- Graphics and Technical Computer Environment bundle (B6268AA) updated to version B.11.11.12.03 to incorporate defect fixes. (See “OpenGL 3D Graphics Developers Kit and Runtime Environment” on page 137.)
- HP CIFS Server updated to 2.2g (version A.01.10) with defect fixes and new enhancements. (See “HP CIFS Client and HP CIFS Server” on page 107.)
- HP Message-Passing Interface (MPI) updated to version 2.0 with new features, including MPI-2 Standard functionality. (See “HP Message-Passing Interface (MPI)” on page 144.)
- HP Visualize Conference updated to version 1.5 to support the XFree86 X server. (See “HP Visualize Conference” on page 145.)
- HP WBEM Services for HP-UX, version A.01.05, now included as a default-installed product on the OE media. (See “HP WBEM Services for HP-UX” on page 109.)
- HP-UX HIDS updated to version 2.2 as a maintenance release. (See “HP-UX Host Intrusion Detection System (HIDS)” on page 147.)
- HP-UX IPFilter updated to version A.03.05.08 with defect fixes to the product and the documentation. (See “HP-UX IPFilter” on page 148.)

- Ignite-UX install environment enhanced to include the Gigabit Ethernet libraries to allow `lanadmin` to configure these network interfaces during installation. (See “Ignite-UX (IUX)” on page 148.)
- Mozilla Application Suite updated to version 1.4 with new functionality, defect fixes, and performance improvements. (See “Mozilla Application Suite” on page 119.)
- Pay Per Use updated to version B.06.03 to incorporate a security improvement. (See “PPU Percent Utilization” on page 151.)
- Servicecontrol Manager updated to version 03.00.04 to include Java SDK version 1.4.1.04. (See “Servicecontrol Manager (SCM)” on page 122.)
- Software Package Builder updated to version A.01.00.04 to allow the use of OR relationships when setting corequisite and prerequisite dependencies. (See “Software Package Builder” on page 152.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- Fibre Channel `fc` driver updated to support the new A9782A and A9784A Fibre Channel/Gigabit Ethernet Combo HBAs. (See “Fibre Channel `fc` Driver” on page 164.)
- Gigabit Ethernet driver `iether` now supports the PCI-X 2-Port 1000Base-SX (fiber-based) card (A7011A) and the PCI-X 2-Port 1000Base-T (copper-based) card (A7012A). (See “Gigabit Ethernet Drivers” on page 157.)
- Gigabit Ethernet driver `gelan` updated to incorporate defect fixes. (See “Gigabit Ethernet Drivers” on page 157.)
- Gigabit Ethernet driver `igelan` updated to incorporate defect fixes. (See “Gigabit Ethernet Drivers” on page 157.)
- The Gigabit Ethernet drivers updated to support various new systems and system upgrades including the `rp4440`, `rp8620`, `rp7420`, and `rx2600`. (See “Gigabit Ethernet Drivers” on page 157.)
- HP RAID160 SA Controller driver updated to improve diagnostic capabilities. (See “HP RAID160 SA Controller Driver (RAID-01 Driver Bundle)” on page 170.)
- The `scsiU320-00` bundle added to provide the always-installed driver `mpt` for the HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter. (See “Ultra320 SCSI Adapter Driver (`scsiU320-00` Driver Bundle)” on page 167.)

Chapter 8: Installation (see page 173)

- Update-UX updated to incorporate defect fixes and to support changes to the Operating Environments. (See “Update-UX” on page 176.)

Chapter 16: Internationalization (see page 301)

- Several commands, library routines and `lp` model files that implement internationalization functionality are deprecated. (See “Deprecated Functionality” on page 302.)

What's New in the September 2003 Release?

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement updated for SAM to recognize new hardware devices; updated commands for latest DLT and SDLT tape units; added support for new I/O card; added support for rp8400 Server Expansion Unit. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- Event Monitoring Service (EMS) updated to version A.04.00.01 to incorporate defect fixes. (See “Event Monitoring Service (EMS)” on page 106.)
- High Availability (HA) Monitors updated to version A.04.00.01 to incorporate defect fixes. (See “High Availability Monitors” on page 124.)
- HP CIFS Client updated to version A.01.09 with new features and defect fixes. (See “HP CIFS Client and HP CIFS Server” on page 107.)
- HP MLIB updated to version 8.5 with full METIS functionality. (See “High Performance Math Libraries (HP MLIB)” on page 143.)
- HP-UX Apache-based Web Server updated to version 1.0.06.01 primarily as a security and bug-fix release. (See “HP-UX Apache-based Web Server” on page 114.)
- HP-UX Tomcat-based Servlet Engine updated to version 1.0.03.03 to incorporate a defect fix. (See “HP-UX Tomcat-based Servlet Engine” on page 116.)
- HP-UX IPFilter updated to version A.03.05.07 with new functionality. (See “HP-UX IPFilter” on page 148.)
- HP-UX Webmin-based Admin updated to version 1.0.05.01 with partial support for additional Apache LDAP modules. (See “HP-UX Webmin-based Admin” on page 116.)
- Ignite-UX updated to version B.4.4 to support new drivers. (See “Ignite-UX (IUX)” on page 148.)
- MC/ServiceGuard NFS Toolkit updated to version A.11.11.03 to support File Lock Migration. (See “MC/ServiceGuard NFS Toolkit” on page 135.)
- Netscape Communicator no longer available; replaced by Mozilla. (For information on Mozilla, see “Mozilla Application Suite” on page 119.)
- Pay Per Use updated to version B.06.02 to improve the software's operation. (See “PPU Percent Utilization” on page 151.)
- Runtime Environment for the Java 2 platform version 1.4 now default-installed, along with versions 1.2 and 1.3. (See “HP-UX Runtime Environment for the Java 2 Platform” on page 110.)
- Runtime Plug-in (JPI) for the Java 2 platform version 1.4 now default-installed, along with versions 1.2 and 1.3. (See “Plug-In for the Java 2 Platform for Netscape/Mozilla” on page 122.)
- Servicecontrol Manager updated to version 03.00.02 to incorporate minor defect fixes. (See “Servicecontrol Manager (SCM)” on page 122.)

- Software Package Builder (SPB) added as a selectable product. SPB provides a visual method to create and edit software packages using the HP-UX Software Distributor (SD) package format. (See “Software Package Builder” on page 152.)
- SCR+DMI obsoleted and replaced by HP Systems Inventory Manager (SIM) for HP-UX, which is available on the Web. (For information on SIM, go to <http://www.software.hp.com/products/SIM/>.)
- TechSysConf updated to version B.11.11.09.xx to incorporate a defect fix. (See “Technical System Configuration (TechSysConf)” on page 138.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- FibrChan1-01 (fcd) added as an always-installed driver for Dual Port Fibre Channel adapter A6826A. (See “Fibre Channel fcd Driver” on page 164.)
- Gigabit Ethernet driver igelan updated to support the copper and fiber versions of the PCI-X Combination 2-Gigabit Fibre Channel and 1000Base-SX/T card. (See “Gigabit Ethernet Drivers” on page 157.)
- RAID-01 added as a selectable driver for the HP A7143A PCI 4-Channel RAID160 SA SCSI Controller. (See “HP RAID160 SA Controller Driver (RAID-01 Driver Bundle)” on page 170.)

Chapter 8: Installation (see page 173)

- Update-UX includes “default selections” file, which provides a list of bundles that will be selected for install during an OS update. Also included is support for the `-f selection_file` option on the `update-ux` command line. (See “Update-UX” on page 176.)

Chapter 15: Programming (see page 281)

- Transition Links product deprecated. (See “Transition Links Deprecated” on page 292.)

What's New in the June 2003 Release?

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Patch Bundle (`HWEnable11i`) updated for SAM to recognize new hardware devices; added multi-initiator support for SCSI Ultra160 adapters; added support for new I/O cards. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- Compressed Dump available on Software Pack. (See “Compressed Dump Available on Software Pack” on page 184.)
- EMS CLI, a new command line utility, available to configure and manage persistent monitoring requests for Event Monitoring Service (EMS) monitors. (See “Event Monitoring Service (EMS)” on page 106.)
- GlancePlus Pak updated to version C.03.71 to support new platforms. (See “GlancePlus Pak” on page 124.)
- GTK+ Libraries 1.2.10.2 added. (See “GTK+ Libraries” on page 107.)
- High Availability Monitors has been updated to version A.04.00 with new functionality and defect repairs. (See “High Availability Monitors” on page 124.)
- HP 3D Technology for the Java Platform updated to version 1.3. (See “HP 3D Technology for the Java 2 Platform” on page 144.)
- HP CIFS Server updated to version 2.2e with new tool scripts and defect fixes. (See “HP CIFS Client and HP CIFS Server” on page 107.)
- HP MPI updated to version 1.8.3 to enhance performance tuning. (See “HP Message-Passing Interface (MPI)” on page 144.)
- HP-UX Runtime Environment for Java versions 1.2 and 1.3 now installed. (See “HP-UX Runtime Environment for the Java 2 Platform” on page 110.)
- HP-UX Web Server Suite added; includes HP-UX Apache-based Web Server, HP-UX Webmin-based Admin, HP-UX Tomcat-based Servlet Engine, and HP-UX XML Web Server Tools. (See “HP-UX Web Server Suite” on page 112.)
- HP-UX Workload Manager updated to version A.02.01 with new features. (See “HP-UX Workload Manager” on page 128.)
- HP-UX Workload Manager Toolkits updated to version A.01.04 with the WLM BEA WebLogic Server Toolkit. (See “HP-UX Workload Manager Toolkits” on page 130.)
- MC/ServiceGuard updated to version 11.15 with enhancements including support for IPv6 and updated commands. (See “MC/ServiceGuard” on page 133.)
- MySQL, an open source relational SQL database, added. (See “MySQL” on page 119.)
- Mozilla added as default-installed browser. (See “Mozilla Application Suite” on page 119.)
- Netscape Directory Server updated to 6.11 with enhancements and bug fixes. (See “Netscape Directory Server (J4258CA)” on page 150.)

- Pay Per Use version B.06.00 now available as a selectable product for Superdome, rp7410, and rp8400. (See “PPU Percent Utilization” on page 151.)
- Process Resource Manager updated to version C.02.01 with enhancements. (See “HP Process Resource Manager (PRM)” on page 126.)
- Quorum Server updated to version 2.0. (See “MC/ServiceGuard” on page 133.)
- Runtime Plug-in (JPI) for the Java 2 platform versions 1.2 and 1.3 now installed. (See “Plug-In for the Java 2 Platform for Netscape/Mozilla” on page 122.)
- Servicecontrol Manager updated to version 3.0 with new features, including Linux-based central management server, certified HP ProLiant agents, XML format, and others. (See “Servicecontrol Manager (SCM)” on page 122.)
- ServiceGuard Manager updated to version A.03.00.01. (See “MC/ServiceGuard” on page 133.)

Chapter 8: Installation (see page 173)

- Update-UX includes its own copy of Software Distributor (SD). (See “Update-UX” on page 176.)

What's New in the March 2003 Release?

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Patch Bundle (HWEEnable11i) updated for current products: A5159A PCI 2-Port FWD SCSI adapter and A5838A PCI 2-Port Ultra2 SCSI with 2-Port LAN adapter; and improved IDE/ATAPI driver for workstation optical (CD-ROM, CD/RW, DVD-ROM) devices. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- HP Apache-based Web Server updated to version v.2.0.43.00 with the “worker” Multi-Processing Module (MPM) and security and defect fixes.
- HP Visualize Conference updated to B.11.13.xx to correct various permissions and ownerships. (See “HP Visualize Conference” on page 145.)
- HP-UX Online Diagnostics (OnlineDiag) bundle updated to support new products: 36/72/144 GB FC disk drives; Ultrium 460 and SDLT 160/320 tape drives; and 8GB high-density SyncDRAM memory module for rp7410 and rp8400 servers. (See “Hardware Enablement” on page 75.)
- Ignite-UX updated to version B.4.2 to provide enhanced support for server response to anonymous Itanium®-based clients. (See “Ignite-UX (IUX)” on page 148.)
- Netscape Communicator has been updated to version 4.79 (B.11.00.11xx) to incorporate a defect fix.
- TechSysConf bundle updated to version B.11.11.08.xx and TC-OpenSource product updated to version B.11.00.08.xx to incorporate defect fixes. (See “Technical System Configuration (TechSysConf)” on page 138.)
- WebQos obsoleted and no longer delivered on OE and AR media.

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- HP-UX iSCSI (SCSI over TCP/IP) supported by SAM. (See “Peripheral Devices” on page 192.)
- HP VERITAS Enterprise Administrator (VEA) launched from SAM. (See “Disks and File Systems Area” on page 190.)

What's New in the December 2002 Release?

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- Hard partitions now supported on HP rp7405. (See “Introduction” on page 56.)
- Partition Manager updated to version B.11.11.01.06 with support for new types of cell boards, new interpartition security features, ability to detect the presence of vPars, and ability to show limited information about I/O cards and I/O slots that belong to virtual partitions. (See “Partition Manager (parmgr)” on page 62.)

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Patch Bundle (HWEnable11i) updated with LVM patches for VA7110 and VA7410 FC disk arrays and new Xserver patch for FireGL graphics. Support verified for workstation processors and for updated optical units. (See “Hardware Enablement” on page 75.)
- B2600 workstation firmware requirements updated.

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- Enterprise Cluster Master (ECM) Toolkit updated to incorporate defect fixes, as well as support for Sybase version 12.0 and Enterprise Server 3.6. (See “Enterprise Cluster Master (ECM) Toolkit” on page 128.)
- GlancePlus Pak updated to version C.03.70 with modifications and defect repairs to support new platforms. (See “GlancePlus Pak” on page 124.)
- HP Apache-based Web Server updated to v.1.3.26.06 with security fixes from v.1.3.26.05, plus auth_ldap functionality, mod_perl built as a DSO, and new helper utilities.
- HP MLIB temporarily removed from the TCOE media. (See “High Performance Math Libraries (HP MLIB)” on page 143.)
- HP MPI updated to version 1.8.2 to incorporate minor defect fixes. (See “HP Message-Passing Interface (MPI)” on page 144.)
- IETHER-00 networking driver always-installed in the OEs. (See “Hardware Enablement” on page 75 and “Always-Installed Networking and Mass Storage Drivers” on page 104.)
- Online Tools (STM and EMS Hardware Manager) updated with enhancements and support for new hardware. (See “HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors” on page 110.)

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- System Administration Manager (SAM) updated to add support for 7400 and 7405 disk arrays; support for IPv6, for adding default routes, and for configuring VLAN; support for IGELAN card. (See “Changes to System Administration Manager (SAM)” on page 190.)

Chapter 11: New and Changed Disk and File Management Features (see page 217)

- Base VERITAS VxFS 3.5 (JFS 3.5 only) available on Software Pack for 11i. (See “VERITAS VxFS 3.5 Available on Software Pack” on page 218.)

What's New in the September 2002 Release?

Chapter 5: Workstation/Server Specific Information

- FireGL-UX graphics adapter card (A7789A) now supported. (See “Hardware Enablement” on page 75 and “Graphics Hardware Support” on page 92.)
- IDE/ATAPI support added for optical units A8068A, A7853A, A5001A. (See “Hardware Enablement” on page 75.)
- SCSI Ultra160 boot support added for SuperDome, rp8400, and rp7410 servers. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- Base VERITAS Volume Manager Bundle updated to version 3.5 with new functionality, including the option to have root disk managed by VxVM. (See “Base VERITAS Volume Manager (VxVM)” on page 105.)
- Graphics and Technical Computer Environment bundle, which delivers OpenGL 3D Graphics Developers Kit and Runtime Environment, updated to version B.11.11.10.01. (See “OpenGL 3D Graphics Developers Kit and Runtime Environment” on page 137.)
- HP Apache-based Web Server updated to version 1.3.26.03 as a security-fix, bug-fix, and version-upgrade release. In the future, HP Apache-based Web Server 1.3.x will be discontinued.
- HP MLIB updated to version B.08.03 with new functionality, including ScaLAPACK, Distributed SuperLU, and Nested SMP parallelism. (See “High Performance Math Libraries (HP MLIB)” on page 143.)
- HP MPI updated to version 1.8.1 with new functionality, including new startup utility. (See “HP Message-Passing Interface (MPI)” on page 144.)
- HP-UX IPFilter (formerly, IPFilter/9000) now supports high availability environment with MC/ServiceGuard. (See “HP-UX IPFilter” on page 148.)
- HP Visualize Conference updated to version 1.4E to incorporate minor defect fixes. (See “HP Visualize Conference” on page 145.)
- HyperFabric2 PCI fiber adapter (A6386A) supported on new HP systems. HSC HyperFabric adapter cards A4920A and A4921A discontinued. (See “HyperFabric2 PCI Fiber Adapter” on page 162.)
- The igelan driver updated to incorporate defect fixes. (See “Gigabit Ethernet Drivers” on page 157.)
- Ignite-UX updated to version B.3.8 to support VxVM “rootability” and changes to make `_*_recovery`. (See “Ignite-UX (IUX)” on page 148 and “Base VERITAS Volume Manager (VxVM)” on page 105.)
- Judy technology now an Open Source product. (See “Judy Libraries” on page 117.)
- Netscape Directory Server updated to version v6.02 with new features and defect fixes. (See “Netscape Directory Server (J4258CA)” on page 150.)

- PAM Kerberos has been updated with the `pamkrb5val` tool and a sample `pam.conf` file. (See “Pluggable Authentication Module (PAM) Kerberos” on page 120.)
- ServiceGuard Manager administration feature updated to version A.02.01 with minor enhancements to functionality. (See “MC/ServiceGuard” on page 133.)
- TechSysConf updated with parameter and other changes. (See “Technical System Configuration (TechSysConf)” on page 138.)

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- The iCOD product updated to version B.05.00 with temporary capacity. (See “On Demand Solutions” on page 200.)

Chapter 15: Programming (see page 281)

- HP-UX Software Transition Kit (STK) updated to version 1.8 with added support for transitions from PA-RISC to Itanium. (See “HP-UX Software Transition Kit (STK)” on page 282.)

What's New in the June 2002 11i Release?

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- HP nPartitions servers now support faster PA-8700 processors on HP Superdome, rp8400, and rp7410. (See “Introduction” on page 56.)

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Patch Bundle (HWEEnable11i) now supports faster processors and additional I/O adapters and devices. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- CIFS/9000 Client updated to version A.01.07 and CIFS/9000 Server updated to version A.01.08 to incorporate several enhancements. (See “HP CIFS Client and HP CIFS Server” on page 107.)
- EMS HA-ATM now supported for HP-UX workstations. (See “Selectable Networking and Mass Storage Drivers” on page 152.)
- Enterprise Cluster Master Toolkit updated to version B.01.08 to include support for Informix version 9.21 and Oracle 9i. (See “Enterprise Cluster Master (ECM) Toolkit” on page 128.)
- GlancePlus Pak updated to version C.03.58. IT/Operations Special Edition removed. (See “GlancePlus Pak” on page 124.)
- HP IDS/9000 updated to version 2.1 to incorporate defect fixes. (See “HP-UX Host Intrusion Detection System (HIDS)” on page 147.)
- HP MPI updated to version 1.8 with new functionality and extended support. (See “HP Message-Passing Interface (MPI)” on page 144.)
- HP-UX Workload Manager updated to version A.02.00 to incorporate several enhancements, including a configuration wizard, greater flexibility in controlling memory, and integration with virtual partitions. (See “HP-UX Workload Manager” on page 128.)
- HP-UX Workload Manager Oracle Database Toolkit now a part of HP-UX Workload Manager Toolkits. (See “HP-UX Workload Manager Toolkits” on page 130.)
- HP-UX Workload Manager Toolkits introduced for easier management of mission-critical software products. (See “HP-UX Workload Manager Toolkits” on page 130.)
- Ignite-UX updated to support file system parameter changes. (See “Ignite-UX (IUX)” on page 148 and “Ignite-UX” on page 175.)
- IPFilter updated to version A.03.05.04 to support PCI FDDI and PCI Token Ring interfaces. (See “HP-UX IPFilter” on page 148.)
- The Judy Libraries product has been updated to incorporate improved manpages and other, minor improvements. (See “Judy Libraries” on page 117.)
- MC/ServiceGuard updated to incorporate support for HP-UX VLAN and other enhancements. (See “MC/ServiceGuard” on page 133.)

- Netscape Communicator updated to version 4.79 (B.11.11.09).
- Netscape Directory Server has been updated to version B.04.16. (See “Netscape Directory Server (J4258CA)” on page 150.)
- Process Resource Manager updated to version C.02.00.02 to support a logging option and improvements to the `prm2d` memory manager. (See “HP Process Resource Manager (PRM)” on page 126.)
- Servicecontrol manager updated to version A.2.5.01. (See “Servicecontrol Manager (SCM)” on page 122.)
- Technical System Configuration (TechSysConf) bundle, now an always-installed part of the MTOE and TCOE, delivers improved out-of-box performance. (See “Technical System Configuration (TechSysConf)” on page 138.)
- `TermIO` drivers updated. (See “Selectable Networking and Mass Storage Drivers” on page 152.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- The `igelan` driver (`GigEther-01`) enhanced to support 1000Base-T/SCSI (A6794A) on HP server `rp7410`, PCI 1000Base-T (A6825A), and 1000Base-SX (A6847A). (See “Gigabit Ethernet Drivers” on page 157.)

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- Interrupt Migration available on Software Pack. (See “Interrupt Migration Available on Software Pack” on page 185.)

What's New in the March 2002 11i Release?

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- HP now supports hard partitions on the HP rp7410 server (model 9000/800/rp7410).

Chapter 5: Workstation/Server Specific Information (see page 69)

- Hardware Enablement Patch Bundle updated to support new servers, I/O adapters, and peripherals. (See “Hardware Enablement” on page 75.)
- SCSI Driver c8xx updated to support two new SCSI PCI Ultra160 Host Bus Adapters. (See “SCSI Driver c8xx” on page 83.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- HP Apache-based Web server updated to version 1.3.19.23 with enhancement of chroot feature.
- Version 1.3 of HP-UX Runtime Environment for the Java 2 (RTE) Platform added. (See “HP-UX Runtime Environment for the Java 2 Platform” on page 110.)
- GlancePlus Pak, updated to version C.03.55, no longer supports HP-UX 10.20. (See “GlancePlus Pak” on page 124.)
- MC/ServiceGuard updated to version A.11.14. (See “MC/ServiceGuard” on page 133.)
- FirstSpace VRML obsoleted.
- HP MPI updated to version 1.7.2. (See “HP Message-Passing Interface (MPI)” on page 144.)
- Ignite-UX updated to version B.3.6. (See “Ignite-UX (IUX)” on page 148.)
- IPFilter/9000 updated to version A.03.05.03. (See “HP-UX IPFilter” on page 148.)
- Java Out-of-Box (JAVAFOB) has been added to allow large server-side Java applications to run more efficiently. (See “Java Out-of-Box (JAVAFOB)” on page 149.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- Networking and I/O card drivers updated. (See “Always-Installed Networking Drivers” on page 156, “Selectable Networking Drivers” on page 161, and “Always-Installed Mass Storage Drivers” on page 164.)
- Gigabit Ethernet now supports 1000Base-T/SCSI (A6794A) on HP server rp7410. (See “Gigabit Ethernet Drivers” on page 157.)
- RAID 4Si controller’s new firmware version (U.01.06) available as a patch. (See “HP RAID 4Si Driver” on page 167.)

Chapter 8: Installation (see page 173)

- New Update-UX product now enables customers to install the update-ux script and its accompanying update-ux manpage on a 10.20 or 11.00 system. (See “Update-UX Product” on page 176.)

Chapter 15: Programming (see page 281)

- Support for CXperf discontinued.
(See “Changes to the linker/dld Interface” on page 294.)

What's New in the December 2001 11i Release?

Chapter 5: Workstation/Server Specific Information (see page 69)

- Additional hardware enablement. (See “Hardware Enablement” on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- The base VERITAS Volume Manager (VxVM) added as an always-installed application for all OEs. (See “Base VERITAS Volume Manager (VxVM)” on page 105.)
- The HP Apache-based Web server updated with version 1.3.19.21.
- Support Tools updated with version A.29.00 (swlist ID B.11.11.05.10) to incorporate fixes and support for new devices. (See “HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors” on page 110.)
- The Judy Libraries now feature the ability to search for empty locations in the array (search empty). (See “Judy Libraries” on page 117.)
- Servicecontrol Manager updated with version A.02.05. (See “Servicecontrol Manager (SCM)” on page 122.)
- Enterprise Cluster Manager Toolkit updated with version B.01.07. (See “Enterprise Cluster Master (ECM) Toolkit” on page 128.)
- MC/ServiceGuard updated with version A.02.00. (See “MC/ServiceGuard” on page 133.)
- MC/ServiceGuard NFS Toolkit updated. (See “MC/ServiceGuard NFS Toolkit” on page 135.)
- HP Intrusion Detection System/9000 added as a selectable application for the three commercial server OEs. (See “HP-UX Host Intrusion Detection System (HIDS)” on page 147.)
- IPFilter/9000 added as a selectable application for the three commercial server OEs. (See “HP-UX IPFilter” on page 148.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- The always-installed Fibre Channel drivers updated. (See “Fibre Channel Tachlite Driver” on page 165.)
- New always-installed Gigabit Ethernet (GigEther-01) driver to support the 1000Base-T/SCSI card (A6794A) for HP-UX 11i, 64-bit only. (See “Gigabit Ethernet Drivers” on page 157.)

What's New in the September 2001 11i Release?

Chapter 5: Workstation/Server Specific Information (see page 69)

- Additional hardware enablement.
(See "Hardware Enablement" on page 75.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- The base VERITAS Volume Manager (VxVM) added as a selectable application for the three commercial server OEs.
(See "Base VERITAS Volume Manager (VxVM)" on page 105.)
- CIFS/9000 Server updated with version A.01.07 and CIFS/9000 Client updated with version A.01.06.
(See "HP CIFS Client and HP CIFS Server" on page 107.)
- HP Apache-based Web Server updated.
- The Judy Libraries product moved from the selectable applications and now installed with all Operating Environments. (See "Judy Libraries" on page 117.)
- Perl programming language installed with all Operating Environments.
(See "Perl Programming Language" on page 119.)
- Java™ Runtime Environment and Java™ Plug-In updated.
(See "Plug-In for the Java 2 Platform for Netscape/Mozilla" on page 122.)
- GlancePlus Pack updated with version C.03.35.00.
(See "GlancePlus Pak" on page 124.)
- MC/ServiceGuard updated with version A.11.13.
(See "MC/ServiceGuard" on page 133.)
- MC/ServiceGuard NFS Toolkit updated.
(See "MC/ServiceGuard NFS Toolkit" on page 135.)
- OpenGL 3.0 Graphics Developers kit updated.
(See "OpenGL 3D Graphics Developers Kit and Runtime Environment" on page 137.)
- HP Visualize Conference updated with version 1.4.
(See "HP Visualize Conference" on page 145.)
- Support Tools updated with version A.28.00 (swlist ID B.11.11.04.09) to incorporate fixes and support for new devices.
- HP-UX Workload Manager updated with version A.01.02.
(See "HP-UX Workload Manager" on page 128.)
- HP-UX Workload Manager Oracle Database Toolkit added to the Mission Critical Operating Environment.
(See "HP-UX Workload Manager Oracle , Database Toolkit" on page 132.)
- HP PRM updated with version C.02.00.
(See "HP Process Resource Manager (PRM)" on page 126.)
- HP MLIB updated with version B.08.01.
(See "High Performance Math Libraries (HP MLIB)" on page 143.)

- HP MPI updated with version 1.7.
(See “HP Message-Passing Interface (MPI)” on page 144.)
- Ignite-UX updated with version 3.4 to incorporate defect fixes. (See “Ignite-UX (IUX)” on page 148.)
- PCI RAID driver updated to support A400 and A500 servers.
(See “Selectable Networking and Mass Storage Drivers” on page 152.)
- ATM and TermIO drivers updated. (See “Selectable Networking and Mass Storage Drivers” on page 152.)

What's New in the June 2001 11i Release?

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- Partition Manager updated to support new hardware. (See “Partition Manager (parmgr)” on page 62.)
- Additional hardware enablement.

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- HP Apache-based Web Server updated to fix defects and enhance performance.
- Java™ Runtime Environment and Java™ Plug-In updated to fix defects and enhance performance. (See “HP-UX Runtime Environment for the Java 2 Platform” on page 110.)
- Judy Libraries added. (See “Judy Libraries” on page 117.)
- New Minimal Technical Operating Environment now available. (See “HP-UX 11i Minimal Technical Operating Environment (MTOE)” on page 137.)
- iCOD software removed from the Operating Environments.
- SD/Update-UX updated to enable updating the Operating Environments and upgrading from the Enterprise OE to the Mission Critical OE.

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- PCI TachyonTL driver updated to support the A6684A and A6685A. (See “Fibre Channel Tachlite Driver” on page 165.)
- HyperFabric driver updated to support the A6092A and A6386A network cards. (See “HyperFabric2 PCI Fiber Adapter” on page 162.)
- PCI RAID driver updated to fix defects. (See “HP RAID 4Si Driver” on page 167.)

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- Diagnostics updated to support new hardware. (See “Diagnostics: EMS Hardware Monitors” on page 198.)

What's New in the Original 11i Release?

The following list includes changes introduced after the initial release of HP-UX 11.0 as part of Extension Packs and/or ACE releases (which were subsequently incorporated into HP-UX 11i), as well as changes introduced at the initial release of HP-UX 11i.

For an introduction to HP-UX 11i and an overview of its features, see Chapter 3, “HP-UX 11i Version 1 Release Overview,” on page 49.

Chapter 4: nPartition (Hard Partition) Systems (see page 55)

- Hard partitions supported on HP Superdome 16-way, 32-way, and 64-way. (See Chapter 4, “nPartition (Hard Partition) Systems,” on page 55.)
- Partition manager, a new system administration tool, supports the initial and ongoing configuration of systems that support hard partitions. (See “Partition Manager (parmgr)” on page 62.)

Chapter 5: Workstation/Server Specific Information (see page 69)

- Lockable pages that experience repeated single-bit memory errors can now be removed. (See “Single-Bit Memory Error Handling Enhancement” on page 81.)
- The Guardian Service Processor (GSP), a new console subsystem, now available. (See “Service Processor (GSP or MP)” on page 84.)
- Graphics and Technical Computing Software supported on all PA-RISC workstations and servers. (See “Workstation Graphics Support” on page 92.)
- Kernel parameters for CAE and EE Engineering workstation kernels optimized during installation or update. (See “Workstation Tuned Kernel Parameters” on page 93.)

Chapter 6: HP-UX 11i Version 1.0 Operating Environment Applications (see page 97)

- The HP-UX operating system is now delivered as part of an HP-UX Operating Environment (OE), an integrated software solution comprised of the operating system and selected applications. (See “The HP-UX 11i Version 1 Operating Environments” on page 99.)
- The Foundation HP-UX 11i OE, the standard Internet server environment for HP-UX systems, includes Java, the HP Apache-based Web Server, Netscape Communicator, and other applications. (See “HP-UX 11i Foundation Operating Environment” on page 104.)
- In addition to the Foundation HP-UX 11i OE, the HP-UX 11i Enterprise OE contains applications to enable an enterprise-level server. Applications include OnLineJFS 3.3, GlancePlus, MirrorDisk/UX, and others. (See “HP-UX 11i Enterprise Operating Environment (EOE)” on page 124.)
- The HP-UX 11i Mission Critical OE contains both the HP-UX 11i Foundation OE and the HP-UX 11i Enterprise OE, as well as applications (such as MC/ServiceGuard and HP-UX Workload Manager) to enable a mission-critical server. (See “HP-UX 11i Mission Critical Operating Environment (MCOE)” on page 128.)

- The HP-UX 11i Technical Computing OE contains applications to enable a technical workstation or technical server. (See “HP-UX 11i Technical Computing Operating Environment (TCOE)” on page 143.)

Chapter 7: Networking and Mass Storage Drivers (see page 155)

- Online Addition and Replacement (OLAR) enables the adding and replacing of PCI I/O cards (adapters) while a system is running. (See “Online Addition and Replacement of Networking and Mass Storage Cards” on page 171.)
- By eliminating driver installation and combining multiple drivers into one, the set-up or upgrade of networking and I/O products has been made easier. (See “Always-Installed Mass Storage Drivers” on page 164.)
- Gigabit Ethernet (PCI, HSC) provides the means for interfacing to a 1000Base-SX multimode fiber network. (See “Gigabit Ethernet Drivers” on page 157.)
- Although EISA interface cards are supported on the HP-UX 11i 32-bit operating system, they are not supported on HP-UX 11i 64-bit operation.
- HSC FDDI driver enhanced. (See “HSC FDDI Driver” on page 163.)

Chapter 8: Installation (see page 173)

- Cold install changed to support new media and the new Operating Environments. (See “Cold Install Changed” on page 174.)
- Ignite-UX version B requires at least 64MB of RAM and no longer supports 10.01 and 10.10 machines for 11i. (See “Ignite-UX” on page 175.)
- Update-UX command replaces `swgettools` to perform OS updates and add Operating Environments. (See “Update-UX” on page 176.)
- Software Distributor changed in multiple ways, including enablement of multiple target management capability and POSIX enhancements. (See “Software Distributor (SD-UX)” on page 177.)
- SD Patch Installation changed to provide more control over patch management. (See “SD-UX Changes to Patch Installation” on page 180.)

Chapter 9: General System Administration and Performance Monitoring (see page 183)

- System Administration Manager (SAM) enhanced to support new devices and features. (See “Changes to System Administration Manager (SAM)” on page 190.)
- HP Distributed Print Service deprecated. (See “HP Distributed Print Service Deprecated” on page 197.)
- Event Monitoring System (EMS) Hardware Monitors enabled to monitor the operation of a wide variety of hardware products. (See “Diagnostics: EMS Hardware Monitors” on page 198.)
- The command `ioscan` improved to provide clearer descriptions for most common PCI devices. (See “Improved `ioscan` Description Field for PCI Devices” on page 199.)

Chapter 10: Process, Threads, Memory, and Kernel Parameters (see page 201)

- Gang scheduling for MPI applications and multi-threaded processes enabled. (See “HP-UX Gang Scheduling” on page 202.)

- CMA threads deprecated and kernel threads implemented. (See “Kernel Threads vs. CMA Threads” on page 203.)
- Amount of private data space available increased. (See “Large Private Data Space” on page 204.)
- The creation of unique memory windows for shared objects now allowed for 32-bit processes. (See “Memory Windows” on page 206.)
- Dynamic tunables enabled. (See “Dynamic Tunables” on page 209.)
- System-V IPC message queue enhanced. (See “System-V IPC Message Queue Enhancement” on page 211.)
- System-V IPC kernel tunable configuration parameter SEMMSL now a dynamic kernel tunable. (See “System-V IPC SEMMSL Dynamic Kernel Tunable” on page 212.)
- SCSI Queue depth management enhanced. (See “SCSI Queue Depth Management” on page 214.)

Chapter 11: New and Changed Disk and File Management Features (see page 217)

- Striping and mirroring for shared volume groups enabled. (See “Additional Support for Striping and Mirroring” on page 218.)
- Journaled File System (JFS) upgraded to version 3.3 (See “New Version of Journaled File System (JFS)” on page 219.)
- Network File System (NFS) now supported over TCP/IP in addition to running over User Datagram Protocol (UDP). (See “Network File System Support on TCP/IP” on page 221.)
- Also added to NSF are loopback transport support, user-space threads, and enhancements to NFS server-side performance. (See “Other NFS Changes” on page 223.)
- New daemon, AutoFS, mounts and unmounts NFS file systems automatically with more reliability than automount. (See “Mounting and Unmounting NFS File Systems Automatically Using AutoFS” on page 224.)
- HP Fibrechannel High Availability Disk and Closure added. (See “HP Fibrechannel High Availability Disk and Closure” on page 227.)

Chapter 12: Internet and Networking Services (see page 229)

- New version of sendmail, sendmail-8.9.3, included. (See “Sendmail-8.9.3” on page 234.)
- New version of BIND, BIND 8.1.2, included. (See “BIND 8.1.2” on page 235.)
- The rexecd and remshd services now use Pluggable Authentication Module (PAM) for authentication. (See ““PAM-ized” rexecd and remshd” on page 236.)
- Dynamic Host Protocol (DHCP) enabled to perform updates to DDNS. (See “DHCP with Nonsecure DNS Updates” on page 237.)
- Network Transport (including ifconfig, ndd, nestat, virtual IP (VIP) address, setsockopt, T_OPTMGMT) enhanced. (See “Network Transport” on page 239.)
- New version of FTPD enhanced with new features. (See “New Versions of FTPD” on page 243.)

- STREAMS/UX enhanced. (See “STREAMS/UX” on page 246.)
- Low Bandwidth X Extension (LBX) improves performance on wide-area networks and on slower speed connections. (See “Low Bandwidth X Extension (LBX)” on page 247.)

Chapter 13: Security (see page 251)

- Generic Security Services Application Programming Interface (GSS API) introduced to provide security independent of underlying security mechanisms and communication protocols. (See “Generic Security Services for Developing Secure Applications” on page 253.)
- Program stacks can now be execute-protected to guard against buffer overflow attacks. (See “Execute Protected Stacks” on page 255.)
- New, convenient way to customize security features enabled. (See “Configurable Security Features” on page 258.)
- Password history enabled to discourage users from re-using previous passwords. (See “Password History Feature on Trusted Systems” on page 259.)
- Kerberos Client Software now provided to enable integrating HP-UX into a secure enterprise environment. (See “Kerberos Client Software” on page 260.)

Chapter 15: Programming (see page 281)

- HP-UX Software Transition Kit (STK) aids in transitioning software to 32-bit or 64-bit versions of HP-UX 11i. (See “HP-UX Software Transition Kit (STK)” on page 282.)
- New ANSI-compliant Standard C++ library included. (See “aC++ Runtime (libCsup*, libstd*, libstream*, librwtool*)” on page 283.)
- System library `libc` enhanced, including performance improvements to `ftw()`, `nftw()`, and `malloc()`. (See “Changes to `libc`” on page 284 and “Overall `libc` Performance Tuning” on page 285.)
- The `libres.a` library, a small archive library, added to provide customers running performance-critical applications with the benefit of a static link. (See “The `libres.a` Library” on page 290.)
- Linker and Object File Tools enhanced. (See “Linker and Object File Tools (`ld`, `crt0.o`, `dld.sl`, `libdld.sl`, `chatr`, and `odump`)” on page 292.)
- The `linker/dld` interface enhanced. (See “Changes to the linker/dld Interface” on page 294.)
- HP Distributed Computing Environment (HP DCE/9000) version 1.8 provides framework to develop, administer, and use distributed applications. (See “HP DCE/9000” on page 295.)
- Extensions to `pstat()` system call enables system management and measurement tools to eliminate dependency on the `/dev/kmem` pseudo-driver. (See “Extensions to `pstat()`” on page 296.)
- New parameters for `confstr()` defined. (See “Machine Identifier Changes to `confstr`” on page 299.)

Chapter 16: Internationalization (see page 301)

- Improved interoperability enabled through system level support provided for the Unicode 2.1/ISO-10646 character set. (See “Unicode Character Set” on page 304.)
- Improved interoperability enabled through corrected character converter mappings. (See “Corrected Character Mappings to iconv(1) and iconv(3C)” on page 307.)
- Enhancements provided to allow Euro display, input, and processing capabilities. (See “EURO (ISO 8859-15 Locales)” on page 312 and “Euro - ISO 10646/Unicode Support” on page 315.)
- Asian enhancements provided, including new Asian codesets, UDC (User Defined Characters, or Gaiji), printing, and codeset conversions with mainframe codesets. (See “Asian System Environment (ASE)” on page 319.)
- Enhancements provided to the printer capabilities of Japanese System Environment; Korean System Environment; Simplified-Chinese System Environment; Traditional-Chinese System Environment. (See “Enhanced Print Capabilities in the Asian System Environment” on page 328.)
- New set of multibyte APIs added to `libc` to follow C99 (ISO/IEC 9899:1999) and Unix98 specifications. (See “Multibyte Support Extension and Unix98 Support” on page 331.)

What's New at a Glance

What's New in the Original 11i Release?

What's in This Chapter?

This chapter introduces you to the HP-UX 11i version 1 release.

- What is HP-UX 11i Version 1? (see page 50)
- Performance Considerations (see page 50)
- The HP-UX 11i Operating Environments (OEs) (see page 52)
 - Operating Environments for HP Commercial Servers (see page 53)
 - Operating Environments for HP Technical Workstations and Technical Servers (see page 53)
- Software Pack -- Optional HP-UX 11i Core Enhancements (see page 54)

What is HP-UX 11i Version 1?

With HP-UX 11i, HP delivers a highly available, secure, and manageable operating system that meets the demands of end-to-end Internet-critical computing. HP-UX 11i supports enterprise, mission-critical, and technical computing environments. HP-UX 11i is available on both PA-RISC systems and Itanium®-based systems.

HP-UX 11i version 1 provides new hardware enablement, additional software functionality, and various HP-UX applications bundled into Operating Environments. HP-UX 11i version 1 is the recommended next-level enterprise release for all HP-UX systems currently running HP-UX 10.x or 11.0.

See the *HP-UX 11i Installation and Update Guide* for information on disk and memory requirements.

HP-UX 11i Release Names and Release Identifiers

Each HP-UX 11i release has an associated release name and release identifier. The `uname (1)` command with the `-r` option returns the release identifier. The following table shows the releases available for HP-UX 11i.

Table 3-1 HP-UX 11i Releases

Release Identifier	Release Name	Supported Processor Architecture
B.11.11	HP-UX 11i v1	PA-RISC
B.11.20	HP-UX 11i v1.5	Intel® Itanium®
B.11.22	HP-UX 11i v1.6	Intel® Itanium®
B.11.23	HP-UX 11i v2	Intel® Itanium®

Performance Considerations

The performance of HP servers and applications with the HP-UX 11i Operating Environments is as good or better as compared to HP-UX 11.0 installed in the same configuration. It must be kept in mind, however, that in the vast majority of cases, HP-UX is likely to be installed as part of one of the predefined HP-UX 11i Operating Environments.

The HP-UX 11i Operating Environments provide numerous benefits, including lower cost as well as simplification of product ordering, installation, integration, and support. While the HP-UX 11i Operating Environments provide these desirable benefits, they all involve more software components and daemons than a base HP-UX 11.0 or HP-UX 11i operating system. Because of this, an Operating Environment may have somewhat greater system overhead compared to a base operating system installation. This increase in system overhead, while modest, can nevertheless make it erroneously appear that

system and application performance are degraded with HP-UX 11i as compared to HP-UX 11.0. In fact, performance with HP-UX 11i is generally better than HP-UX 11.0 when the software configurations are the same.

While not recommended, one of the options for installing HP-UX 11i is as a base operating system only, without an Operating Environment. Installing HP-UX 11i as a base operating system will give the greatest performance and the lowest system overhead but eliminates the advantages provided by the HP-UX 11i Operating Environments.

The HP-UX 11i Operating Environments (OEs)

new at 11i original release Beginning with HP-UX 11i version 1, the operating system is delivered as part of an HP-UX Operating Environment (OE), an integrated and tested software solution containing the operating system and selected applications.

The following software bundles are always delivered with an Operating Environment. Thus, if you do a minimum install, these bundles, plus the HP-UX applications within each OE, will be loaded:

- HPUXBase32 or HPUXBase64, which consist of operating system commands and libraries bundled for either 32- or 64-bit systems.
- HPUXBaseAux, which includes system manageability software such as Software Distributor (SD) and the Partition Manager (parmgr). This additional required core software is also referred to as the Auxiliary OS.
- The Hardware Enablement Patch Bundle (HWEnable11i), which enables the latest hardware on HP-UX 11i. Only a few patches are added at each quarterly release to minimize the number of patches needed to support new systems and I/O devices.
- The Feature Enablement Bundle (FEATURE11-11), which contains additional software and patches to enable installed HP-UX 11i software and functionality.
- BUNDLE11i, which contains required OS patches and is installed by default.
- Network and mass storage drivers that are required by the operating system, plus other, selectable drivers. The always-installed drivers include the following:
 - FDDI-00: drivers for PCI FDDI (A3739A, A3739B)
 - FibrChan1-00: drivers for PCI Fibre Channel (A5158A, A6684A) and HSC Fibre Channel (A6685A, A6795A)
 - FibrChan1-01: drivers for dual port Fibre Channel adapter A6826A and the Fibre Channel portion of the PCI-X 2 Gb Fibre Channel/1000Base-SX Combination cards A9782A (fibre) and A9784A (copper).
 - GigEther-00: 1000Base-T/SX (Gigabit Ethernet) drivers for cards A4924A, A4925A, A4926A, and A4929A
 - GigEther-01: driver for add-in cards A6825A and A6847A (64-bit only). GigEther-01 is also for the Gigabit port on the PCI-X 2 Gb Fibre Channel/1000Base-SX Combination cards A9782A (fibre) and A9784A (copper).
 - IETHer-00: driver for the PCI-X 2-Port 1000Base-SX (fiber-based) card (A7011A) and the PCI-X 2-Port 1000Base-T (copper-based) card (A7012A)
 - RAID-00: driver for the PCI RAID 4Si controller (64-bit OS; A5856A)
 - scsiU320-00: driver for the PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter (A7173A)

(For further information, see Chapter 7, “Networking and Mass Storage Drivers,” on page 155.)

- OnlineDiag, installed by default, which provides the HP-UX 11i Diagnostics (Support Tools) that include STM, ODE, and EMS hardware monitors.
- CDE-English: CDE language (such as for English or alternate languages).

Operating Environments for HP Commercial Servers

The following lists each 11i Operating Environment available for HP servers. These Operating Environments are supported on all HP servers, including technical servers. They are not supported on technical workstations.

- **HP-UX 11i Foundation OE**

The standard Internet server environment for HP-UX systems. It includes Java, the HP-UX Apache-based Web Server, Mozilla, and other applications.* This OE is included without additional charge.

- **HP-UX 11i Enterprise OE**

Contains the HP-UX 11i Foundation OE and additional applications to enable an enterprise-level server. Products include OnLineJFS 3.3, GlancePlus, MirrorDisk/UX, and other applications.*

- **HP-UX 11i Mission Critical OE**

Contains both the HP-UX 11i Foundation OE and the HP-UX 11i Enterprise OE plus applications to enable a mission-critical server, such as MC/ServiceGuard and HP-UX Workload Manager.*

NOTE

The 11i, Enterprise, and Mission Critical OEs are also supported on technical servers. (They are not supported on technical workstations, however.)

Operating Environments for HP Technical Workstations and Technical Servers

**updated for June
2001**

The following 11i Operating Environments are available for HP technical workstations and technical servers:

- **HP-UX 11i Minimal Technical OE (new for June 2001)**

Contains all the base functionality that is common to the other four OEs, including the base 32/64 bit HP-UX Operating System, network drivers, and other always-installed functionality. However, it includes only a sparse set of high-demand applications so as not to increase purchase costs, support costs, or license costs over the Foundation OE.*

- **HP-UX 11i Technical Computing OE**

contains applications to enable a technical workstation or technical server.*

*. All products included with each OE are described in Chapter 6. Some applications may require post-installation configuration; see the current *HP-UX 11i Installation and Update Guide* for details.

Software Pack -- Optional HP-UX 11i Core Enhancements

The “Software Pack -- Optional HP-UX 11i Core Enhancements” CD is included in the HP-UX 11i version 1.0 media kit. You can also download Software Pack from HP’s Software Depot (<http://software.hp.com>). Select **enhancement releases**, and then **hp-ux software pack**.

- new for June 2003** The June 2003 Software Pack includes Compressed Dump. (See “Compressed Dump Available on Software Pack” on page 184.)
- new for December 2002** The December 2002 Software Pack includes VERITAS VxFS 3.5 (HP OnlineJFS/JFS 3.5). For further information, see “VERITAS VxFS 3.5 Available on Software Pack” on page 218.
- new for June 2002** The June 2002 Software Pack includes Interrupt Migration. For further information, see “Interrupt Migration Available on Software Pack” on page 185.
- new for December 2001** The December 2001 Software Pack includes Processor Sets and IPv6. (See “Processor Sets Available on Software Pack” on page 186 and “IPv6 Available on Software Pack” on page 231.)

What's in This Chapter?

This chapter describes changes to HP's new high-performance HP-UX server environments.

- Introduction (see page 56)
- Superdome Systems at HP-UX 11i (see page 57)
- Machine Identifier (see page 58)
- Hard Partition Hardware Path Format (see page 59)
- New and Modified Hard Partition Commands (see page 60)
- Partition Manager (parmgr) (see page 62)
- Service Processor (GSP or MP) (see page 64)
- hd_fabric Driver (see page 65)
- New Attention Indicator Behavior (see page 66)

For information about such topics as supported systems, hardware enablement, and workstations, see Chapter 5, "Workstation/Server Specific Information," on page 69.

Introduction

Hewlett-Packard's new nPartition (hard partition) servers provide highly configurable, high-performance HP-UX system environments.

**updated for
December 2003**

In addition to the servers listed below, HP now supports hard partitions on the following servers:

- hp 9000 rp8420 server (model 9000/800/rp8420)
- hp 9000 rp7420 server (model 9000/800/rp8420)
- hp 9000 Superdome SD16A
- hp 9000 Superdome SD32A
- hp 9000 Superdome SD64A

**updated for
December 2002**

In addition to the servers listed below, HP now supports hard partitions on the HP rp7405 server (model 9000/800/rp7410). The HP rp7405 server is a pre-configured version of the HP rp7410 model.

**updated for June
2002**

For HP Superdome, rp8400, and rp7410: HP nPartitions servers now support faster PA-8700 processors, including both 750 MHz and 875 MHz CPUs.

**updated for March
2002**

In addition to the servers listed below, HP now supports hard partitions on the HP rp7410 server (model 9000/800/rp7410).

**new at 11i original
release**

Currently, HP supports hard partitions on the following servers:

- HP Superdome 16-way (model 9000/800/SD16000)
- HP Superdome 32-way (model 9000/800/SD32000)
- HP Superdome 64-way (model 9000/800/SD64000)
- HP rp8400 server (model 9000/800/S16K-A)

The ability to create hard partitions allows you to configure a single nPartition server as either one large system or as multiple smaller systems. Because hard partitions are managed through software, you can reconfigure a server without physically modifying the server's hardware configuration.

As a result, an nPartition server can run multiple instances of the 11i operating system on a single server. This capability is accomplished by defining multiple partitions within an nPartition server.

Each partition definition establishes a subset of a server's hardware resources that are to be used as a system environment for booting a single instance of HP-UX.

All processors, memory, and I/O in a partition are available exclusively to the software running in the partition. Thus, each partition runs a single instance of the Boot Console Handler (BCH) interface and HP-UX.

You can reconfigure partitions to include more, fewer, and/or different hardware resources, but this will require shutting down the operating system running in the partition and resetting the partition as part of reconfiguring it.

For details on performing nPartition administration tasks refer to the *HP System Partitions Guide*, available at <http://software.hp.com>.

Superdome Systems at HP-UX 11i

new at 11i original release Superdome models differ with regard to the characteristics shown in Table 2-1.

Table 4-1 Maximums for Superdome Models

	Superdome 16-way	Superdome 32-way	Superdome 64-way
Number of Cells	4	8	16
Number of Processors	16	32	64
Amount of Memory (using 512 MB DIMMs)	64GB	128GB	256GB
Number of I/O Slots (internal chassis)	48	48	96

Note: Each I/O expansion (IOX) cabinet can provide an additional six I/O chassis containing 12 slots each, providing a total of 72 slots for each I/O expansion cabinet.

Machine Identifier

**updated for June
2001**

The `uname -i` command on your nPartition systems may not return a unique value for each system. To guarantee compatibility on current and future platforms, use the new interfaces to `getconf` (1) and `confstr` (3C) to retrieve unique machine identifiers.

For example, use the following `getconf` commands instead of `uname -i` in order to obtain a unique identifier for an HP Superdome server complex (`getconf _CS_MACHINE_IDENT`) or a hard partition (`getconf _CS_PARTITION_IDENT`) within a complex:

```
# uname -i
1945761737
# getconf _CS_PARTITION_IDENT
Z3e02955673f9f7c9_P1
# getconf _CS_MACHINE_IDENT
Z3e02955673f9f7c9
#
```

As shown in the above example, the `getconf` commands return partition-unique and machine-unique (complex-unique) identifiers on HP PA-RISC nPartition servers.

The output returned by `uname` is *not necessarily a unique identifier* and should not be used for licensing or other purposes that require unique IDs.

These interfaces are documented in the manpages and in Chapter 15, “Programming,” in the section “Machine Identifier Changes to `confstr`” on page 299.

Hard Partition Hardware Path Format

**new at 11i original
release**

The HP-UX command `ioscan` reports the hardware paths for components within the partition in which the command is issued. (Note that the `ioscan` command reports information only for the *currently active* hardware components *in the local partition*. It does not report details for hardware not assigned to the local partition.)

On nPartition systems, HP-UX hardware paths conform to the following format:

a/b/c/d/e.f.g

The components of a hardware path are as follows:

- a* The global cell number
- b* A processor (10-13), memory (5), or system bus adapter (0). Each nPartition server I/O chassis has a single system bus adapter.
- c* A local bus adapter (the LBA, one for each PCI card slot in the chassis). The LBA connects its corresponding PCI card slot with the system bus adapter.

(Note that the LBA number *is not necessarily the same* as the PCI slot number. Use the `rad -q` command to list all PCI slots and their corresponding hardware paths.)
- d* The card's address on the slot's PCI bus.

Typically this is 0 (zero), although the Superdome core I/O card has multiple devices in a single card.
- e* The function for the I/O card. Typically this is 0 (zero) for single-function cards.
- f* The target of the I/O device, or SCSI ID.
- g* The device-specific address such as a SCSI controller (initiator).

Refer to the `ioscan` (1M) manpage for details on using `ioscan` to list hardware path information.

This hardware path format is used only on nPartition systems.

New and Modified Hard Partition Commands

new at 11i original release Several system administration commands are provided with HP-UX 11i for creating and maintaining partitions on all nPartition systems.

Additionally, the existing commands `shutdown`, `reboot`, and `setboot` have been modified to support nPartition platforms.

New Commands

Below are brief descriptions of the seven new commands used to manage an nPartition server complex:

Table 4-2 New nPartition Commands

Command	Description
<i>parcreate</i> (1M)	Creates a new partition.
<i>parmodify</i> (1M)	Modifies an existing partition.
<i>parstatus</i> (1)	Provides information about an entire Superdome complex, including partition information and available resources in the complex.
<i>parremove</i> (1M)	Removes an existing partition.
<i>parunlock</i> (1M)	Unlocks the Stable Complex Configuration Data or Partition Configuration Data.
<i>fruled</i> (1)	Turns locator LEDs on/off for cells, cabinets and I/O chassis.
<i>frupower</i> (1M)	Enables or disables power to a cell or I/O chassis, or displays the power status of cells or I/O chassis.

Modified Commands

The commands `shutdown` and `reboot` have been modified for systems that support hard partitions. Two new options, `-R` and `-H`, have been added to both these commands.

The `-R` option is used to shut down the system to a “ready to reconfig” state and reboot automatically. The `-R -H` option is used to shut down the system to a “ready to reconfig” state but without rebooting. A partition must be put into the “ready to reconfig” state before its newly assigned cells can be activated. (A normal reboot will not activate newly assigned cells.) The “ready to config” state is also necessary to complete the removal of active cells that have been unassigned from the partition. The commands’ default behaviors, or the behaviors of all the other existing options, remain unchanged.

The interpretation of `Autoboot` and `Autosearch` in the command `setboot` has changed for systems that support hard partitions. The firmware interprets the bits in combination and not individually as done before.

In order to approximate the traditional behavior of `setboot`, the user input for the Autoboot and Autosearch flags is internally mapped to the right combination to achieve the desired behavior. This mapping should be transparent to the user of `setboot`, but it might not be so apparent to those accessing the firmware using other means. For the primary path, the boot action corresponds to the Autoboot and Autosearch flags in the following manner:

Table 4-3 nPartition Boot Actions

AutoBoot (setboot -b)	AutoSearch (setboot -s)	nPartition Boot Action
off	off	Go to the Boot Console Handler (BCH) and prompt the user.
on	off	Attempt the primary path; on failure go to BCH.
on	on	Attempt to boot the PRI boot path; if fail to boot PRI, attempt to perform the HAA boot path's boot action.
off	on	Skip the PRI boot path; attempt to perform the HAA boot path's boot action.

Additionally, systems with hard partitions support a boot action for each path. However, boot actions for paths other than the primary path cannot be set using `setboot`. (In this case, the default boot action for boot paths on nPartitions is “skip this device and try next path,” [a path flag value of 2.]) Instead, setting both the Autosearch and Autoboot flags to “on” (`setboot -b on -s on`) means that if the PRI path fails to boot, then booting the HAA boot path will not be attempted unless the HAA path flag is set to a non-default value (such as 1 or 2, which attempt booting HAA).

In the default case (when the HAA boot path is not set to “boot from the path”), specifying `setboot -b on -s on` will not cause an alternate path to be automatically booted when the primary path fails. Instead the user will be prompted.

Documentation Changes

Eight new manpages document the syntax and usage of the new commands. The *reboot* (1M) and *shutdown* (1M) manpages have been updated to document the `-R` and `-H` options, and the *setboot* (1M) manpage has been updated as well.

Partition Manager (parmgr)

Partition Manager (parmgr), supports the initial and ongoing configuration of systems that support nPartitions, (such as Superdome systems), and also provides extensive information about the status of a Superdome complex. Partition Manager can be installed on any HP computer system that supports nPartitions, subject to the system requirements listed in “System Requirements” on page 62.

Partition Manager can be launched from SAM or directly from the command line. It can also be launched from a Web browser running on a PC. For complete details, refer to the “Starting and Exiting Parmgr” page of the Partition Manager online help, which is installed at `/opt/webadmin/parmgr/help/C/start-exit.html`.

The Partition Manager’s functionality includes the ability to do the following:

- create, modify, and delete partitions. (Modifying partitions includes adding cells to a partition, removing cells from a partition, changing the name of a partition, and changing the per cell “Use On Next Boot” attribute. For more detail, see *HP System Partitions Guide*, available at <http://docs.hp.com>.)
- display a complete hardware inventory of an entire complex
- display the status of key complex components
- check for problems or unusual conditions in the complex
- manage power to cells and I/O chassis
- turn on/off attention indicators associated with cells, I/O chassis, I/O cards, and cabinets

Selected configuration screens of the Partition Manager can also be launched via the command line by use of the `-t task` option. See the *parmgr* (1M) manpage for more details.

NOTE

Partition Manager includes online help that is displayable within a web browser. An appropriate version of Netscape/Mozilla is included in the Operating Environment (OE) bundle that is shipped with this release of HP-UX. Please install the OE bundle on any machine running Partition Manager for full access to the online help.

updated for December 2003

Partition Manager has been updated to version B.11.11.01.07 to incorporate a defect fix.

System Requirements

Partition Manager depends on the following additional products:

- OBAM B.11.00.05.2.06 Object Action Manager user interface
- SystemAdmin B.11.11 HP-UX System Administration Tools

NOTE

For documentation about Partition Manager in previous releases of HP-UX 11i v1, see *HP-UX 11i December 2002 Release Notes*, available at <http://docs.hp.com>.

Additional Information

For detailed information about using Partition Manager, consult the online help installed from the PARMGR-HELP file set. Within Partition Manager, the help can be accessed through the **Help** menu on the tool bar. You can also view the online help simply by pointing your web browser to:

`file:/opt/webadmin/parmgr/help/C/overview.html`

Service Processor (GSP or MP)

Each of HP's nPartition servers include a service processor that provides server-wide status, maintenance, and console interfaces.

NOTE

The service processor in HP servers is sometimes called the Management Processor (MP) and sometimes the Guardian Service Processor (GSP).

Regardless of the name, the service processor in these servers provides approximately the same features and performs essentially the same role.

Throughout this document the term “service processor” refers to both the MP and GSP service processors.

See “Service Processor (GSP or MP)” on page 84 in Chapter 5.

hd_fabric Driver

**new at 11i original
release**

Although the HP-UX 11i install kernel does not include a `/stand/system` entry for the new 11i driver, `hd_fabric`, an entry is added to the system file as part of the installation process on nPartition systems. When the `/usr/sbin/mk_kernel` command builds a kernel, the `hd_fabric` driver is then built into the HP-UX kernel.

This only affects nPartition systems. HP-UX kernels built with `hd_fabric` present in the system file will not cause compatibility issues on non-nPartition systems.

Although it is not required for booting HP-UX on hard partitions, the `hd_fabric` driver supports partition configuration commands (`/usr/sbin/parstatus` and others) and related functionality in the Partition Manager.

New Attention Indicator Behavior

updated for
September 2001

The `fruled` command and Partition Manager now blink the attention indicators (LEDs) on HP Superdome cells and I/O chassis rather than illuminating them in a steady-on state, as was the case with the original 11i release.

Likewise, on HP rp7410 and rp8400 servers, the `fruled` command and Partition Manager behaviors are to blink cell attention indicators. (HP rp7410 and rp8400 servers do not provide user-controllable I/O chassis or cabinet-level attention indicators.)

In addition, the SAM (`/usr/sbin/sam`) and Partition Manager utilities now blink PCI slot attention LEDs for procedures that involve locating PCI slots. Both HP Superdome and HP rp8400 servers support this PCI slot attention indicator usage.

For example, the `fruled -o -c2` command now causes cell 2's attention indicator to blink. On HP Superdome servers, the `fruled -o -i0/1/3` command blinks the attention indicator for cabinet 0, I/O bay 1, chassis 3.

The `/usr/bin/rad` command still provides the same functionality for managing PCI card slot attention indicators. You should use the `rad -f attention #-#-#-#` command to blink the attention LED when locating the specified slot (`#-#-#-#`). See `rad (1M)` for options.

Benefits

These changes conform to the PCI Hot-Plug specifications for attention indicator states and meanings, as detailed in the following table:

Table 4-4 Attention Indicator (LED) States and Meanings

Attention LED State	Meaning
OFF	Normal; not selected, normal operation.
ON	Attention; operational problem. <i>Supported for PCI card slot LEDs only.</i> Service is required; problems have been identified with the component.
BLINKING	Locate; user requested to locate hardware. User has selected the hardware for use in a service operation.

Impact

These changes affect all current HP hard-partitionable servers and will be implemented for all future HP hard-partitionable servers, as well. (Note that only Superdome servers were supported by HP-UX releases with the old behavior.)

However, it wasn't until the HP-UX 11i June 2001 release that SAM and Partition Manager started to blink PCI slot attention indicators during tasks involving PCI cards or card slots. As a result, sites that have HP Superdome servers running both the original HP-UX 11i release and the HP-UX 11i June 2001 (or later) release can have attention indicators at different states (steady-on and blinking).

NOTE

These changes do not affect the behavior of the HP rp7410, rp8400 or HP Superdome cabinet "attention" lights, which are not user-controllable.

These changes also do not affect HP Superdome cabinet number LCD behavior.

Documentation

Details about how the new `fruled` and Partition Manager affect cell and I/O chassis attention indicators are provided in the *fruled* (1) manpage, the *HP System Partitions Guide*, and the Partition Manager online help.

The `rad` command, whose functionality has not changed, is documented in the *rad* (1M) manpage.

What's in This Chapter?

This chapter covers the following topics:

- Supported Systems (see page 70)
 - Table 5-1: “Servers” (see page 70)
 - Table 5-2: “D-Class Support for 11i 64-bit” (see page 72)
 - Table 5-3: “Workstations” (see page 73)
- Firmware Requirements (see page 74)
- Hardware Enablement (see page 75)
- HP-UX V-Class Changes (see page 81)
- SCSI Drivers scsi3 and c720 (see page 82)
- SCSI Driver c8xx (see page 83)
- Service Processor (GSP or MP) (see page 84)
- N4000 and rp7400 Server Functionality (see page 86)
- ttytype Support for the N4000 and rp7400 Console (see page 90)
- New stty Options (see page 91)
- Workstations (see page 92)
 - Workstation Graphics Support (see page 92)
 - Workstation Tuned Kernel Parameters (see page 93)
 - X Window System (X11 R6) Run-Time Libraries on Workstations (see page 95)

Information about network cards and drivers can be found in Chapter 7, “Networking and Mass Storage Drivers,” on page 155.

For more information about such topics as Superdome and nPartitions (Hard Partitions), see Chapter 4, “nPartition (Hard Partition) Systems,” on page 55.

Supported Systems

**updated for
December 2003**

HP-UX 11i continues to support both a 32-bit and 64-bit version of the HP-UX kernel. The following tables outline the supported HP-UX 11i configurations for HP servers and workstations.

NOTE

The information in the following tables is subject to change. For the most up-to-date data, refer to http://devresource.hp.com/STK/hpux_faq.html.

Table 5-1 Servers

Bezel or Model	32-bit Support	64-bit Support	Comments
A-Class: A180, A180C	Yes		PA-7300LC
A-Class: A400, A500		Yes	PA-8500 and newer processors
bp2200 blade (in an HP bh3710 chassis)		Yes	PA-8600 processor only HP-UX model string: 900/800/HPServerBlade8600/3xx2 ^a
D-Class: D270/370, D280/380, D390	Yes	Yes	PA-8xxx (See Table 5-2 for the D-Class systems that support 64-bit operation.)
D-Class: All other	Yes		PA-7xxx
K-Class: Kx50, Kx60, Kx70, Kx80	Yes	Yes	PA-8xxx
K-Class: Kx00, Kx10, Kx20	Yes		PA-7xxx
L-Class: L1000, L2000, L3000		Yes	PA-8500 and newer processors
L-Class: L1500, L3000		Yes	PA-8700 and newer processors
N-Class: N4000		Yes	PA-8500 and newer processors
R-Class: R380, R390	Yes	Yes	PA-8000 and newer processors
rp2400		Yes	PA-8500 processor HP-UX model string: A400-44 ^a
rp2430		Yes	PA-8700 processor HP-UX model string: A400-6X ^a

Table 5-1 Servers (Continued)

Bezel or Model	32-bit Support	64-bit Support	Comments
rp2450		Yes	PA-8500 and newer processors HP-UX model string: A500-44 or A500-5X ^a
rp2470		Yes	PA-8700 processors HP-UX model string: A500-6X or A500-7X ^a
rp3440		Yes	PA-8800 and newer processors HP-UX model string: 9000/800/rp3440
rp4440		Yes	PA-8800 and newer processors HP-UX model string: 9000/800/rp4440
rp5400		Yes	PA-8500 and PA-8600 processors HP-UX model string: L1000-36, -44, -5X ^a
rp5405		Yes	PA-8700 processors HP-UX model string: L3000-6X ^a
rp5430		Yes	PA-8700 processors HP-UX model string: L1500-5X, -6X, -7X, or -8X ^a
rp5450		Yes	PA-8500 and PA-8600 processors HP-UX model string: L2000-36, -44, -5X ^a
rp5470		Yes	PA-8700 processors HP-UX model string: L3000-5X, -6X, -7X, or -8X ^a
rp7400		Yes	PA-8700 processors HP-UX model string: N4000-65 or N4000-75 ^a
rp7405 and rp7410		Yes	HP-UX model string: 9000/800/rp7410 ^a (both rp7405 and rp7410) (See Chapter 4, “nPartition (Hard Partition) Systems.”)
rp7420		Yes	PA-8800 and newer processors HP-UX model string: 9000/800/rp7420 (See Chapter 4, “nPartition (Hard Partition) Systems.”)
rp8400		Yes	PA-8700 and newer processors HP-UX model string: S16K-A ^a (See Chapter 4, “nPartition (Hard Partition) Systems.”)

Table 5-1 Servers (Continued)

Bezel or Model	32-bit Support	64-bit Support	Comments
rp8420		Yes	PA-8800 and newer processors HP-UX model string: 9000/800/rp8420 (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD16		Yes	HP-UX model string: 9000/800/S16000 (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD16A		Yes	HP-UX model string: 9000/800/SD16A (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD32		Yes	HP-UX model string: 9000/800/S32000 (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD32A		Yes	HP-UX model string: 9000/800/SD32A (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD64		Yes	HP-UX model string: 9000/800/S64000 (See Chapter 4, "nPartition (Hard Partition) Systems.")
Superdome SD64A		Yes	HP-UX model string: 9000/800/SD64A (See Chapter 4, "nPartition (Hard Partition) Systems.")
T-Class: T5xx	Yes		PA-7xxx
T-Class: T6xx	Yes	Yes	PA-8xxx
V-Class: V22xx, V2500, V2600		Yes	PA-8200 and newer processors

a. Use the model command to display the model string.

The following D-Class systems support HP-UX 11i 64-bit operation:

Table 5-2 D-Class Support for 11i 64-bit

Model	CPU	Speed (MHz)	32/64 bit	Minimum Firmware Revision
D270/370	PA8000	160	Both	38.27 or later
D280/380	PA8000	180	Both	38.27 or later

Table 5-2 D-Class Support for 11i 64-bit (Continued)

Model	CPU	Speed (MHz)	32/64 bit	Minimum Firmware Revision
D390	PA8200	240	Both	38.28 or later

Table 5-3 Workstations

Model(s)	32-bit Support	64-bit Support	Comments
Series 700: PA-7xxx	Yes		All 712, 715/64/80/100/100XC, 725/100, 743, 744, 745, 748i, 748
B-Class: PA-7300LC	Yes		B132L, B132L+, B160L, B180L
B-Class: PA-8500 and forward		Yes	Bx000
B-Class: PA-8600		Yes	B2600
C-Class: PA-7xxx	Yes		C100, C110, C160L
C-Class: PA-8xxx	Yes	Yes	C160, C180, C180-XP, C200, C240, C360
C-Class: PA-8500 and forward		Yes	C3x00
C-Class: PA-8700 and forward		Yes	C3650, C3700, C3750
J-Class: PA-7xxx	Yes		J200, J210, J210XC
J-Class: PA-8000/8200	Yes	Yes	J280, J282, J2240
J-Class: PA-8500 and forward		Yes	J5x00, J6000, J7000
J-Class: PA-8700 and forward		Yes	J6700, J6750

The following servers, workstations, and graphics adapters are no longer supported:

- Servers: E-, F-, G-, H-, and I-Class
- Workstations: 705, 710, 715/33, 715/50, 715/75, 720, 725/50, 725/75, 730, 735, 750, 755
- Graphics adapters: GRX, CRX, CRX-24, CRX-48Z

Firmware Requirements

The information that was formerly included in this section can be found in the *HP-UX 11i Installation and Update Guide*, located at <http://docs.hp.com/hpux/os/11i/index.html#Installing%20and%20Updating>.

IMPORTANT

HP strongly recommends that you update your system firmware with the latest patches available at the following Web site:

<http://itrc.hp.com>

Hardware Enablement

The Hardware Enablement (HWE) Program releases a quarterly update of the HWEEnable11i Patch Bundle, HP-UX Support Tools (Online Diagnostics), and other HP-UX software to support the hardware used with HP-UX systems. The HWEEnable11i bundle and Online Diagnostics provide support for new and future systems, I/O adapters, and mass-storage products. This HP-UX software is labeled as required, ignited on new systems in HP manufacturing, and automatically loaded as part of any 11i OE update. It is included on the 11i OE media and on the Support Plus CD.

**updated for
December 2003**

- Updated install kernels to support Rock Ridge extension for ISO-9660 format.
- Enabled support for new PA-8800 servers:
 - A5201A - PA-8800 32-way Superdome Enterprise Server (SD32A)
 - A5202A - PA-8800 64-way Superdome Enterprise Server (SD64A)
 - A6113A - PA-8800 16-way Superdome Enterprise Server (SD16A)
 - A6912A - 16-socket PA-8800 server with multiple partitions (rp8420)
 - A7025A - 8-socket PA-8800 server with dual partitions (rp7420)
 - A7124A - 4-socket 8-way PA-8800 server (rp4440)
 - A7137A - 2-socket 4-way PA-8800 server (rp3440)
- Qualified support for new slim optical devices for J6X00 workstations:
 - A8069A - DVD-ROM Drive
 - A8070A - DVD/CD-RW Combo Drive
- Enabled correct density and compression for the following tape drives:
 - STK 9840B, STK 9940B, and STK 9940A
 - SuperDLT 320 (257319), VS80 Autoloader (C9264CB-VS80)
 - VS80 tape drives (C7503A/C7504A/C7507A)
- Added support for the following new I/O cards:
 - A7011A PCI-X 1000Base-SX Dual Port Adapter
 - A7012A PCI-X 1000Base-T Dual Port Adapter
- Updated support for following new I/O card:
 - HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter
The `scsiU320-00` driver bundle is now available on the OE media.

**updated for
September 2003**

- Updated SAM to recognize the following new hardware devices:
 - CD-RW Drive (A7853B) for BXX00, C3XX0, J5X00 workstations
 - DVD-ROM Drive (A8068B) for BXX00, C3XX0, J5X00 workstations
 - HP StorageWorks Disk Array eva5000 (HSV110 controllers)
 - HP StorageWorks Disk Array eva3000 (HSV100 controllers)

- PCI-X Dual port 2 Gb/1Gb FC Adapter (Product #: A6826A)
- PCI-X 2-Ch Ultra320 SCSI Adapter (Product #: A7173A)
- HP A7143A PCI 4-Channel RAID160 SA SCSI Controller (Product #: A7143A)
- PCI-X 2Gb FC and 1000Base-T [Fibre] Combo Card - (Product #: A9782A)
- PCI-X 2Gb FC and 1000Base-T [Copper] Combo Card (Product #: A9784A)
- Updated `fbackup` and `frecover` commands for latest DLT and SDLT tape units.
- Added support for following new I/O card:¹
 - HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter
New `scsiU320-00` driver is available at <http://software.hp.com> (search for A7173A).
- Added support for the rp8400 Server Expansion Unit (A6434A).²
- Updated SAM to recognize the following new hardware devices:
 - HLDS GDR-8161B ATAPI DVD-ROM/CD-ROM Reader (Product #: A8068A)
 - LITE-ON LTR-48126S ATAPI CD-RW DRIVE (Product #: A7853A)
 - TEAC DW224E-B ATAPI DVD-ROM/CD-RW COMBO (slim) (Product #: A8070A)
 - 10/100BT PCI Single Port card (Product #: A6974A)
 - Fibre Channel Disk Array VA7110 (Product #: A6189B)
 - CD-RW Drive (Product #: A7853A)
 - HP Ultrium 460 External Drive (Product #: Q1509A)
 - HP Storaeworks SDLT 160/320 GB Tape Drive (Product #: 257319-B21)
- Added multi-initiator support for A6828A and A6829A SCSI Ultra160 adapters.
- Added support for following new I/O cards:³
 - A6826A PCI Dual-Port 2Gb/1Gb Fibre-Channel adapter
New `FibrChanl-01` driver is only available at <http://software.hp.com> (search for A6826A)
 - A7109A GigE LAN Core I/O card for rp8400 server
Requires updated `GigEther-01` driver from 11i OE for June 2003.
 - A7143A 4-Port Ultra-160 RAID adapter
New `RAID-01` driver is only available at <http://software.hp.com> (search for A7143A)
 - A9782A PCI Fibre-Channel and GigEthernet Combo adapter

**updated for June
2003**

1. Install `HWEnable11i` bundle for September 2003 before installing new I/O drivers.
2. The SEU is supported on rp8400 servers updated to Firmware Version 6.0 or later.
3. Install `HWEnable11i` bundle for June 2003 before installing new I/O drivers.

Requires updated GigEther-01 driver and new FibrChan1-01 driver.

updated for March 2003

- Improved IDE/ATAPI driver for workstation optical devices (CD-ROM, CD-RW, and DVD-ROM units).
- Improved support of A5159A (FWD SCSI) and A5838A (Combo SCSI/LAN) adapters.
- Provided MirrorDisk/UX fix for the hot-pluggable disks on rp8400 and rp7410 servers.
- Added support for multiple USB hubs.
- Added support for 8GB high-density SyncDRAM memory module (uses 4 SIMM slots) for rp7410 and rp8400 servers.
- Added support for Ultrium 460 and SDLT 160/320 tape drives (in HP StorageWorks Tape Libraries).
- Updated diagnostics to recognize EVA FC disk array.
- Updated diagnostics to support new 36/72/144 GB FC disk drives.
- Added diagnostics to support the iSCSI decoder/monitor.
- Updated required patches that support latest GSP firmware update on HP servers. Note these other dependencies for the rp7400, rp54xx, L-Class with A6696B GSP cards, and rp24xx products:
 - Install PHNE_26326 and PHCO_27243 (or superseding patches) before system is updated with the GSP Firmware Revision B.02.11 or C.02.05 or later.
 - HWEEnable11i bundle for March 2003 provides PHNE_27760 (Cumulative Mux and Pty Patch) and PHCO_28169 (*mkst* (1M) cumulative patch), which supersede PHNE_26326 and PHCO_27243.

updated for December 2002

- SMART support has been added for new and legacy HDD drives.
- The existing Firmware Update tool in Support Tools Manager (STM) was enhanced.
- Added `reset_recovery` feature for A7789A Graphics Card used in newer workstations.
- Verified HP-UX support for the following workstations with 875MHz PA8700+ processors (no HP-UX software changes were required for these models in December 2002):
 - A9636A Visualize C3750 workstation
 - A9638A Visualize J6750 workstation
- Verified HP-UX support for the following newly updated optical units (although updated, some of these products retain previous product numbers):

Table 5-4 Supported Updated Optical Units

Product Number	HP Part Number	Product Description	Platform Requirements
A7853A	D4398-60083	CD-RW Drive	BXX00, C3XX0, J5X00
A8068A	D4388-60018	DVD-ROM Drive	BXX00, C3XX0, J5X00
A8070A	A7851-64001	DVD-ROM/CD-RW Combo	J6X00

- New FC Disk Arrays VA7110 and VA7410 are now identified by the STM ID tool.
- Added support for the following new hardware:
 - A6974A: 10/100 BT PCI Single Port LAN Card
 - A8068A: HLDS GDR-8161B ATAPI CD-RW Drive
 - A7853A: LITE-ON LTR-48126S ATAPI CD-RW Drive
 - A8070A: TEAC DW224E-B ATAPI DVD-ROM/CD-RW Combo (slim)
- Added patches to support new `IEther-00` networking driver for A6974A¹. (As of the December 2002 release, the `IEther-00` driver is always installed with the OE media.)
- Added required 11.00 and 11.11 LVM patches for the following products²:
 - A6189A (formerly A7293A) FC Disk Array VA7110
 - A6218A VA7410 Array (released August 2002)

updated for
September 2002

- Added IDE/ATAPI support for workstations with the following optical units:

Table 5-5 Supported Optical Units

Product Number	HP Part Number	Product Description	Platform Requirements
A5001A	D4389-60091	CD-ROM Drive	BXX00, C3XX0, J5X00
A7853A	D4398-60083	CD-RW Drive	BXX00, C3XX0, J5X00
A8068A	D4388-60018	DVD-ROM Drive	BXX00, C3XX0, J5X00
A8069A	A7231-64005	Slim DVD-ROM Drive	J6X00

- Enabled 3D graphics support for A7789A graphics adapter.
- Added SCSI Ultra160 boot support for SuperDome, rp8400, and rp7410 servers.
- Added support for the faster processors of the following servers (pre-enabled with March 2002 release):
 - rp5430 (model string: 9000/800/L1500-8X)
 - rp5470 (model string: 9000/800/L3000-8X)
 - rp7410 (model string: 9000/800/rp7410)
 - rp8400 (model string: 9000/800/S16K-A)
- Added support for I/O adapters:

updated for June
2002

1. Although HP has decided not to release the A6974A adapter card, the `IEther-00` driver software will remain in 11i to support future cards.
2. The September HWE bundles lack the necessary LVM patches needed to avoid potential data corruption when using the Business Copy feature with the VA7110 and VA7410 arrays. The HWE bundles for December 2002 include these required LVM patches.

- A6825A PCI 1000Base-T, A6847A PCI 1000Base-SX, and A6794A 1000Base-T/SCSI
- A7789A Graphics Card for workstations C3650, C3700, J6000, and J6700
- Added support for I/O devices:
 - A6491A SC Disk System DS2300 (Ultra160 SCSI Disk Enclosure)
 - A6255A FC Disk System DS2405 (FibreChannel Disk Enclosure)
 - A8068A, A8069A, A8070A DVD-ROM Units for Workstations

**updated for March
2002**

- Added support for servers:
 - rp2430 (model string: 9000/800/A400-6X)
 - rp2470 (model string: 9000/800/A500-6X or 9000/800/A500-7X)
 - rp7410 (model string: 9000/800/rp7410)
- Added support for I/O adapters:
 - A7784A PCI-Universal Audio Card
 - A7789A PCI Graphics Card for PA-8700 Workstations
 - A6684A HSC Tachlite FC Mass-Storage I/O Adapter for D- and R-Class servers (HP-UX 11.x boot only supported on D390/R390 with PDC version 41.35)
 - A6794A 10/100/1000Base-T Product for HP rp7410 server
 - A6828A PCI Single Channel Ultra160 SCSI Adapter¹
 - A6829A PCI Dual Channel Ultra160 SCSI Adapter¹
- Added support for peripherals:
 - A6188A VA7100 Disk Array
 - A6189A VA7405 Disk Array
 - A6189B (2Gb-FC) VA7405 Array
 - A6218A (2Gb-FC) VA7410 Array

**updated for
December 2001**

- Added support for servers:
 - rp2400 (model string: 9000/800/A400-6X)
 - rp2450 (model string: 9000/800/A500-6X or 9000/800/A500-7X)
 - rp5400 (model string: 9000/800/L1000)
 - rp5430 (model string: 9000/800/L1500-7X or 9000/800/L1500-8X)
 - rp5450 (model string: 9000/800/L2000)
 - rp5470 (model string: 9000/800/L3000-7X or 9000/800/L3000-8X)
 - rp7400 (model string: 9000/800/N4000-7X or 9000/800/N4000-8X)
 - rp8400 (model string: 9000/800/S16K-A)
- Added support for workstations:
 - C3650
 - C3700
 - J6700

1. See “SCSI Driver c8xx” on page 83 for further information about supported systems.

Hardware Enablement

- Support for Superdome IO Expansion (IOX) cabinets
- Support for all PA 8700-based products
- Support for changes of SAM and `fruled` commands to modify the behavior of PCI Attention light (LED), so that it conforms to PCI Hotplug Specification (See “New Attention Indicator Behavior” on page 66 in Chapter 4.)
- Support for modified DIMM labels so that user interface to `parstatus` command more accurately matches HW labeling
- Support for 2D graphics on L-class systems
- Support for add-on workstation audio card/driver for B-Class
- Improved USB driver supports Update-UX tool for migration from HP-UX 10.20 to 11i
- The `ups_mond` software now supports longer shutdown values for PowerTrust II UPS units
- Added Ultrium tape drive support to `fbackup` and `frecover` commands

The `HWEnable11i` bundle also includes support for the following peripherals:

- A4982B PCI Visualize-fxe Graphics Adapter
- A6077A PCI 128 Audio Card for B2600 workstations
- A6795A PCI Tachlite 2Gb FC Mass-Storage I/O Adapters
(HP-UX 11.x boot supported with PDC version 41.46 on L3000, N4000 servers)
- A6685A HSC Tachlite FC Mass-Storage I/O Adapter for Kx60, Kx70, Kx80 servers
(HP-UX 11.x boot supported with PDC version 41.33/41.34)
- A6188A VA7100 Disk Array
- A6189A VA7405 Disk Array
- A6092A HyperFabric Adapter (PCI 4X)
- A6386A HyperFabric2 Adapter (PCI 4X)

HP-UX V-Class Changes

Single-Bit Memory Error Handling Enhancement

new at 11i original release Single-bit memory errors are now handled exclusively by memlogd. This allows the system to remove lockable pages that experience repeated single-bit memory errors. At boot time, the system uses the Page Deallocation Table to remove these pages dynamically from the kernel's list of free pages.

Single-bit memory error logging information can be viewed using the Support Tools Manager (STM). This information can no longer be found in `/var/adm/syslog/syslog.log`.

SCSI Drivers scsi3 and c720

**updated for
 September 2001**

The table below lists information about the SCSI Host Bus Adapters (HBAs) that the `scsi3` and `c720` SCSI drivers support for HP-UX 11i. Both the `scsi3` and `c720` drivers are included in the Foundation 11i Operating Environment.

For the most recent information about the SCSI HBAs, you should periodically check the SCSI HBA information at the HP IT Resource Center (ITRC), at <http://itrc.hp.com>.

Table 5-6 Supported HBAs for HP-UX 11i

SCSI HBA	Bus Type	Technology	Supported HP-UX Systems
28655A (single channel)	HP-PB (NIO)	SE SCSI-2	K- and T-Class servers
28696A (single channel)	HP-PB (NIO)	FWD SCSI-2 (HVD)	K- and T-Class servers
A2679A (single channel)	EISA	SE SCSI-2	D- and R-Class servers (32-bit only) 715/64/80/100, 725/100, B132L+, B180L, C200, C240, J200, J210, and J210XC workstations
A2969A (single channel)	HSC	FWD SCSI-2 (HVD)	K-Class servers
A3644A ^a (single channel)	HSC	FWD SCSI-2 (HVD)	T600 servers
A4107A (single channel)	HSC (EISA FF)	FWD SCSI-2 (HVD)	A180, A180C, and D-, and R-Class servers 715/64/80/100, 725/100, B132L, B132L+, B160L, B180L, C100, C110, C160, C160L, C180, C180-XP, C200, C240, J200, J210, J210XC, J280, H282, and J2240 workstations
A4800A (single channel)	PCI	FWD SCSI-2 (HVD)	A-, L-, N-, and V-Class, rp24xx, rp54xx, rp7400, rp7410, rp8400, and Superdome servers
A5159A (dual channel)	PCI	FWD SCSI-3 (HVD)	A-, L-, and N-Class, rp24xx, rp54xx, rp7400, rp7410, rp8400, and Superdome servers

a. A3644A was obsoleted February 1, 2001.

SCSI Driver c8xx

new for March 2002

The c8xx driver is being updated to support two new SCSI PCI Ultra160 Host Bus Adapters (HBAs) that are available beginning in March 2002. The driver is included in the March 2002 HwEnable11i bundle, which is available on the March 2002 11i OE media and on the Support Plus CD.

Four patches (PHKL_25712, PHCO_25831, PHKL_24854, and PHKL_25218) are required for the c8xx driver. Note that all four patches are included in the HwEnable11i bundle. So, if you install the entire bundle, you will automatically install the four patches.

Table 5-7 HBAs Supported by c8xx SCSI Driver for HP-UX 11i

SCSI HBA	Bus Type	Technology	Supported HP-UX Systems
A6828A (single channel)	PCI	Ultra160 LVD/SE SCSI-3	A400, A500, and L- and N-Class, rp24xx, rp54xx, rp7400, rp7410, rp8400, and Superdome ^a servers
A6829A (dual channel)	PCI	Ultra160 LVD/SE SCSI-3	A400, A500, and L- and N-Class, rp24xx, rp54xx, rp7400, rp7410, rp8400, and Superdome ^a servers

a. NOTE: For the availability of OLAR support on Superdome servers, periodically check the HP IT Resource Center (ITRC), at <http://itrc.hp.com>.

For the most recent information about the SCSI HBAs, you should periodically check the SCSI HBA information at the HP IT Resource Center (ITRC), at <http://itrc.hp.com>.

Service Processor (GSP or MP)

NOTE

The service processor in HP servers is sometimes called the Management Processor (MP) and sometimes the Guardian Service Processor (GSP).

Regardless of the name, the service processor in these servers provides approximately the same features and performs essentially the same role.

Throughout this document the term “service processor” refers to both the MP and GSP service processors.

The service processor is a service and console subsystem on the following servers:

- N4000
- all L-Class
- A-Class (the A400 and A500)
- Superdome systems
- rp2400, rp2450
- rp5400, rp5430, rp5450, rp5470
- rp7400, rp7410
- rp8400
- all new servers introduced starting with the N-Class

The GSP console driver, the software component of the GSP, provides the following features on HP-UX:

Local console port	provides system console while HP-UX is running.
Remote session port	establishes an HP-UX login session on the remote console.
Local session port	establishes an HP-UX login session on the local console.
Internal console port	supports firmware upgrade and diagnostics on GSP.
UPS port	establishes a communication channel between the UPS daemon and UPS.

SAM provides configuration support (that is, modem and UPS connections) over the GSP serial ports. The *insf*(1M) and *mksf*(1M) commands create device files for the GSP serial ports.

The following commands have been changed to provide additional support for the GSP console:

- `ttytype` can determine the ID of the terminal connected to the local console port.
- `stty` supports the status query and reset function of the GSP.

The GSP console driver is based on the existing built-in serial port driver (`asio0`). Every serial port on the GSP adheres strictly to the `termio` feature set; these features are described in the *termio*(7) and *modem*(7) manpages.

GSP Logging Capabilities

The introduction of GSP to the above platforms dramatically changes the way chassis operations and diagnostic evaluations are performed on a running system.

The new subsystem requires HP-UX to provide more information than was provided on previous platforms. HP-UX will continue to output the same chassis-codes and forward-progress indicators that have been provided in previous releases. On the above and subsequent systems, however, the codes are displayed on the Virtual Front Panel (VFP) of the system. Most of the existing four-hex digit chassis codes are enclosed in GSP-specific encoding.

The GSP subsystem interprets various forms of logging information from both firmware and software. Several new software events are now logged, including:

- “Boot Complete” indicator
- Timestamp
- Periodic heartbeat, with:
 - timeout value (a time-limit within which another event must be logged before the system is declared “dead”)
 - activity level indicating system usage
- Minimal LED control

In addition to existing four-hex digit chassis codes, the following information is sent with each event:

- Alert level
- CPU number

NOTE

The GSP will not store codes of alert level 0 after PDC's “boot complete” code. All incoming codes will display on the VFP, but level 0's will not be stored for later retrieval. This is so the log won't fill up with heartbeat entries.

PDC_CHASSIS, the old firmware call for old-style, four-hex digit chassis codes, always produces codes of alert level 0. In order to create new-style chassis codes, the PAT_ call for CHASSIS must be used.

N4000 and rp7400 Server Functionality

This section describes 11i functionality to enable HP N4000 and rp7400 mid-range servers. Related operating system changes can be found in the following sections of this document:

- “Changes to System Administration Manager (SAM)” on page 190
- “Improved ioscan Description Field for PCI Devices” on page 199
- “ttytype Support for the N4000 and rp7400 Console” on page 90
- “New stty Options” on page 91
- “SCSI Drivers scsi3 and c720” on page 82
- “Service Processor (GSP or MP)” on page 84

With the exception of some new system build options, changes to HP-UX 11i for these servers will have little, if any, bearing on customers using legacy PA-RISC systems.

NOTE

For the purpose of this document, all systems prior to N4000 are termed “legacy” (including B-, C-, and D-Class low-end systems, K-Class mid-range systems, and T- and V-Class high-end systems).

Platform Infrastructure

The HP N4000 and rp7400 servers are the first HP systems based on PA-RISC processors with Itanium® Core Electronic Complex (CEC) components. This “hybrid” system contains a new modular platform infrastructure. Whether PA-based, Itanium-based, or hybrid, new kernel interfaces and platform modules are being provided to support all current platforms.

Subsequent sections describe the following new platform architecture components:

- Platform Support Modules (PSM)

The PSMs control specific hardware or the functions of a given platform. PSMs designed for the new functionality include the following:

- PAT PSM
- SBA PSM
- SAPIC PSM

- Context Dependent I/O module (CDIO)

Because of the hierarchal dependency requirements of some platform modules, not all new platform code is handled by PSMs. The following CDIOs are included in HP-UX:

- CB CDIO
- LBA CDIO
- PCI CDIO
- PCItoPCI CDIO

Impact on Legacy Systems

Legacy system users will see minimal impact in their applications or system administration tools due to the changes in the platform infrastructure.

Although the configuration files on 64-bit systems (for example, `/stand/system` and `master.d/core-hpux`) and SAM will refer to CB-CDIO, PSMs and new CDIOs now included in the system, these components may coexist in the configuration files and be loaded into the kernel at the same time, even if they are inactive on a particular platform. Run-time checks evaluate which components are activated.

For legacy systems, end users might see new entries (`sapic`, `lba`, and `sba`) in the `/stand/system` file. In addition, some new lines have been added to CDIO and DRIVER_DEPENDENCY tables of the `/usr/conf/master.d/core-hpux` file to include the new central bus (`cb`) and the various new PSMs (for example, `pa_psm` or `pa_generic_psm`).

Configuration Changes

N4000 and rp7400 users must have the following modules in the kernel (via the master file entries) for the PAT, SBA, and Lower Bus Adapter (LBA) components to be detected and properly configured—and for the HP-UX kernel to boot. Without these modules, the HP-UX kernel will be unable to detect the hardware CEC components on a N4000 or rp7400 system and the kernel will not boot.

The master file, `/usr/conf/master.d/core-hpux`, contains the following entries for all systems.

\$CDIO Table:

```
cb 1
lba 0
PCItoPCI 0
pa_generic_psm 0
pa_psm 0
pat_psm
sapic 0
sba 0
```

\$DRIVER_DEPENDENCY table:

```
core pa_psm pa_generic_psm asp lasi
sio pa_psm pa_generic_psm
wsio pat_psm core DlmDrv
lba pci sapic PCItoPCI
GSctoPCI pci PCItoPCI
```

The `/stand/system` file contains the following entries:

```
*****
* Bus-Dependent subsystems
*****
* lba
*****
* PSMs
*****
```

- * sapic
- * sba

PAT PSM

This software module interacts with N-Class and rp7400 firmware to discover and keep track of the CEC components configured on the N4000 and rp7400. The PAT PSM also provides access to platform-specific hardware components at runtime.

Although it may be included and linked into all 64-bit kernels, the PAT PSM is useful only to N4000 and rp7500 systems. As of HP-UX 11.0 Extension Pack, May 1999, a run-time test determines whether the linked-in PAT PSM is installed on the system.

Since PAT functionality is only supported on 64-bit systems, 32-bit kernels do not have the PAT PSM built into them.

SBA PSM

The SBA PSM detects and configures the system bus adapter hardware and translates addresses between the Merced bus and the underlying LBA.

The SBA PSM supports system bus adapters on all N4000 and rp7400 systems, and is active and visible to N4000 and rp7400 users.

SAPIC PSM

The SAPIC PSM manages line-based interrupts. This configurable software module handles interrupts routed through the I/O SAPICs.

The SAPIC PSM conforms to the Central Bus CDIO platform infrastructure. It maintains the SAPIC redirection table.

CB CDIO

The CB CDIO contains interfaces that isolate platform-specific code from the rest of the kernel. These interfaces allow generic access to the platforms, regardless of which platform-specific PSMs are active in the kernel. The Central Bus framework interconnects the different PSMs that control the hardware.

For backward compatibility, the PA-CDIO has been restructured into a PA-generic PSM and PA-legacy PSM.

LBA CDIO

The LBA CDIO provides bus translation for all activity between the System Bus Adapter and the PCI bus. The LBA CDIO is the hardware-enabling HP-UX kernel module that controls the lower bus adapter and, therefore, all the intricacies of the dependent hardware. This CDIO also resolves any overlapping configuration issues with LBA, and interacts directly with the PCI CDIO.

PCI CDIO

The PCI subsystem has been redesigned to support PCI Card Online Addition and Replacement (OLAR) and to support a new interrupt line routing architecture.

On legacy systems (B-, C-, and V-Class), platform firmware had complete responsibility for configuring all devices. In contrast, the PCI CDIO detects unconfigured PCI devices and programs the base address registers in order to support PCI Card OLAR.

On N4000 and rp7400 systems, the firmware programs only the boot and console devices. The PCI CDIO programs the remaining devices, using information provided by firmware to the operating system (PAT PSM gets this for PCI).

The N4000 and rp7400 disassociates interrupt routing/handling from the platform-specific bus adapter. On legacy PCI systems, the interrupt lines are routed to the PCI host bus-adapter chip and handled by the same driver (for example, GSCtoPCI and EPIC CDIOs). On N4000 and rp7400 systems, though the interrupt lines are routed to the LBA (PCI bus interface chip), SAPIC PSM handles the interrupt support instead of the LBA CDIO.

LBA CDIO provides N4000 and rp7400 specific services to support PCI drivers and access to the PCI bus. Legacy PCI bus adapter drivers have been modified to be compatible with the new PCI CDIO.

PCItoPCI CDIO

The restructuring of the PCI subsystem permits PCItoPCI configuration of devices to more than two bridges deep. There is no new functionality for this release.

ttytype Support for the N4000 and rp7400 Console

new at 11i original release Although the `ttytype` command has been enhanced to support the N4000 and rp7400 console, there are no user-visible changes in the behavior of the command.

However, a new `ioctl()` call has been added to the command to query the Guardian Service Processor (GSP) console driver for the TERM identity. If the `ioctl()` call fails, `ttytype` will continue with the existing terminal identification process.

For more information on the GSP, see “Service Processor (GSP or MP)” earlier in this chapter. For information on the `ttytype` command, see the `ttytype (1)` manpage.

New stty Options

new at 11i original release Two new options have been added to the `stty` command to support the console on the following systems:

- N4000
- all L-Class
- all N-Class
- rp2400, rp2450
- rp5400, rp5430, rp5450, rp5470
- rp7400

`+queryGSP` queries the status of the GSP (Guardian Service Processor)

`+resetGSP` resets the GSP of the console

Typically, you might use `+queryGSP` if you are getting no response at the console or `+resetGSP` if the console locks up. Here is an example of the latter, which runs the command elsewhere from the console but directs the command at the console device:

```
stty +resetGSP < /dev/GSPdiag1
```

Note that these options require superuser status.

For information on the `stty` command, see the `stty (1)` manpage.

Workstations

Workstation Firmware Requirements

The information that was formerly included in this section can be found in the *HP-UX 11i Installation and Update Guide*, located at <http://docs.hp.com/hpux/os/11i/index.html#Installing%20and%20Updating>.

IMPORTANT

HP strongly recommends that you update your system firmware with the latest patches available at the following Web site:

<http://docs.hp.com/hpux/hw/index.html#System%20Firmware>

Workstation Graphics Support

Graphics Software Support

HP's Graphics and Technical Computing bundle includes OpenGL, Starbase, HP PEXlib, and HP-PHIGS 3D APIs. HP's workstation graphics software support includes the run-time and programming environment packages for the 3D graphics APIs named above, plus additional software for technical computing environments. However, some functionality (notably accelerated 3D graphics) requires special hardware.

NOTE

As of the September 2002 11i release, HP 3D Graphics are no longer supported on PA-RISC systems older than 2.0. The 3D graphics code is now optimized for PA 2.0 (64-bit capable) processors and will not execute on older PA-RISC microprocessors.

If you have an older PA-RISC workstation and need local 3D graphics support, HP recommends that you *not* update to the September 2002 release (or later) of the Technical Computing (TCOE) or Minimal Computing (MCOE) Operating Environments. The previous releases of HP-UX 11i contain 3D graphics code that will execute on any PA-RISC microprocessor.

You can determine the PA version with the System Administration Manager (SAM) by selecting "Performance Monitors" and then "System Properties." The PA version appears on the line labeled "CPU Version."

Graphics Hardware Support

updated for September 2002

HP-UX 11i version 1.0, as of the September 2002 release, supports the FireGL-UX graphics adapter card (A7789A).

This new, high-end, full-featured 3D graphics card provides 3D support for OpenGL, similar to the Visualize-FX10 feature set, with the exception of multi-screen support, which FireGL-UX does not provide. It also provides, via the X server and Xlib, 2D features comparable to those of the Visualize-FX10.

FireGL-UX is supported on these systems:

- C3650, C3700, C3750
- J6000, J6700, J6750

new at 11i original release

In addition to the many existing graphics cards, HP-UX 11i now supports the HP VISUALIZE-fxe card. This new entry-level, low cost, full-featured 3D graphics card replaces the VISUALIZE-fx² card for 3D applications and the VISUALIZE-EG card for 2D applications.

HP VISUALIZE-fxe provides 3D support for OpenGL, Starbase, HP PEXlib and HP-PHIGS 3D APIs, with a full VISUALIZE-fx²-like feature set. It also provides 2D features via the X server and Xlib comparable to those of the VISUALIZE-fx² and VISUALIZE-EG products.

HP VISUALIZE-fxe is supported on these systems:

- B180L (2D X libraries only; 3D supported only via VMX/VMD)
- B1000, B2000
- C3000, C3600
- J5000, J5600, J6000, J7000

HP VISUALIZE-fxe is not supported on the C360 workstation.

For a complete list of supported systems and graphics combinations on HP-UX 11i, consult <http://www.hp.com/workstations>.

Workstation Tuned Kernel Parameters

updated for June 2001

As of the June 2001 release, kernel parameters for CAE and EE Engineering workstation kernels will be optimized during the installation or update. If the system is installed or updated using Ignite-UX (IUX), this occurs automatically.¹ If you install or update manually, the optimization only occurs after you select one of the new engineering workstation kernel sets via SAM.

On factory Instant Ignition, IUX will install workstation systems with optimized default kernel parameter settings as long as the system has at least 64MB of RAM. The new defaults are optimized for general performance and are tailored appropriately for a 32-bit or 64-bit kernel. (The default parameter settings for each set are listed at the end of this section.) The larger `maxdsiz` limit for 64-bit installations now allows users to take advantage of the increased (approximately 3GB) process data space available with the June 2001 release.

Also on factory Instant Ignition, IUX automatically configures the kernel with the appropriate new CAE kernel parameter set:

- CAE/ME/General Eng. Workstation 64-bit Kernel, or
- CAE/ME/General Eng. Workstation 32-bit Kernel

Via SAM, you can apply tuned kernel parameter settings by selecting one of these new sets:

1. For additional information about IUX, see “Ignite-UX (IUX)” on page 148 and “Ignite-UX” on page 175.

- CAE/ME/General Eng. Workstation 64-bit Kernel
- CAE/ME/General Eng. Workstation 32-bit Kernel
- EE Engineering Workstation 64-bit Kernel
- EE Engineering Workstation 32-bit Kernel

The 64-bit versions of these parameter sets configure the kernel to use the increased process data space. The CAE/ME/General Engineering Workstation sets are for general workstation use, which includes running typical MDA applications. The EE Engineering Workstation sets are for compute-intensive applications that do not perform large amounts of disk I/O. Many EDA applications fall into this category. Be sure to select the 64-bit or 32-bit versions depending on the “bitness” of your installed kernel.

CAE/ME/General Eng. Workstation 64-bit Kernel Parameter Defaults

```
maxusers      128
maxfiles      200
maxfiles_lim  2048
maxdsiz       0xC0000000
maxdsiz_64bit 0x400000000
maxtsiz       0x400000000
maxtsiz_64bit 0x1000000000
maxssiz       0x04FB3000
maxssiz_64bit 0x100000000
shmmax        0x400000000
ninode        4000
maxuprc       256
npty          200
nstrpty       200
maxswapchunks 4096
create_fastlinks 1
fs_async      1
```

CAE/ME/General Eng. Workstation 32-bit Kernel Parameter Defaults

```
maxusers      128
maxfiles      200
maxfiles_lim  2048
maxdsiz       0x7b03a000
maxtsiz       0x400000000
maxssiz       0x04FB3000
shmmax        0x400000000
ninode        4000
maxuprc       256
npty          200
nstrpty       200
maxswapchunks 4096
create_fastlinks 1
fs_async      1
```

EE Engineering Workstation 64-bit Kernel Parameter Defaults

```
maxusers      128
maxfiles      200
maxfiles_lim  2048
maxdsiz       0xC0000000
maxdsiz_64bit 0x400000000
maxtsiz       0x400000000
maxtsiz_64bit 0x1000000000
maxssiz       0x04FB3000
maxssiz_64bit 0x100000000
```

```
shmmax          0x40000000
ninode          4000
maxuprc         256
npty            200
nstrpty         200
maxswapchunks  4096
create_fastlinks 1
fs_async        1
vps_ceiling     64
dbc_max_pct     15
dbc_min_pct     15
```

EE Engineering Workstation 32-bit Kernel Parameter Defaults

```
maxusers        128
maxfiles        200
maxfiles_lim    2048
maxdsiz         0x7b03a000
maxtsiz         0x40000000
maxssiz         0x04FB3000
shmmax          0x40000000
ninode          4000
maxuprc         256
npty            200
nstrpty         200
maxswapchunks  4096
create_fastlinks 1
fs_async        1
vps_ceiling     64
dbc_max_pct     15
dbc_min_pct     15
```

X Window System (X11 R6) Run-Time Libraries on Workstations

The HP-UX 11i provides workstation support for the 64-bit X Window System shared library (stack).

The following X and Motif libraries are available in 64-bits:

```
libMrm.a
libXm.4
libICE.2
libSM.2
libX11.3
libXIE.2
libXext.3
libXhp11.3
libXi.3
libXp.2
libXmu
libXaw
```

To date, these libraries are only found in release 6 of the X libs (X11 R6) and Motif version 2.1. No 64-bit versions of the `tooltalk` libraries, `libtt`, or `libDtSvc` are available.

The 64-bit X Window System (X11 R6) run-time libraries are usable only on systems that support the 64-bit operating system. To use the 64-bit run-time libraries, you must specify that the application will run (compile) in 64-bit mode. The 64-bit libraries are then used automatically.

What's in This Chapter?

This chapter describes the new and updated applications available in each of the five Operating Environments. Always-installed applications are covered first, followed by selectable applications. (For a listing of new or changed applications included in each Operating Environment, see Table 6-1, “Operating Environment Applications,” on page 99.)

- The HP-UX 11i Version 1 Operating Environments (see page 99)
- HP-UX 11i Foundation Operating Environment (see page 104)
 - Always-Installed Networking and Mass Storage Drivers (see page 104)
 - Base VERITAS Volume Manager (VxVM) (see page 105)
 - Codeword iCOD (see page 106)
 - Event Monitoring Service (EMS) (see page 106)
 - GTK+ Libraries (see page 107)
 - HP CIFS Client and HP CIFS Server (see page 107)
 - HP WBEM Services for HP-UX (see page 109)
 - HP-UX Runtime Environment for the Java 2 Platform (see page 110)
 - HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors (see page 110)
 - HP-UX Web Server Suite (see page 112)
 - HP-UX Apache-based Web Server (see page 114)
 - HP-UX Webmin-based Admin (see page 116)
 - HP-UX Tomcat-based Servlet Engine (see page 116)
 - HP-UX XML Web Server Tools (see page 117)
 - Judy Libraries (see page 117)
 - Mozilla Application Suite (see page 119)
 - MySQL (see page 119)
 - Perl Programming Language (see page 119)
 - Pluggable Authentication Module (PAM) Kerberos (see page 120)
 - Plug-In for the Java 2 Platform for Netscape/Mozilla (see page 122)
 - Servicecontrol Manager (SCM) (see page 122)
- HP-UX 11i Enterprise Operating Environment (EOE) (see page 124)
 - GlancePlus Pak (see page 124)
 - High Availability Monitors (see page 124)
 - HP OnLineJFS 3.3 (see page 125)

What's in This Chapter?

- HP Process Resource Manager (PRM) (see page 126)
- MirrorDisk/UX (see page 127)
- HP-UX 11i Mission Critical Operating Environment (MCOE) (see page 128)
 - Enterprise Cluster Master (ECM) Toolkit (see page 128)
 - HP-UX Workload Manager (see page 128)
 - HP-UX Workload Manager Toolkits (see page 130)
 - HP-UX Workload Manager Oracle , Database Toolkit (see page 132)
 - MC/ServiceGuard (see page 133)
 - MC/ServiceGuard NFS Toolkit (see page 135)
- HP-UX 11i Minimal Technical Operating Environment (MTOE) (see page 137)
 - OpenGL 3D Graphics Developers Kit and Runtime Environment (see page 137)
 - Technical System Configuration (TechSysConf) (see page 138)
- HP-UX 11i Technical Computing Operating Environment (TCOE) (see page 143)
 - High Performance Math Libraries (HP MLIB) (see page 143)
 - HP 3D Technology for the Java 2 Platform (see page 144)
 - HP Message-Passing Interface (MPI) (see page 144)
 - HP Visualize Conference (see page 145)
- Selectable Applications (see page 147)
 - HP-UX Host Intrusion Detection System (HIDS) (see page 147)
 - HP-UX IPFilter (see page 148)
 - Ignite-UX (IUX) (see page 148)
 - Java Out-of-Box (JAVAOOB) (see page 149)
 - Netscape Directory Server (J4258CA) (see page 150)
 - PPU Percent Utilization (see page 151)
 - Selectable Networking and Mass Storage Drivers (see page 152)
 - Software Package Builder (see page 152)

The HP-UX 11i Version 1 Operating Environments

new at 11i original release

The HP-UX 11i Version 1 Operating Environments each consist of the HP-UX operating system and a set of applications and drivers that are “always installed” through various bundles, as well as a collection of additional applications and drivers that you can selectively install.

The HP-UX 11i release is available in one of the following Operating Environments (OEs):

- HP-UX 11i Foundation OE (page 104)
- HP-UX 11i Enterprise OE (page 124)
- HP-UX 11i Mission Critical OE (page 128)
- HP-UX 11i Minimal Technical OE (page 137)
- HP-UX 11i Technical Computing OE (page 143)

You can choose the HP-UX 11i Operating Environment that is best suited for your computing environment. Although there are five OEs available, only one can be installed and operate on your HP server or workstation. The applications of the HP-UX 11i Operating Environments include those shown in Table 6-1.

NOTE

For a description of the Operating Environments’ media structure, including the contents of each bundle, see the whitepaper “HP-UX 11i Operating Environments” at <http://docs.hp.com/hpux/onlinedocs/os/11i/hpwoldfullpres.pdf>.

For an overview of the applications available on various versions of HP-UX, including 10.20, 11.0, and 11i, see the Application Availability Matrix at <http://www.software.hp.com/MATRIX>.

Table 6-1 Operating Environment Applications

Application	IM ^a	HP-UX 11i Foundation OE (commercial servers)	HP-UX 11i Enterprise OE (commercial servers)	HP-UX 11i Mission Critical OE (commercial servers)	HP-UX 11i Minimal Technical OE (workstations)	HP-UX 11i Technical Computing OE (technical servers & workstations)
Always-Installed Networking and Mass Storage Drivers (see page 104)	AI	YES	YES	YES	YES	YES

Table 6-1 Operating Environment Applications (Continued)

Application	IM ^a	HP-UX 11i Foundation OE (commercial servers)	HP-UX 11i Enterprise OE (commercial servers)	HP-UX 11i Mission Critical OE (commercial servers)	HP-UX 11i Minimal Technical OE (workstations)	HP-UX 11i Technical Computing OE (technical servers & workstations)
Base VERITAS Volume Manager (VxVM) (see page 105)	AI	YES	YES	YES	YES	YES
Codeword iCOD (see page 106)	AI	YES	YES	YES	YES	YES
Enterprise Cluster Master (ECM) Toolkit (see page 128)	AI	NO	NO	YES	NO	NO
Event Monitoring Service (EMS) (see page 106)	AI	YES	YES	YES	YES	YES
GlancePlus Pak (see page 124)	AI	NO	YES	YES	NO	NO
GTK+ Libraries (see page 107)	DI	YES	YES	YES	YES	YES
High Availability Monitors (see page 124)	AI	NO	YES	YES	NO	NO
High Performance Math Libraries (HP MLIB) (see page 143)	AI	NO	NO	NO	NO	YES
HP 3D Technology for the Java 2 Platform (see page 144)	AI	NO	NO	NO	NO	YES
HP CIFS Client and HP CIFS Server (see page 107)	AI	YES	YES	YES	NO	YES
HP Message-Passing Interface (MPI) (see page 144)	AI	NO	NO	NO	NO	YES
HP Process Resource Manager (PRM) (see page 126)	AI	NO	YES	YES	NO	NO
HP OnLineJFS 3.3 (see page 125)	AI	NO	YES	YES	NO	NO

Table 6-1 Operating Environment Applications (Continued)

Application	IM ^a	HP-UX 11i Foundation OE (commercial servers)	HP-UX 11i Enterprise OE (commercial servers)	HP-UX 11i Mission Critical OE (commercial servers)	HP-UX 11i Minimal Technical OE (workstations)	HP-UX 11i Technical Computing OE (technical servers & workstations)
HP Visualize Conference (see page 145)	AI	NO	NO	NO	NO	YES
HP WBEM Services for HP-UX (see page 109)	DI	YES	YES	YES	YES	YES
HP-UX Host Intrusion Detection System (HIDS) (see page 147)	S	YES	YES	YES	NO	NO
HP-UX IPFilter (see page 148)	S	YES	YES	YES	NO	NO
HP-UX Runtime Environment for the Java 2 Platform (see page 110)	DI	YES	YES	YES	YES	YES
HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors (see page 110)	AI	YES	YES	YES	YES	YES
HP-UX Web Server Suite (see page 112)	DI	YES	YES	YES	NO	YES
HP-UX Workload Manager (see page 128)	AI	NO	NO	YES	NO	NO
HP-UX Workload Manager Toolkits (see page 130)	AI	NO	NO	YES	NO	NO
HP-UX Workload Manager Oracle , Database Toolkit (see page 132)	AI	NO	NO	YES	NO	NO
Ignite-UX (IUX) (see page 148)	S	YES	YES	YES	YES	YES
Java Out-of-Box (JAVA00B) (see page 149)	S	YES	YES	YES	YES	YES
Judy Libraries (see page 117)	AI	YES	YES	YES	YES	YES

Table 6-1 Operating Environment Applications (Continued)

Application	IM ^a	HP-UX 11i Foundation OE (commercial servers)	HP-UX 11i Enterprise OE (commercial servers)	HP-UX 11i Mission Critical OE (commercial servers)	HP-UX 11i Minimal Technical OE (workstations)	HP-UX 11i Technical Computing OE (technical servers & workstations)
MC/ServiceGuard (see page 133)	AI	NO	NO	YES	NO	NO
MC/ServiceGuard NFS Toolkit (see page 135)	AI	NO	NO	YES	NO	NO
MirrorDisk/UX (see page 127)	AI	NO	YES	YES	NO	NO
Mozilla Application Suite (see page 119)	DI	YES	YES	YES	YES	YES
MySQL (see page 119)	AI	YES	YES	YES	NO	NO
Netscape Directory Server (J4258CA) (see page 150)	S	YES	YES	YES	YES	YES
OpenGL 3D Graphics Developers Kit and Runtime Environment (see page 137)	AI	NO	NO	NO	YES	YES
Partition Manager (parmgr) (see page 62)	AI	YES	YES	YES	YES	YES
PPU Percent Utilization (see page 151)	S	YES	YES	YES	YES	YES
Perl Programming Language (see page 119)	DI	YES	YES	YES	YES	YES
Pluggable Authentication Module (PAM) Kerberos (see page 120)	AI	YES	YES	YES	NO	YES
Plug-In for the Java 2 Platform for Netscape/Mozilla (see page 122)	DI	YES	YES	YES	YES	YES

Table 6-1 Operating Environment Applications (Continued)

Application	IM ^a	HP-UX 11i Foundation OE (commercial servers)	HP-UX 11i Enterprise OE (commercial servers)	HP-UX 11i Mission Critical OE (commercial servers)	HP-UX 11i Minimal Technical OE (workstations)	HP-UX 11i Technical Computing OE (technical servers & workstations)
Selectable Networking and Mass Storage Drivers (see page 152)	S	YES	YES	YES	YES	YES
Servicecontrol Manager (SCM) (see page 122)	AI	YES	YES	YES	NO	NO
Software Distributor (SD-UX) (see page 177)	AI	YES	YES	YES	YES	YES
Software Package Builder (see page 152)	S	YES	YES	YES	YES	YES
Technical System Configuration (TechSysConf) (see page 138)	AI	NO	NO	NO	YES	YES
Update-UX (see page 176)	AI	YES	YES	YES	YES	YES

a. Installation Method: AI = Always-Installed; DI = Default-Installed; S = Selectable

HP-UX 11i Foundation Operating Environment

The HP-UX 11i **Foundation** Operating Environment is the standard OE from which the Enterprise OE and Mission Critical OE have been derived by adding appropriate applications. The HP-UX 11i Foundation OE includes the base 32/64-bit HP-UX Operating System, network drivers, other always-installed functionality, and the following applications:

Always-Installed Applications

- Always-Installed Networking and Mass Storage Drivers (see page 104)
- Base VERITAS Volume Manager (VxVM) (see page 105)
- Codeword iCOD (see page 106)
- HP CIFS Client and HP CIFS Server (see page 107)
- Event Monitoring Service (EMS) (see page 106)
- HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors (see page 110)
- Judy Libraries (see page 117)
- MySQL (see page 119)
- Partition Manager (parmgr) (see page 62)
- Pluggable Authentication Module (PAM) Kerberos (see page 120)
- Servicecontrol Manager (SCM) (see page 122)
- Software Distributor (SD-UX) (see page 177)
- Update-UX (see page 176)

Default-Installed Applications

- Perl Programming Language (see page 119)
- GTK+ Libraries (see page 107)
- HP WBEM Services for HP-UX (see page 109)
- HP-UX Web Server Suite (see page 112)
- HP-UX Runtime Environment for the Java 2 Platform (see page 110)
- Mozilla Application Suite (see page 119)
- Plug-In for the Java 2 Platform for Netscape/Mozilla (see page 122)

Selectable Applications

- HP-UX Host Intrusion Detection System (HIDS) (see page 147)
- HP-UX IPFilter (see page 148)
- Ignite-UX (IUX) (see page 148)
- Java Out-of-Box (JAVA00B) (see page 149)
- Netscape Directory Server (J4258CA) (see page 150)
- PPU Percent Utilization (see page 151)
- Selectable Networking and Mass Storage Drivers (see page 152)
- Software Package Builder (see page 152)

Always-Installed Networking and Mass Storage Drivers

For information on always-installed networking and mass storage drivers, see Chapter 7, “Networking and Mass Storage Drivers,” on page 155.

Base VERITAS Volume Manager (VxVM)

updated for
September 2002

With the September 2002 release, Base VERITAS Volume Manager has been upgraded to version 3.5. The following products are installed by default with the Base VERITAS Volume Manager Bundle 3.5 for HP-UX (swlist version B.03.50.5):

- Base-VXVM B.03.50.5 Base VERITAS Volume Manager Bundle 3.5 for HP-UX
- Base-VXVM.VRTSvxvm 3.5m Base VERITAS Volume Manager 3.5 for HP-UX
- Base-VXVM.VRTSvmdoc 3.5m VERITAS Volume Manager Documentation
- Base-VXVM.VRTSfspro 3.5-ga08 VERITAS File System Management Services Provider
- Base-VXVM.VRTSvmpro 3.5m VERITAS Volume Manager Management Services Provider
- Base-VXVM.VRTSobgui 3.0.2.261a VERITAS Enterprise Administrator
- Base-VXVM.VRTSob 3.0.2.261a VERITAS Enterprise Administrator Service
- Base-VXVM.VRTSvlic 3.00.007e VERITAS License Utilities

The VRTSvxvm product replaces the HPvxvm product available with previous HP-UX 11i releases. It is the same product, but since HP and VERITAS have moved to a binary model for VxVM products, VERITAS handles all the packaging and the new name reflects this.

The HPvmsa product is no longer supported with VxVM 3.5. VERITAS has moved to a Unified GUI (UniGUI) product for 3.5. The VRTSob, VRTSobgui, VRTSvmpro, and VRTSfspro products are all part of the UniGUI product.

VERITAS has moved to SIG licensing for VxVM 3.5. As such, the VRTSvlic package is required for correct functioning of VxVM.

During upgrades from previous OEUR or AR releases, the previous HPvxvm and HPvmsa products will be replaced by the above new products. Previous ELM licensing keys will still work with the new SIG licensing package (that is, if a customer has installed the VxVM full product on their December 2001 system and then upgrades to 3.5, they will *not* need to get new license keys to get the same full functionality).

With VxVM 3.5, changes have been made to Ignite-UX to support VxVM “rootability.”¹ Customers can select at installation time to have their root disk managed by VxVM. (They do not have this option with Update-UX, however.)

NOTE

For documentation about VxVM in previous releases of HP-UX 11i v1, see *HP-UX 11i December 2001 Release Notes*, available at <http://docs.hp.com>.

Documentation for VxVM 3.5

The following documentation can be found on the Instant Information CD and in the /usr/share/doc/vxvm directory:

- *VxVM 3.5 Administrator's Guide*
- *VxVM 3.5 Hardware Release Notes*
- *VxVM 3.5 Installation Guide*

1. For further information about Ignite-UX's support of VxVM rootability, see “Ignite-UX (IUX)” on page 148.

- *VxVM 3.5 Migration Guide*
- *VxVM 3.5 Release Notes*
- *VxVM 3.5 Troubleshooting Guide*
- *VxVM 3.5 User's Guide*

The online manual pages are installed with the `VRTSvxvm.VXVM-ENG-A-MAN` fileset in the `/usr/share/man` directory.

Codeword iCOD

Part of the HP On Demand Solutions program (see “On Demand Solutions” on page 200), Codeword iCOD is a purchase model in which processor capacity can be instantly increased to accommodate increasing demands. With Codeword iCOD, you initially purchase a specified number of activated system components and license deactivated system components for activation through the application of right-to-use codewords.

new for December 2003 Codeword iCOD version 6.0 has been added as an always-installed product.

Documentation

See “On Demand Solutions” on page 200.

Event Monitoring Service (EMS)

The Event Monitoring Service (EMS) is a framework for monitoring system resources which includes configuring resources for monitoring, checking resource status, and sending notification to target systems when configured conditions are met.

updated for September 2003 EMS has been updated to version A.04.00.01 to incorporate defect fixes.

updated for June 2003 A new command line utility, EMS CLI, is available to configure and manage persistent monitoring requests for EMS monitors, such as HA Monitors, Hardware Monitors, and Kernel Monitors. EMS CLI can be used to perform the following activities:

- Add, modify, delete, and list monitoring requests
- Generate script for currently configured monitoring requests
- View status of monitoring requests
- List resource instances available for monitoring

EMS A.04.00 will support IPv6 on HP-UX 11i.

NOTE

For documentation about EMS in previous releases of HP-UX 11i v1, see *HP-UX 11i March 2003 Release Notes*, available at <http://docs.hp.com>.

Documentation

The following documentation is currently available:

- Release Notes

Event Monitoring Service A.04.00.01 Release Notes for HP-UX 11i and *High Availability Monitors A.04.00.01 Release Notes for HP-UX 11i* are shipped with the Event Monitoring Service product for HP-UX 11i. These documents can be found on the HP-UX 11i Instant Information CD and at <http://docs.hp.com/hpux/ha>.

- Manpages

A new manpage, *emscli* (1M), which describes the *emscli* functionality, is shipped with the product. Also shipped with the product is the *resls* (1) manpage, which has been updated to include a new option (-s) that has been added to display the current value of the resource instance.

- User Manuals

The EMS user manuals, *Using Event Monitoring Service* and *Using High Availability Monitors*, have been updated and are shipped with the product.

GTK+ Libraries

new for June 2003 The GTK+ Libraries 1.2.10.2 are the open source GNU toolkit for X windows development. The copy provided here is only supported for use with the Mozilla browser, which depends on it. GTK+ consists of the following component libraries:

- GLib - Provides many useful data types, macros, type conversions, string utilities and a lexical scanner. Includes Win32 support.
- GDK - A wrapper for low-level windowing functions.
- GTK - An advanced widget set.

For more information, see:

http://www.software.hp.com/cgi-bin/swdepot_parser.cgi/cgi/displayProductInfo.pl?productNumber=B6848BA and <http://www.gtk.org/announce.html>.

HP CIFS Client and HP CIFS Server

With HP CIFS Client and HP CIFS Server, Hewlett-Packard provides a Common Internet File System (CIFS), the Microsoft protocol for remote file access. CIFS is built into all recent Windows operating systems, including Windows 95, 98, NT 4.0, and 2000. By providing both server and client, CIFS enables file and print interoperability for environments with a mix of UNIX and Windows platforms.

The HP CIFS Server provides file sharing, printer access and authentication services to CIFS clients including Microsoft Windows NT, XP, and 2000, and HP-UX machines running HP CIFS Client software.

For the most recent information on HP CIFS Client and HP CIFS Server, see the release notes and other documents listed under the following “Documentation” section.

**updated for
December 2003**

The new version of HP CIFS Server 2.2g (version A.01.10) is based on Samba 2.2.8a. It contains defect fixes and the following new enhancements:

- Provides the SWAT wizard tool for users to configure the `smb.conf` file and minimize the `smb.conf` file size.
- Includes changes to support manipulating POSIX directory ACLs from Windows 2000 and XP Clients using the Windows ACL Advanced interface (Directory->Properties->Security Tab->Advanced Button).

- Includes changes to support the following new configuration parameter:
 - max connections per client

**updated for
September 2003**

The HP CIFS Client A.01.09 provides the following new features and defect fixes:

- Kerberos Authentication, integration with System Kerberos Cache:

This release provides Kerberos authentication within the `cifslogin` and `cifsmount` commands, and provides a method for automatic CIFS logins by integrating CIFS authentication with programs that utilize the system Kerberos cache, such as PAM Kerberos and `kinit`.
- Added support for new infolevel for `FIND_FIRST` and `FIND_NEXT` SMBs:

An enhancement has been implemented that improves interoperability with third-party CIFS Servers that do not support older SMB infolevels.
- Fix for duplicate `/etc/mnttab` entries:

This fix eliminates a problem where, in certain instances, duplicate entries for CIFS-mounted filesystems can be created in `/etc/mnttab`, thus causing duplicate entries to be displayed in the output of `mount`.
- Resolved defect of CIFS mounts becoming unusable:

This fix eliminates a cause of a rare problem wherein a CIFS mount can become inaccessible under certain conditions.
- Enhancements to PAM NTLM:

PAM NTLM now supports the ignore option, as well as per-user configuration within the `pam_user.conf` and `pam_updb` framework.
- New option for representation of mounted CIFS filesystems:

In previous releases, the representation of mounted CIFS filesystems in the output of `mount` and `bdf` followed a proprietary form. In this release, the standard UNIX representation of a mounted filesystem (`server/share`) can be displayed by setting the configuration parameter, `mtabName`, to the null string:

```
mtabName = " "
```
- Enhancements to `cifsclient` control script

**updated for June
2003**

The CIFS Server 2.2e (version A.01.09.04) is based on Samba version 2.2.5 and contains fixes and minor enhancements. This new version of CIFS Server incorporates the new tools and new configuration parameters from the previous version 2.2c. New tool scripts and new configuration parameters follow:

- Provide the new tool `tdbbackup` and new script `findsmb`.
- Changes have been made to provide the following new configuration parameters support:
 - force unknown ACL user
 - mangling method
 - csc policy
 - inherit ACLs

- lock spin count
- lock spin time
- pid directory

Please refer to the *CIFS Server 2.2b/c/d/e Release Note* for detailed changes.

NOTE

For documentation about CIFS/9000 Client and CIFS/9000 Server in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

For a more detailed description of changes, please refer to the following documentation in the “Networking and Communications” section at <http://docs.hp.com>:

- *HP CIFS Server 2.2e Release Note version A.01.09.04*
- *HP CIFS Server 2.2f Release Note version A.01.09.05*
- *HP CIFS Server 2.2g Release Note version A.01.10*
- *HP CIFS Server Administrator's Guide*
- The *HP CIFS Client A.01.09 Administrator's Guide* and *HP CIFS Client A.01.09 Release Note* can also be found in the product directory `/opt/cifscclient/HP_docs`, as well as <http://docs.hp.com>.

HP WBEM Services for HP-UX

Web-Based Enterprise Management (WBEM) (<http://www.dmtf.org/>) is a platform and resource independent DMTF (Distributed Management Task Force) standard that defines both a common model (i.e., description) and protocol (i.e., interface) for monitoring and controlling a diverse set of resources.

The HP WBEM Services for HP-UX product is the HP-UX implementation of the DMTF (Distributed Management Task Force) WBEM standard.

This product is based on The Open Group (TOG) Pegasus Open Source Software (OSS) project (<http://www.opengroup.org/pegasus/>).

new for December 2003

HP WBEM Services for HP-UX, version A.01.05, is now included as a default-installed component in the 11i v1 Operating Environments.

Major features in the A.01.05 release include the following:

- This version of the product supports strong SSL encryption.
- The CIM Server can now be configured to simultaneously support both SSL and non-SSL connections.
- Local connections have been enhanced to use Unix Domain Sockets offering increased security and improved performance.

- Four additional providers have been added to the HP-UX WBEM Services product: HP-UX Network Time Protocol (NTP) CIM Provider, HP-UX Domain Name System (DNS) CIM Provider, HP-UX Network Information Service (NIS) CIM Provider and HP-UX Internet Protocol (IP) CIM Provider.

This is the first release of HP WBEM Services to support strong SSL encryption. Interoperability between HP WBEM Services 1.1 and 1.5 is not supported.

Documentation

Manpages are packaged with the product and are placed in the directory `/opt/wbem/share/man`.

The *HP WBEM Services for HP-UX System Administrator's Guide* and the *HP WBEM Services for HP-UX Version A.01.05 Release Notes* are available on the Web at <http://www.docs.hp.com/hpux/netsys/index.html>.

Further information can also be found at the HP WBEM Solutions Web site at <http://www.hp.com/large/infrastructure/management/wbem/hpux/index.html>.

HP-UX Runtime Environment for the Java 2 Platform

The HP-UX Runtime Environment for the Java 2 (RTE) Platform provides the Runtime Environment which allows you to deploy the latest Java technology with the best performance on PA-RISC systems running HP-UX 11.0 and 11i.

updated for
September 2003

The Runtime Environment for Java versions 1.2, 1.3, and 1.4 will be installed. (See the following documentation section for the location of further information.)

NOTE

For documentation about the HP-UX Runtime Environment for the Java 2 (RTE) Platform in previous releases of HP-UX 11i v1, see *HP-UX 11i March 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

For further information, please read the release notes in the RTE software. Or for the most up-to-date information, go to the Web at <http://www.hp.com/go/java> and select “information library” in the left navigation bar.

HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors

HP-UX Support Tools provide a complete set of tools for verifying, troubleshooting, and monitoring HP system hardware, including CPUs, memory, interface cards, and mass storage devices.

Support Tool Manager (STM) is the platform for executing online diagnostics. The commands to start it are `xstm` (GUI interface), `mstm` (menu-driven interface), `cstm` (command line interface), or `stm` (general). STM is part of the `OnlineDiag` bundle delivered through Hardware Enablement on the OE media and on the Support Plus CD.

Offline Diagnostic Environment (ODE) is the platform for executing offline diagnostics. Normally it is run from the Support Plus CD with the system offline.

EMS Hardware Monitors allow you to monitor the operation of a wide variety of hardware products and be alerted immediately if any failure or other unusual event occurs. The EMS Hardware Monitors are started automatically with no user intervention. EMS Hardware Monitors are part of the OnlineDiag bundle delivered through Hardware Enablement on the OE media and on the Support Plus CD.

NOTE

Since the initial release of HP-UX 11i, there have been numerous changes to the Support Tools, including support for new devices, bug fixes, and enhancements. Changes to hardware support are listed in “Hardware Enablement” on page 75. For the latest details about these and other changes, go to the web site <http://docs.hp.com/hpux/diag/>.

The rest of this section describes the major differences between Support Tools on HP-UX 11i and Support Tools on previous releases (HP-UX 11.0).

Impact

The HP-UX Support Tools have been modified to support new products, such as Superdome systems.

With HP-UX 11i, the Support Tools are automatically installed with the HP-UX 11i Operating Environment CD. It is no longer necessary to load the Support Tools from the Support Plus media. (The Support Plus media, however, still contains the Support Tools, and will continue to be distributed. Offline tools are run from the Support Plus CD and cannot be run from the HP-UX 11i Operating Environment CD.)

NOTE

As of HP-UX 11i, Predictive Support is no longer distributed with the Support Tools.

Disk space required by the HP-UX 11i Support Tools is comparable to the disk space required for previous releases (in the range of 60-70MB).

Compatibility

There are minor changes in `monconfig`, the user interface for configuring EMS Hardware Monitors. These changes relate to the client configuration files which have been added to support the multiple-view (Predictive-enabled) feature.

If you have scripts which invoke `monconfig`, they may have to be modified.

For more information on these changes, refer to “Adding a Monitoring Request” in Chapter 2 of the *EMS Hardware Monitors User’s Guide* (June 2000 or later edition) available by searching on the manual title at:

<http://docs.hp.com/hpux/diag/>

Alternately, you can just run `monconfig` on HP-UX 11i to see the revised dialog.

Documentation

The <http://docs.hp.com/hpux/diag/> web site also has tutorials, FAQs, Release Notes, and manuals documenting the Support Tools. Although some documentation is also available through other means, such as through the Support Plus CD, the web pages provide the latest information.

For changes since the initial release of HP-UX 11i, see the March 2001, June 2001, December 2001, March 2002, June 2002, September 2002, December 2002, March 2003, June 2003, September 2003, or December 2003 documents at the following URLs:

For *EMS Release Notes*, see

http://docs.hp.com/hpux/onlinedocs/diag/ems/ems_rel.htm

For *STM Release Notes*, see

http://docs.hp.com/hpux/onlinedocs/diag/stm/stm_rel.htm

HP-UX Web Server Suite

new for June 2003 The HP-UX Web Server Suite is a free product that can be downloaded for the HP-UX platform. It contains key software products necessary to deploy, manage, and implement mission critical web servers. The following components can be separately installed:

- HP-UX Apache-based Web Server (see page 114)
- HP-UX Webmin-based Admin (see page 116)
- HP-UX Tomcat-based Servlet Engine (see page 116)
- HP-UX XML Web Server Tools (see page 117)

Installation

- Products are now separately installable into their own directory under `/opt/hpws/`.

NOTE

Shared documentation, such as Migration Guides and FAQs, are located at `/opt/hpws/hp_docs` and are included in the HP-UX Webmin-based Admin bundle.

Table 6-2 New Locations of HP-UX Web Server Suite Products

Product	New Location	Old Location
HP-UX Apache-based Web Server	<code>/opt/hpws/apache</code>	<code>/opt/hpapache2</code>
HP-UX Tomcat-based Servlet Engine	<code>/opt/hpws/tomcat</code>	<code>/opt/hpapache2/tomcat</code>
HP-UX Webmin-based Admin	<code>/opt/hpws/webmin</code>	<code>/opt/hpapache2/webmin</code>
HP-UX XML Web Server Tools	<code>/opt/hpws/xmltools</code>	n/a

- After installing, use the README and GETTING_STARTED documents for details on prerequisites and starting each component. The README is located at /opt/hpws/README. The GETTING_STARTED document is found in multiple locations under each component directory (i.e., /opt/hpws/apache/GETTING_STARTED)
- Products do *not* start automatically after installation. Previously, Apache would try to start on port 80.
- For updates, new configuration files are delivered in the standard location if the existing one is unchanged or nonexistent. Otherwise, they are delivered in an alternate location, allowing the system administrator to incorporate the changes individually. Detailed information can be found in the GETTING_STARTED document.
- Filenames and variables have changed for the RC (Resource Configuration) files, located in the /etc/rc.config.d/ directory.

Table 6-3

Resource Configuration Filenames

Product	New Filename	Old Filename
HP-UX Apache-based Web Server	hpws_apacheconf	hpapache2conf
HP-UX Tomcat-based Servlet Engine	hpws_tomcatconf	
HP-UX Webmin-based Admin	hpws_webminconf	
HP-UX XML Web Server Tools	hpws_xmltoolsconf	n/a

Installation Requirements

The following requirements must be fulfilled before certain components/features will work. See the following documentation section for the location of further information.

- Building Apache DSOs using apxs depends on Perl installed at /opt/perl/bin/perl.
- Apache binaries are dependent on the B.11.32 or later versions of ld and libld. See the *HP-UX 11i Installation and Update Guide* for more information.
- Fast Perl scripts and Apache modules written in Perl require mod_perl to be configured and Perl 5.6.1 to be installed.
- HP-UX Tomcat-based Servlet Engine and HP-UX XML Web Server Tools requires HP-UX Developer's Kit for Java 1.3 or later. If your web application uses JSPs (Java Server Pages) then you will also need the JDK (Java Development Kit) so you can compile the JSPs.
- HP-UX Webmin-based Admin depends on Perl 5 or later.

Documentation

Bundled documentation (Release Notes, Admin Guides, User Guides, Migration Guides and FAQs) now install into /opt/hpws/hp_docs. These documents can be accessed after starting HP-UX Apache-based Web Server, HP-UX Tomcat-based Servlet Engine, and HP-UX Webmin-based Admin by browsing to http://yourserver.com/hp_docs on the

appropriate port (i.e., for Webmin on port 10000, the URL should be: http://yourserver.com:10000/hp_docs). See `/opt/hpws/README` for more information about getting started with each component.

The latest information can also be found on the product web site:
<http://www.hp.com/go/webserver>

HP-UX Apache-based Web Server

HP-UX Apache-based Web Server combines Apache with numerous popular modules from other Open Source projects and provides HP value-added features for the HP-UX platform:

- Scripting capabilities: PHP, `mod_perl`, CGI
- Content management: WebDAV
- Security: authentication through an LDAP server, Chrooted environment, SSL and TLS support

updated for September 2003

HP-UX Apache-based Web Server v.1.0.06.01 is primarily a security and bug-fix release which addresses the following vulnerabilities and problems:

- Apache upgraded to 2.0.46, which addresses and fixes these security vulnerabilities described at:
 - <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0189>
 - <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0245>
- `mod_perl` upgraded to 1.99_09: `mod_perl` has been upgraded in conjunction with the Apache upgrade. Apache 2.0.46 and `mod_perl` 1.99_09 both depend on APR version 0.9.4 (which is incorporated into Apache).
- Resolved problem causing `mod_cgid` with Chroot to fail.
- Corrected message, “unclean shutdown of previous Apache run,” generated during a subsequent startup of Apache with Chroot turned on.

Plus enhancements from v1.0.05.01:

- `mod_auth_ldap` and its caching module, `mod_ldap`, have been added to provide authentication to an LDAP directory. These are new modules from the Apache Software Foundation. `auth_ldap` is still provided; however, all `ldap` users are encouraged to begin transitioning to `mod_auth_ldap`. `auth_ldap` is provided during this transition but will be removed in a future release.

Plus enhancements from v1.0.03.01:

- Apache upgraded to 2.0.45 which addresses and fixes these security vulnerabilities described at:
 - <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0132>
 - <http://nagoya.apache.org/bugzilla/index.html>: BUG # 17206
- Fixed OpenSSL 0.9.6i to address and fix these security vulnerabilities described at:
 - <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0147>

— <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0131>

- Enabling more file descriptors:

HP-UX Apache-based Web Server is now compiled with `_USE_BIG_FDS` to raise the maximum allowed number of simultaneous open files, or maximum number of file descriptors, from 2048 to 60000 per process (depending on system configuration).

new for June 2003 HP-UX Apache-based Web Server v1.0.01.02 includes the following:

- OpenSSL upgraded to 0.9.6i, which addresses and fixes the security vulnerability described at:

— <http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2003-0078>

- Resolved a problem with Apache going into an infinite loop under certain network conditions, consuming 100% CPU. The details regarding the bug is available at <http://nagoya.apache.org/bugzilla/index.html>: BUG # 15380.
- Resolved a problem with Apache not able to load modules written in C++.

Plus enhancements from v1.0.00.01:

- Apache 2.0.43: All users are urged to upgrade immediately to Apache 2.0.43 which addresses and fixes these security vulnerabilities described at <http://cve.mitre.org/>: CAN-2002-0839, CAN-2002-1156, CAN-2002-0843.
- New Apache modules: `mod_charset_lite`, `mod_deflate`, `mod_mem_cache`
- PHP 4.2.3, a maintenance release with a large number of bug fixes to version 4.2.2. This version of PHP also incorporates a fix for PHP bug #17466 for uid/gid in `safe_mode`.
- New PHP extensions, which add support for sockets, FTP, network management, XML manipulation using DOM, handling compressed files, image manipulation and password strength checking.
- Support for IPv6
- `mod_perl 1.99_07`, now dependent on Perl 5.6.1, which is included in the OE.

Compatibility

This release is binary-compatible only with 2.0.42 and greater. All the modules compiled with Apache 2.0.42 or greater will continue to work with this version since the Apache API has not changed.

Performance

Performance is similar to previous HP Apache-based Web Server 1.3.x and 2.x releases.

Installation

See “Installation” on page 112.

Documentation

See “Documentation” on page 113.

HP-UX Webmin-based Admin

HP-UX Webmin-based Admin is a configuration and administration GUI with extensive enhancements for the HP-UX Apache-based Web Server.

**updated for
September 2003**

HP-UX Webmin-based Admin 1.0.05.01 is a minor enhancement release:

- Added partial support for additional Apache LDAP modules (`mod_auth_ldap`, `mod_ldap`), which are available starting with HP-UX Apache-based Web Server version 1.0.05.01.

new for June 2003

HP-UX Webmin-based Admin v.1.0.01.02 includes the following:

- Upgraded to Webmin 1.070: Vulnerability regarding `miniserv.pl` in (1) Webmin before 1.070 and (2) Usermin before 1.000 does not properly handle metacharacters such as line feeds and carriage returns (CRLF) in Base-64 encoded strings during Basic authentication, which allows remote attackers to spoof a session ID and gain root privileges. More details are available at <http://cve.mitre.org/CAN-2003-0101>.

Note: Usermin was not shipped in previous releases of Webmin bundled by HP.

- HP-UX Webmin-based Admin has also been enhanced to integrate with HP-UX Internet Express.

Plus enhancements from 1.0.00.01:

- This release has been extensively enhanced to be more tightly integrated with the HP-UX Web Server Suite. Many changes have been made, including new HP look-and-feel, easy access to documentation, support for more Apache modules (`auth_ldap`, `mod_ssl`), and added “help” for Apache directives.

Installation

See “Installation” on page 112.

Documentation

See “Documentation” on page 113.

HP-UX Tomcat-based Servlet Engine

HP-UX Tomcat-based Servlet Engine provides customers with Java-based extensions for dynamic content generation via Servlets and JavaServer Pages (JSPs).

**updated for
September 2003**

HP-UX Tomcat-based Servlet Engine v.1.0.03.03 includes the following:

- Fix to the Tomcat Admin application that had affected numerous Tomcat administrative tasks.

new for June 2003

HP-UX Tomcat-based Servlet Engine v.1.0.01.02 includes the following:

- Tomcat 4.1.12 supports `ajp13` protocol
- `mod_jk` 1.2

Installation

See “Installation” on page 112.

Compatibility

Server-side Java Servlets and JavaServer Pages (JSPs) that used Tomcat 3.x or JServ may need to be modified to use Tomcat 4.x. Configuration files have also changed in Tomcat 4.x. Details about changes can be found in the *Tomcat Migration Guide* which is included in the product. See “Documentation” on page 113 for more information.

Documentation

See “Documentation” on page 113.

HP-UX XML Web Server Tools

HP-UX XML Web Server Tools is a collection of a Java-based XML tools used for XML parsing, stylesheet and XSL processing, web-publishing and image translating from the Open Source projects: Xerces-J, Xalan-J, Cocoon, FOP, and Batik.

new for June 2003 New HP-UX XML Web Server Tools v.1.0.01.02 includes the following:

- Xerces-J 2.2.1, Xalan-J 2.4.1, Batik 1.5, FOP 0.20.4, Cocoon 2.0.3

Installation

See “Installation” on page 112.

Documentation

See “Documentation” on page 113.

Judy Libraries

The Judy product is a C language library that enables an unbounded array capability. Judy Libraries provide a state-of-the-art core technology that replaces many traditional data structures and algorithms (such as arrays, sparse arrays, hash tables, B-trees, binary trees, linear lists, skip lists, and counting functions).

updated for September 2002 The Judy technology is now an Open Source product that is available from SourceForge at <http://sourceforge.net/projects/judy>.

updated for June 2002 The Judy Libraries product has been updated to incorporate improved manpages, minor defect fixes, and minor code improvements.

updated for December 2001 New functionality has been added to the Judy libraries to search for the next available (empty) location in a Judy array. Functions include the following:

- FirstEmpty
- NextEmpty
- LastEmpty

- PrevEmpty

See the information library for details at: <http://www.hp.com/go/judy>.

**updated for
September 2001**

As of September 2001, the Judy Libraries product was removed as a selectable application and is now installed with the OEs.

new for June 2001

The Judy product delivers:

- Very easy-to-use API
- Improved overall performance and better memory management
- Scalable arrays that can grow dynamically to very large populations while maintaining excellent performance

Judy offers three types of arrays:

Judy1 functions provide a way to store, retrieve, and locate Boolean values (bit maps) in a Judy array.

JudyL functions provide a way to store, retrieve, and locate long-word values in a Judy array.

JudySL functions provide a way to store, retrieve, and locate strings as indexes (similar to associative arrays in awk, Perl, and Java).

Compatibility

The following table shows the location of the libraries that are provided with the Judy technology on the HP-UX system:

Table 6-4 Locations of Judy Libraries

Hardware Architecture	Type	Location on system (from root)	
		32-bit	64-bit
HP-PA 1.1 (32-bit only)	archive	/usr/lib/libJudy.a	N/A
	shared	/usr/lib/libJudy.sl	N/A
HP-PA 2.0	archive	none	/usr/lib/pa20_64/libJudy.a
	shared	/usr/lib/pa20_32/libJudy.sl	/usr.lib/pa20_64/libJudy.sl

NOTE

The 32-bit HP-PA 1.1 shared library (/usr/lib/libJudy.sl) is provided for compatibility only. For best performance on 32-bit machines, use the HP-PA 2.0 shared library (/usr/lib/pa20_32/libJudy.sl).

Documentation

For more information about the Judy technology, refer to the *Judy* (3x) manpages (installed with the product) or visit the Judy web site at <http://www.hp.com/go/judy>.

Mozilla Application Suite

The Mozilla Application Suite includes the Navigator web browser, Messenger email client, Composer HTML editor, Newsgroup client, Address book, and IR Chat. It is designed around online tasks people do the most—browsing, searching, and e-mail—bringing them together for the most convenient and customized experience.

**updated for
December 2003**

The Mozilla Application Suite 1.4 includes new junk-mail filtering features, pop-up blocking, and thousands of additional bug fixes, including changes to improve performance, stability, web site compatibility, standards support, and usability. For more information, see the Mozilla Foundation release notes:

<http://www.mozilla.org/releases/mozilla1.4/README.html#new>.

new for June 2003

With the June 2003 release, Mozilla 1.21 has replaced Netscape as the default browser on HP-UX, and includes numerous bug fixes and performance enhancements.

Documentation

Visit our web site for more details and the latest Mozilla releases for HP-UX:

<http://www.hp.com/go/mozilla>.

MySQL

new for June 2003

MySQL is an open source relational SQL database developed by MySQL AB. This product is used by Servicecontrol Manager (SCM) 3.0 to store vital information about the management domain. This is the first version of SCM that uses MySQL. (For further information about SCM, see “Servicecontrol Manager (SCM)” on page 122.)

SCM 2.5 used Netscape Directory Server (NDS) for the repository. SCM 3.0 uses MySQL instead of NDS for the repository. Therefore, after you upgrade to SCM 3.0, you can remove NDS if it is not used by another product. The upgrade process including steps to remove NDS is covered in the *HP Servicecontrol Manager 3.0 User's Guide* available at <http://docs.hp.com>.

Documentation

MySQL information is available at www.mysql.com.

MySQL information as it applies to SCM 3.0 is available at <http://docs.hp.com>.

Partition Manager

See “Partition Manager (parmgr)” on page 62 in Chapter 4, “nPartition (Hard Partition) Systems.”

Perl Programming Language

Perl is a high-level programming language created and enhanced by the Open Source community. Perl takes the best features from other languages, such as C, awk, sed, sh, and BASIC, among others, and at least a dozen other tools and languages.

**new for September
2001**

Included as of the September 2001 release, Perl programming language version 5.6.1 is a release of ActivePerl, a product of ActiveState Tool Corporation.

Documentation

For more information see the following:

- *Perl Programming*, Third Edition, by Larry Wall, Tom Christiansen, and Jon Orwant. O'Reilly and Associates, Inc. USBN 0-596-00027-8
- the *perl* (1) manpage (points you to related perl manpages)
- the `/opt/perl/bin/perldoc` file

For further information, see the following URLs:

`http://www.perl.org`
`www.activestate.com`
`http://learn.perl.org`

Pluggable Authentication Module (PAM) Kerberos

Pluggable Authentication Module (PAM) Kerberos version 11i is a service for authenticating users or services across an open network. HP-UX 11i provides Kerberos authentication through a Kerberos-Client product which is a part of the HP-UX base operating system. Kerberos, the primary authentication mechanism for Windows 2000, is integrated with Active Directory Service to provide enterprise-wide account management. This necessitates the implementation of the Kerberos authentication mechanism on HP-UX as a Pluggable Authentication Module.

Pluggable Authentication Module (PAM) [OSF RFC 86.0] is the standard framework, and is easily configurable to support multiple authentication technologies on HP-UX.

PAM Kerberos provides the PAM mechanism using Kerberos.

The PAM service module was implemented as a shared library, `libpam_krb5.1`. This library is built by linking with `libkrb5.sl`, and is therefore not dependent on the `libsys.sl` library.

The HP-UX 11i implementation of Kerberos version 5 protocol provides enterprise-wide strong user authentication. Using encryption during the user authentication process, Kerberos infrastructure provides privacy and integrity of user login information since passwords are no longer communicated in clear text over the network.

HP-UX system entry services can work with any Kerberos v5 Server, namely, MIT Kerberos and Microsoft Windows 2000. Thus, passwords can be effectively unified in an Intranet with heterogeneous systems such as UNIX and Microsoft Windows 2000. Furthermore, support of password change protocol has been implemented. These two features can significantly reduce user administration complexity in a heterogeneous environment.

The HP-UX applications using PAM include `telnet`, `login`, `remsh`, `ftp`, `rexec`, `rlogin`, `dtlogin`, and `rcp`. PAM Kerberos interoperates with a Key Distribution Center (KDC) operating on either a UNIX or a Microsoft Windows 2000 server.

The PAM Kerberos module is compliant with IETF RFC 1510 and Open Group RFC 86.0. PAM Kerberos is also available under the product number J5849AA on the Applications Software CD. This product provides a `libpam_krb5.1` library, a `pam_krb5` (1) manpage, and a release note document.

**updated for
September 2002**

Now included with PAM Kerberos is the `pamkrb5val` tool, which will help administrators validate the PAM Kerberos setup. The tool validates the following files for PAM Kerberos-related entries:

- `/etc/pam.conf`
- `/etc/pam_user.conf`
- `/etc/krb5.conf`
- `/etc/krb5.keytab`

Also included is a sample `pam.conf` file.

Installation Requirements

The minimum disk space required to install the product is 1MB. Additional disk space of about 1KB per user in the system `/tmp` file is required to store initial Ticket Granting Tickets in the credential cache file.

Impact

HP-UX PAM Kerberos is implemented under the PAM framework, which allows the new authentication service module to be plugged in and made available without modifying the application or rebooting the system.

PAM Kerberos works on HP servers and workstations with a minimum of 32MB of memory and sufficient swap space (a minimum of 50MB is recommended).

NOTE

PAM Kerberos is not thread safe.

Coexistence Issues

PAM Kerberos (`libpam_krb5.1`) and PAM DCE (`libpam_dce.1`) plug-in modules can not be stacked together in the `pam.conf` file because of different principal styles and credential file paths. If so stacked, the results will be unpredictable.

If the password has expired on a Microsoft Windows 2000 KDC, you will not be asked for a new password and will not be allowed to log in. When changing passwords on a MIT KDC with a version prior to 1.1, up to 45 seconds may elapse before the password is actually changed due to the selection mechanism of the change password protocol.

Documentation

The following documentation is available:

- The newly created manpage for `pam_kerberos` is available at `/usr/share/man/man5.Z/pam_krb5.5`.
- New for September 2002 is the manpage for `pamkrbval`.
- The white paper, *Network Security Features of HP-UX 11i*, is available at <http://www.unix.hp.com/operating/hpux11i/infolibrary/>.
- The *PAM Kerberos Release Notes for HP-UX 11i* is available at <http://docs.hp.com>.

Plug-In for the Java 2 Platform for Netscape/Mozilla

The Runtime Plug-in (JPI) for the Java 2 platform allows you to use a version of the runtime environment that differs from the runtime environment embedded with Netscape Navigator 4.61 or later.

**updated for
September 2003**

The Runtime Plug-in (JPI) for the Java 2 platform versions 1.2, 1.3, and 1.4 will be installed.

**updated for June
2003**

The Runtime Plug-in (JPI) for the Java 2 platform versions 1.2 and 1.3 will be installed.

Documentation

For prerequisites, installation information, and documentation, read the release notes included in the Plug-in software. Or, for the most up-to-date information, go to the Web at <http://www.hp.com/go/java>.

Servicecontrol Manager (SCM)

HP Servicecontrol Manager (SCM) provides a convenient multi-system management solution for HP-UX and Linux systems. You can access SCM using a web-enabled graphical user interface or a command line interface. SCM enables you to execute HP-UX and Linux manageability tools including custom tools and scripts across multiple systems simultaneously.

**updated for
December 2003**

SCM has been updated to version 03.00.04 to include Java SDK version 1.4.1.04.

**updated for
September 2003**

SCM has been updated to version 03.00.02 to incorporate minor defect fixes.

**updated for June
2003**

SCM 3.0 provides the following new features:

- Linux-based central management server
- Certified HP ProLiant Linux agents
- XML file format
- Web-browser-based tools
- Improved user interface and ease-of-use
- Increased number of administration roles
- Increased security through HTTP and SSL

See also “MySQL” on page 119.

Compatibility

SCM 3.0 supports the following operating systems:

- For the central management server:
 - HP-UX 11.0
 - HP-UX 11i v1
 - HP-UX 11i v2
 - Red Hat Linux 7.2 Professional
 - Red Hat Linux 7.3 Professional
 - SuSE Linux 8.0 Professional

- For a managed node:
 - HP-UX 11.0
 - HP-UX 11i v1
 - HP-UX 11i v2
 - Red Hat Linux 7.2 Professional
 - Red Hat Linux 7.3 Professional
 - SuSE Linux 8.0 Professional

SCM 3.0 agents are only compatible with an SCM 3.0 central management server (CMS). Therefore, if you have an existing SCM 2.5 management domain, you need to upgrade these systems from SCM 2.5 to 3.0 before they can manage or be managed by a system running SCM 3.0.

Documentation

Documentation for SCM is available at <http://software.hp.com/products/SCMGR/> or <http://docs.hp.com>.

NOTE

For documentation about Servicecontrol Manager in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2002 Release Notes*, available at <http://docs.hp.com>.

Software Distributor

See “Software Distributor (SD-UX)” on page 177 in Chapter 8, “Installation.”

Update-UX

See “Update-UX” on page 176 in Chapter 8, “Installation.”

HP-UX 11i Enterprise Operating Environment (EOE)

The HP-UX 11i **Enterprise** Operating Environment (EOE) provides a superset of the features available in the HP-UX 11i Foundation Operating Environment described in “HP-UX 11i Foundation Operating Environment” on page 104. Targeted especially for database servers, the Enterprise OE includes these additional applications:

- GlancePlus Pak (see page 124)
- High Availability Monitors (see page 124)
- HP OnLineJFS 3.3 (see page 125)
- HP Process Resource Manager (PRM) (see page 126)
- MirrorDisk/UX (see page 127)

See also “HP-UX 11i Foundation Operating Environment” on page 104.

GlancePlus Pak

GlancePlus Pak combines the GlancePlus and OpenView Performance Agent (OVPA)¹ products into one package.

**updated for
December 2003**

GlancePlus Pak, which supports HP-UX 11.0 and 11i, has been updated to version C.03.72.00 to incorporate defect fixes.

NOTE

For documentation about GlancePlus Pak in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2003 Release Notes*, available at <http://docs.hp.com>.

Documentation

For more information, please refer to the release notes of each product (GlancePlus and OpenView Performance Agent) at the following site:

http://ovweb.external.hp.com/lpe/doc_serv/

High Availability Monitors

High Availability (HA) Monitors includes the database monitor, disk monitor, and Management Information Base (MIB) monitors. HA Monitors help in providing high availability in an HP-UX environment by monitoring particular system resources and then informing target applications (e.g., MC/ServiceGuard) when the resources they monitor are at critical user-defined values.

**updated for
September 2003**

HA Monitors has been updated to version A.04.00.01 to incorporate defect fixes.

1. HP OpenView Performance Agent for HP-UX (OVPA) was previously named MeasureWare Agent for HP-UX. However, the software components and process names operationally remain MeasureWare Agent (MWA).

**updated for June
2003**

HA Monitors A.04.00 is being released for use with HP-UX 11i. This release has all the features found in earlier versions in addition to new functionality and defect repairs. The contents of HA Monitors releases A.03.20.01 through A.04.00 have been incorporated.¹

HA Monitors A.04.00 contains a suite of monitors. Among them, MIB Monitor is used for monitoring LAN interface availability. With the introduction of IPv6, there are new interface monitoring MIBs. MIB Monitor has been enabled to use the newer MIBs on IPv6-enabled systems.

NOTE

The HA Monitors product does not provide Native Language Support.

Documentation

The following documents are available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>:

- *Using High Availability Monitors* (B5736-90046)
- *High Availability Monitors version A.04.00.01 Release Notes for HP-UX 11i* (B5736-90050)

HP OnLineJFS 3.3

HP OnLineJFS 3.3 is the advanced optional product for JFS 3.3, which is the latest version of JFS, the Journaled File System. (JFS is also known as the VERITAS File System or VxFS.)

You can use the capabilities of HP OnLineJFS to perform certain key administrative tasks on mounted JFS file systems; this allows users on the system to perform their work uninterrupted. These tasks include:

- Defragmenting a file system to regain performance
- Resizing a file system
- Creating a snapshot file system for backup purposes

Documentation

See “New Version of Journaled File System (JFS)” on page 219 for information about new features in JFS 3.3.

For more information on JFS 3.3 and OnLineJFS 3.3, see the following books:

- *HP JFS 3.3 and HP OnLineJFS 3.3 VERITAS File System 3.3 System Administrator's Guide*
- *Managing Systems and Workgroups: A Guide for HP-UX System Administrators*

Both are available on the Web at:

<http://docs.hp.com/>

1. For documentation about High Availability Monitors in previous releases of HP-UX 11i v1, see *HP-UX 11i March 2003 Release Notes*, available at <http://docs.hp.com>.

HP Process Resource Manager (PRM)

Process Resource Manager (PRM) enables system administrators to guarantee CPU, real memory, and disk bandwidth resources to users and applications on the system.

NOTE

Process Resource Manager and HP-UX Workload Manager both make use of the PRM API. Consequently, *only one* of the products should be used at a time. (See also “HP-UX Workload Manager” on page 128.)

updated for June 2003

PRM version C.02.01 provides the following:

- disk bandwidth management for VERITAS Volume Manager (VxVM)
- wide-column option `-w` available with various PRM utilities for better display of group names

NOTE

For documentation about HP PRM in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

- The following documents are available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>:
 - *The HP Process Resource Manager User's Guide*
 - *HP PRM Version C.02.01 Release Notes for HP-UX 11.0, HP-UX 11i V1.0, and HP-UX 11i V2.0*
 - *PRM Product Overview*
- Manpages:
 - *prm* (1) (revised)
 - *prmagt* (1) (new for 11i)
 - *prmanalyze* (1) (revised)
 - *prmaid* (1) (revised)
 - *prmavail* (1) (revised)
 - *prmconf* (4) (revised)
 - *prmconfig* (1) (revised)
 - *prmlist* (1) (revised)
 - *prmloadconf* (1) (revised)
 - *prmmmonitor* (1) (revised)
 - *prmmmove* (1) (revised)
 - *prmmrecover* (1) (revised)
 - *prmmrun* (1) (revised)
 - *xprm* (1) (revised)
- For more information on Process Resource Manager, see <http://www.hp.com/go/prm>.

MirrorDisk/UX

Prior to HP-UX 11i, Logical Volume Manager (LVM) mirroring supported the non-Shared Logical Volume Manager (non-SLVM) environment only. In other words, the disks were only accessible by a single system and could not be shared by multiple hosts.

Beginning with HP-UX 11i, LVM mirroring now automatically enables SLVM for a two-node environment supporting both non-SLVM and SLVM environments. All LVM systems can mirror their data on disk, and the mirrored copy of the data can also be accessed from a two-node cluster.

Impact

There have been no changes to the LVM command interface to enable LVM mirroring in the SLVM environment. Therefore, you must still use the `lvcreate` and the `lvextend` commands to create mirrored logical volumes. The only software code changes were made to the HP-UX kernel and do not affect any LVM manpages, or the MirrorDisk/UX version B.11.11 products, which are:

- B5403BA MirrorDisk/UX License for Workstations
- B2491BA MirrorDisk/UX License for Servers

To make use of the LVM mirroring capability, you may want to add extra disks to the volume group to mirror the data.

Compatibility Issues

There is no need to make any changes to scripts or makefiles to make use of the LVM mirroring capability in the SLVM environment.

NOTE

SLVM mirroring is NOT supported for striped logical volumes and is ONLY supported in a two-node environment. SLVM mirroring does *not* support spared disks in a shared volume group. You should disable sparing by using the `pvchange -z n <path>` command on shared volume disks.

HP-UX 11i Mission Critical Operating Environment (MCOE)

The HP-UX 11i **Mission Critical** Operating Environment (MCOE) is a high-availability Operating Environment for HP servers. In addition to the features found in the two previously described environments, the Mission Critical OE includes:

- Enterprise Cluster Master (ECM) Toolkit (see page 128)
- HP-UX Workload Manager (see page 128)
- HP-UX Workload Manager Toolkits (see page 130)
- HP-UX Workload Manager Oracle , Database Toolkit (see page 132)
- MC/ServiceGuard (see page 133)
- MC/ServiceGuard NFS Toolkit (see page 135)

For the available selectable products for this OE, see Table 6-1 on page 99. See also “HP-UX 11i Enterprise Operating Environment (EOE)” on page 124 and “HP-UX 11i Foundation Operating Environment” on page 104.

Enterprise Cluster Master (ECM) Toolkit

The Enterprise Cluster Master (ECM) Toolkit is a set of templates and scripts that allow you to configure ServiceGuard packages for the HP Domain Internet servers as well as for several third-party database management systems. The toolkit also includes other specialized tools for monitoring your mission critical environment.

This release of the ECM Toolkit is for use with HP-UX 11.0 and HP-UX 11i, and has all the features found in earlier versions in addition to new features and defect repairs.

**updated for
December 2003**

Version B.02.00 includes the following changes:

- Addition of a SAMBA toolkit
- Addition of an HP Apache toolkit
- Enhancement to Oracle 9i toolkit to support maintenance mode

NOTE

For documentation about ECM Toolkit in previous releases of HP-UX 11i v1, see *HP-UX 11i December 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

For further documentation, see the *Enterprise Cluster Master Toolkit*, available on the Instant Information CD and on the Web at <http://docs.hp.com/>.

HP-UX Workload Manager

HP-UX Workload Manager (WLM) provides goal-based workload management, enabling automatic resource allocation and application performance management. HP-UX WLM uses a configuration file specifying workloads and their prioritized service-level objectives (SLOs). HP-UX WLM automatically allocates CPU resources to the workloads based on priorities and current performance.

NOTE

Process Resource Manager and HP-UX Workload Manager both make use of the PRM API. Consequently, *only one* of these products should be used at a time. (See also “HP Process Resource Manager (PRM)” on page 126.)

updated for June 2003

For version A.02.01, new features include the following:

- `wlminfo` utility for monitoring workloads and their SLOs
- auditing and billing information
- PSET-based workload groups can now have their number of CPUs adjusted based on SLOs
- passive mode to allow you to see how WLM will approximately respond to a given WLM configuration
- ability to easily capture the `stderr` of data collectors by using `coll_stderr` in your WLM configuration
- ability to temporarily remove groups with no active SLOs by using the `transient_groups` keyword, ensuring that resource use is reduced to zero for such groups

updated for June 2002

For version A.02.00, new features include the following:

- A configuration wizard
- Ability to define workload groups based on processor sets
- New syntax for, and greater flexibility in, controlling memory
- Integration with virtual partitions
- New tunable `cntl_convergence_rate` to simplify the fine-tuning of how quickly a workload group converges on its SLO

updated for September 2001

For version A.01.02, new features include the following:

- Example configuration files
- Ability to grant a certain amount of CPU per metric
- Integration with Oracle databases
- Integration with iCOD (instant Capacity On Demand)
- Integration with SCM (Servicecontrol Manager)

new at 11i original release

Besides resource shares, the bundling of version A.01.00.02 with PRM provides:

- An SNMP agent for accessing PRM data
- Display of resource percentages to two decimal places (was formerly integer precision)
- Expanded field length for PRM group names in PRM’s monitoring utilities (30-character field was formerly 14-character field)
- In-kernel memory management

This version of HP-UX WLM does not take advantage of PRM’s hierarchical groups.

Installation Requirements

updated for June 2002

HP-UX WLM requires 11MB of disk space (91 if PRM is not already installed) and 5MB of memory.

Prior to June 2002, HP-UX WLM requires 9MB of disk space (89 if PRM is not already installed) and 5MB of memory.

Compatibility Issues

HP-UX WLM can be used with any 11.x version of GlancePlus for monitoring. However, if you are going to use a WLM `glance_*` data collector (for example, `glance_app` or `glance_tt`), use GlancePlus version C.03.35.00 or later. Do not use GlancePlus for changing PRM entitlements.

If you have iCOD or Pay Per Use (PPU) software installed, do not use WLM's vPar (virtual partitions) management. Using WLM's vPar management in such an environment may cause an iCOD processor to be automatically enabled without customer authorization. If this situation occurs, please contact your HP representative.

Documentation

Documentation includes:

- The *HP-UX Workload Manager User's Guide* and the *HP-UX Workload Manager Version A.02.01 Release Notes for HP-UX 11.0, HP-UX 11i V1.0, and HP-UX 11i V2.0* are available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>.
- Manpages:
 - *wlm* (5)

For more information on HP-UX Workload Manager, see <http://www.hp.com/go/wlm>.

HP-UX Workload Manager Toolkits

HP-UX Workload Manager Toolkits (WLMTK), product number T1302AA, consist of utilities and examples that make it easier to deploy WLM for the management of specific mission-critical software products. As described earlier ("HP-UX Workload Manager" on page 128), HP-UX WLM provides goal-based workload management.

updated for June 2003

WLMTK A.01.04 includes the following new toolkit:

WebLogicTK WLM BEA WebLogic Server Toolkit (WebLogicTK) allows you to move CPUs to or from WebLogic instances as needed to maintain acceptable performance. By managing the instances' CPU resources, the instances will tend to consume fewer net CPU resources over time. You can then use the additional resources for other computing tasks.

new for June 2002

WLMTK A.01.03 consists of the following toolkits:

ApacheTK WLM Apache Toolkit (ApacheTK) facilitates the management and prioritization of Apache-based workloads.

ApacheTK illustrates how to:

- Separate Apache from Oracle database instances

- Separate Apache from batch work
- Isolate a resource-intensive CGI workload
- Separate all Apache JServ workloads from other Apache workloads
- Separate all Apache Tomcat workloads from other Apache workloads
- Separate high/low priority JServ workloads using two JServ JVMs
- Separate http from https (SSL) traffic using two Apache instances
- Separate module-based workloads with two Apache instances
- Manage Apache entitlement by performance goal

DMTK WLM Duration Management Toolkit (DMTK) allows users to specify a desired duration for an application.

DMTK offers the ability to:

- Increase an application's CPU resources if it may not complete in time
- Decrease an application's CPU resources if it is completing too quickly

ODBTK WLM Oracle Database Toolkit (ODBTK) provides an easy mechanism for feeding Oracle database metrics into HP-UX WLM.

ODBTK offers the ability to:

- Keeps response times for your transactions below a given level by setting response-time SLOs
- Increases an instance's available CPU when a particular user connects to the instance
- Increases an instance's available CPU when more than *n* users are connected
- Increases an instance's available CPU when a particular job is active
- Gives an instance *n* percent of the CPU for each process in the instance (This feature is available only with HP-UX WLM version A.01.02 and later.)
- Gives an instance *n* percent of the CPU for each user connection to the instance (This feature is available only with HP-UX WLM version A.01.02 and later.)

These features are provided by ODBTK's:

- Ability to gather and send Oracle database metrics (elapsed walltime and SQL values) to HP-UX WLM for use in service-level objectives
- Ability to average extreme values in database metrics before sending them to HP-UX WLM (This feature maintains a more smooth and predictable stream of metrics.)

NOTE

Earlier, separate versions of the WLM Oracle Database Toolkit are described in the following section, “HP-UX Workload Manager Oracle , Database Toolkit” on page 132.

SASTK	<p>WLM SAS Toolkit (SASTK) provides enhancements to DMTK specifically for SAS users.</p> <p>SASTK offers:</p> <ul style="list-style-type: none">• A SAS macro for instrumenting jobs to provide “percent complete” data to WLM for improved duration management• Example scripts showing how to manage the duration of SAS jobs
SNMPTK	<p>WLM SNMP Toolkit (SNMPTK) provides a data collector called <code>snmpdc</code> that fetches values from an SNMP agent for use as metrics in your WLM configuration.</p>

Compatibility

For compatibility information, see the *HP-UX Workload Manager Toolkits Version A.01.04 Release Notes for HP-UX 11.0, HP-UX 11i V1.0, and HP-UX 11i V2.0*.

Documentation

Documentation includes:

- The *HP-UX Workload Manager Toolkit User’s Guide* and the *HP-UX Workload Manager Toolkits Version A.01.04 Release Notes for HP-UX 11.0, HP-UX 11i V1.0, and HP-UX 11i V2.0*, available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>.
- `wlmtk` (5) manpage

For more information on HP-UX Workload Manager Toolkits, see <http://www.hp.com/go/wlm>.

HP-UX Workload Manager Oracle ® Database Toolkit

As described earlier (“HP-UX Workload Manager” on page 128), HP-UX WLM provides goal-based workload management. This management enables automatic resource allocation and application performance management through the use of prioritized service-level objectives (SLOs). It provides this functionality by building on HP Process Resource Manager (PRM) functionality.

updated for June 2002

As of June 2002, WLM Oracle Database Toolkit is part of the HP-UX Workload Manager Toolkits product. See “HP-UX Workload Manager Toolkits” on page 130.

new for September 2001

WLM Oracle Database Toolkit (ODBTK) A.01.00, product number T1302AA, provides an easy mechanism for feeding Oracle database metrics into HP-UX WLM.

ODBTK offers the following features:

- Keeps response times for your transactions below a given level by setting response-time SLOs

- Increases an instance's available CPU when a particular user connects to the instance
- Increases an instance's available CPU when more than n users are connected
- Increases an instance's available CPU when a particular job is active
- Gives an instance n percent of the CPU for each process in the instance (This feature is available only with HP-UX WLM version A.01.02 and later.)
- Gives an instance n percent of the CPU for each user connection to the instance (This feature is available only with HP-UX WLM version A.01.02 and later.)

These features are provided by ODBTK's:

- Ability to gather and send Oracle database metrics (elapsed walltime and SQL values) to HP-UX WLM for use in service-level objectives
- Ability to average extreme values in database metrics before sending them to HP-UX WLM (This feature maintains a more smooth and predictable stream of metrics.)

Compatibility

- HP-UX WLM version A.01.02 on HP-UX 11.0 and HP-UX 11i
- HP-UX WLM version A.01.01 on HP-UX 11.0
- Oracle 8.0.x, Oracle 8.1.5, Oracle 8.1.6, and Oracle 8.1.7

Documentation

Documentation includes:

- The *HP-UX Workload Manager Oracle Database Toolkit User's Guide* and the *HP-UX Workload Manager Oracle Database Toolkit A.01.00 Release Notes for HP-UX 11.0 and HP-UX 11i*, available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>.
- *wlmtk* (5) manpage

MC/ServiceGuard

Multi-Computer/ServiceGuard (MC/ServiceGuard) is a specialized facility for protecting mission critical applications from a wide variety of hardware and software failures.

MC/ServiceGuard is used to create high-availability clusters of HP servers. Computer systems with high-availability clusters allow applications to continue in spite of a hardware or software failure. Such systems protect users from software failures as well as from failure of a system processing unit (SPU) or local area network (LAN) component. In the event that one component fails, the redundant component takes over and MC/ServiceGuard coordinates the transfer between components.

ServiceGuard Manager, the graphical user interface (GUI) for ServiceGuard, is available from <http://software.hp.com> or from the ServiceGuard Distributed Components CD. ServiceGuard Manager installs on HP-UX, Linux, and Windows.

The Distributed Components CD also includes Quorum Server, which is supported as a type of cluster lock mechanism different from the lock disk.

NOTE

When you purchase the Mission Critical OE, it is assumed that you want MC/ServiceGuard, *not* ServiceGuard Extension for RAC (replacing ServiceGuard OPS Edition). MC/ServiceGuard and ServiceGuard Extension for RAC cannot coexist on the same system. Users of ServiceGuard Extension for RAC are encouraged to purchase and install the Enterprise OE and then install ServiceGuard Extension for RAC. For more information, see *Managing MC/ServiceGuard* and *Using ServiceGuard Extension for Real Application Cluster (RAC)*, both available at <http://docs.hp.com>.

**updated for June
2003**

MC/ServiceGuard has been updated to version 11.15 with the following changes:

- Support for IPv6, with some restrictions which are listed in the product Release Notes.
- The `cmrunnode` and `cmruncl` commands now do a validation check of networks by default. ServiceGuard probes the existing network setup to be sure it matches the information in its configuration files. The check is recommended, but can be skipped with an option.
- ServiceGuard configuration commands `cmcheckconf` and `cmapplyconf` have a new option that enables these commands to respond faster on systems with large storage networks, such as a SAN. With the `-K` option, ServiceGuard will check connectivity for only the cluster lock volume groups, and will skip all other LVM volume groups.
- The user's manual *Managing MC/ServiceGuard* (B3936-90065) has been revised and corrected for this release.
- MC/ServiceGuard no longer supports the use of FibreChannel networking for the heartbeat or data LAN, except on releases prior to A.11.12
- MC/ServiceGuard A.11.15 supports up to 200 relocatable package IP addresses per cluster. This can be a combination of IPv4 and IPv6 addresses
- On Ethernet networks, MC/ServiceGuard supports local failover between network interfaces configured with "Ethernet protocol" or between network interfaces configured with "SNAP encapsulation within IEEE 802.3 protocol." You cannot use both protocols on the same interface, nor can you have a local failover between interfaces that are using different protocols.
- In a cluster, you cannot attach both PCI and NIO F/W SCSI adapters on a shared SCSI bus.
- Support for the HyperFabric product (B6257AA) is provided for some configurations.
- In a vPars (virtual partitions) environment, the multi-function I/O card (HP product number A5838A) is not supported as a boot device, as stated in the *HP-UX Virtual Partitions Ordering and Configuration Guide*, available at <http://docs.hp.com>.

The Distributed Components CD for includes the following changes for both ServiceGuard Manager and Quorum Server.

- ServiceGuard Manager, Version A.03.00.01:
 - Version A.03.00.01, a minor release, supports HP-UX 11i, June 2003; also ServiceGuard 11.15.
 - Version A.03.00 added ability to do common ServiceGuard administration functions through interface.

- Interface now available in English, Japanese, Korean, Simplified Chinese, and Traditional Chinese.
- Quorum Server, Version 2.0:
 - Quorum Server A.02.00 supports cross-compatibility between Intel® Itanium® and PA-RISC, as well as between HP-UX, and Linux.
 - Now, the quorum server can be run in a package.

NOTE

For documentation about MC/ServiceGuard and ServiceGuard Manager in previous releases of HP-UX 11i v1, see *HP-UX 11i September 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

- *MC/ServiceGuard Version A.11.15 Release Notes*
- *Managing MC/ServiceGuard*, Ninth Edition (B3936-90065)

These documents are available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/hpux/ha/>.

MC/ServiceGuard NFS Toolkit

Multi-Computer/ServiceGuard Network File Server (MC/ServiceGuard NFS) Toolkit uses MC/ServiceGuard (MC/SG) to set up highly available NFS servers. An NFS server is a host that “exports” its local directories (makes them available for client hosts to mount using NFS). On the NFS client, these mounted directories look to users like part of the client’s local file system. With MC/ServiceGuard NFS, the NFS server package containing the exported file systems can move to a different node in the cluster in the event of failure.

**updated for
September 2003**

MC/ServiceGuard NFS Toolkit version A.11.11.03 delivers an enhancement to support File Lock Migration. MC/ServiceGuard/NFS Toolkit was never designed to keep track of which remote NFS clients were holding file locks with the filesystems associated with highly available packages and transition these locks between servers during a failover event. When enabled, the File Lock Migration enhancement removes this limitation.

Software Requirements

- Version A.11.11.01, A.11.11.02, and A.11.11.03 are supported only on HP-UX 11i v1.
- As of September 2003, MC/SG version A.11.15 must be installed, as MC/ServiceGuard NFS Toolkit version A.11.11.03 has a dependency on MC/SG A.11.15.
- To enable the File Lock Migration enhancement, the NFS General Release and Performance Patch PHNE_26388 (or a superseding patch) must be installed.

NOTE

For documentation about MC/ServiceGuard NFS Toolkit in previous releases of HP-UX 11i v1, see *HP-UX 11i December 2001 Release Notes*, available at <http://docs.hp.com>.

Documentation

Product documentation is available on the Web at <http://docs.hp.com/>.

Documentation related to the MC/ServiceGuard NFS products available include the following:

- *Managing MC/ServiceGuard NFS User Manual* (B5140-90012)
- *MC/ServiceGuard NFS Toolkit Version A.11.11.03 Release Notes* (B5140-90013)

HP-UX 11i Minimal Technical Operating Environment (MTOE)

new for June 2001 New for June 2001, the **Minimal Technical** Operating Environment (MTOE) is the smallest and most fundamental OE that is defined specifically for HP workstations. It exists to offer an HP-UX 11i solution to the customer who is interested in a low-cost HP Workstation and a correspondingly basic Operating Environment. The Minimal Technical Operating Environment is directed to the Workstation OEM market and to those customers for whom the Technical Computing Operating Environment (TCOE) is not a suitable solution.

The MTOE contains all the base functionality that is common to the other four OEs, including the base 32/64-bit HP-UX Operating System, network drivers, and other always-installed applications. However, compared to the Technical Computing Operating Environment, the set of additional applications is greatly reduced.

The MTOE is positioned to deliver a lean set of high-demand applications that do not increase purchase cost, support cost, or license cost over the base Operating System.

The HP-UX 11i Minimal Technical Operating Environment includes these always-installed or default-installed applications:

- Base VERITAS Volume Manager (VxVM) (see page 105)
- Codeword iCOD (see page 106)
- Event Monitoring Service (EMS) (see page 106)
- GTK+ Libraries (see page 107)
- HP WBEM Services for HP-UX (see page 109)
- HP-UX Runtime Environment for the Java 2 Platform (see page 110)
- HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors (see page 110)
- HP-UX Web Server Suite (see page 112)
- Judy Libraries (see page 117)
- Mozilla Application Suite (see page 119)
- OpenGL 3D Graphics Developers Kit and Runtime Environment (see page 137)
- Partition Manager (parmgr) (see page 62)
- Perl Programming Language (see page 119)
- Plug-In for the Java 2 Platform for Netscape/Mozilla (see page 122)
- Software Distributor (SD-UX) (see page 177)
- Technical System Configuration (TechSysConf) (see page 138)
- Update-UX (see page 176)

For the available selectable products for this OE, see Table 6-1 on page 99.

OpenGL 3D Graphics Developers Kit and Runtime Environment

The OpenGL 3D Graphics Developers Kit and Runtime Environment is delivered through the Graphics and Technical Computer Environment bundle (B6268AA), which also provides the following 3D APIs: Starbase, PEX, Phigs and OGL.

**updated for
December 2003**

The Graphics and Technical Computer Environment bundle (B6268AA) has been updated to version B.11.11.12.03 to incorporate defect fixes.

**updated for
September 2002** The Graphics and Technical Computer Environment bundle (B6268AA) has been updated to version B.11.11.10.01. New functionality has been added, namely support for FireGL-UX. (For more information, see “Graphics Hardware Support” on page 92.)

NOTE As of the September 2002 11i release, HP 3D Graphics are no longer supported on PA-RISC systems older than 2.0. The 3D graphics code is now optimized for PA 2.0 (64-bit capable) processors and will not execute on older PA-RISC microprocessors.

If you have an older PA-RISC workstation and need local 3D graphics support, HP recommends that you *not* update to the September 2002 release (or later) of the Technical Computing (TCOE) or Minimal Computing (MCOE) Operating Environments. The previous releases of HP-UX 11i contain 3D graphics code that will execute on any PA-RISC microprocessor.

You can determine the PA version with the System Administration Manager (SAM) by selecting “Performance Monitors” and then “System Properties.” The PA version appears on the line labeled “CPU Version.”

**updated for
September 2001** Various defect fixes have been made to improve quality. New functionality has also been added, including:

- level 2 thread support for OpenGL
- 3DSLS and 3DSLS/d support under 11i on fx4 and fx6
- new graphics hardware fx5/fx10 support
- fxe support

Documentation

Both the *Graphics Administration Guide* and *OpenGL Implementation Guide* are available in new releases at the following site:

http://www.hp.com/workstations/support/documentation/hpux_manuals.html

See the release notes for the appropriate versions of the Xserver, Xlib, and the kernel. The *HP OpenGL Release Notes* are located in the following directory after the product is installed: `/opt/graphics/OpenGL/11.00_Rel_Notes`.

Technical System Configuration (TechSysConf)

By delivering part of the functionality that was featured in Easy Setup HP-UX 11.0 (product B5532A) for HP Workstations, the TechSysConf bundle addresses the need of HP workstation and technical server customers for improved out-of-the-box performance. The TechSysConf bundle (version B.11.11.xx) is an always-installed part of the MTOE (and, by extension, the TCOE), and it contains the TC-SysSetup and TC-OpenSource products. (For additional information about these products, see the following section for June 2002. Further information may also be found in *HP-UX 11i Installation and Update Guide* and *Read Before Installing or Updating to HP-UX 11i*.)

**updated for
September 2003** TechSysConf has been updated to version B.11.11.09.xx to incorporate a defect fix.

**updated for March
2003** The TechSysConf bundle has been updated to version B.11.11.08.xx and the TC-OpenSource product has been updated to version B.11.00.08.xx to incorporate defect fixes.

**updated for
September 2002**

The TechSysConf bundle (containing the TC-SysSetup product, version B.11.00.02.xx, and TC-OpenSource product, version B.11.00.02.xx) has been updated to incorporate the following changes:

- The TechSysConf bundle now increases the target system disk space occupancy by only 90MB (rather than 140MB).
- NFS daemons are now only configured on systems with a physical memory size of at least 128MB.
- TechSysConf no longer installs an `/etc/nsswitch.conf` file. However, it still delivers a name service switch file (`/etc/nsswitch.TC-SysSetup`) which can be used to configure sources and lookup orders (for mail aliases, host names, passwords, etc.) suitable for most technical computing environments.

new for June 2002

With the HP-UX 11i June 2002 release, the TechSysConf bundle consists of two component products:

- **TC-SysSetup (version b.11.00.01.xx)**

Alters kernel configurable parameters, assigning values that are proven to increase performance in technical environments. (See Table 6-5 for actual values.)

Alters selected system configuration files to ease NFS, AutoFS, and NIS+ configuration.

Makes other system changes to correct minor nuisances and oversights.

- **TC-OpenSource (version b.11.00.01.xx)**

Delivers a set of high-demand Open Source software tools.

- bash 2.04 (The Bourne-Again Shell)
- tcsh 6.10 (tcsh [a superset of C-shell])
- vim 5.7 (Vi IMproved)
- emacs 20.7 (GNU Emacs)
- gmake 3.79.1 (GNU make)
- less 358 (GNU less)
- xcdroast 0.98alpha9 (X-CD-Roast)
- cdrecord 1.10 (CDRecord)

Impact

The TechSysConf bundle increases the target system disk space occupancy by about 140MB, mostly attributable to the TC-OpenSource product.

Installing the TC-SysSetup product changes kernel parameters, which results in a kernel build and system reboot. Since most of the kernel parameters are selected for the ability to improve performance in typical EDA and MDA application environments, a performance increase should be realized without further kernel tuning.

Specific non-kernel changes include the following:

- Configure the system as an NFS server in `/etc/rc.config.d/nfsconf`.
- Set NFS daemons to 30 and BIO daemons to 16 in `/etc/rc.config.d/nfsconf`. (Both daemon values are changed *only* if they increase current settings.)
- Modify the search sequence and fallback activities in `/etc/nsswitch.conf`.
- Enable AutoFS and automount in `/etc/rc.config.d/nfsconf`.
- Set read and write block size to 32K in `/etc/auto_master`.

- Configure `/etc/passwd` and `/etc/group` to import NIS-served data.

Installation Requirements

There are no unique system requirements or dependencies. This bundle is intended to be installed on HP workstations and technical servers.

Kernel Configurable Parameters

The following table lists the kernel parameters that are changed by installing the TechSysConf bundle. Existing parameter values are tested and are not changed if the new value would be less than the current value.

Table 6-5 Kernel Parameters Changed by TechSysConf

Parameter	Parameter Value ^a <256MB	Parameter Value ^a <1024MB	Parameter Value ^a >=1024MB
<code>create_fastlinks</code>	Ignored ^b	1	1
<code>dbc_min_pct</code>	Ignored ^b	Ignored ^b	Formula ^c
<code>dbc_max_pct</code>	Ignored ^b	Ignored ^b	Formula ^c
<code>hfs_max_ra_blocks</code>	Ignored ^b	20	20
<code>hfs_max_revra_blocks</code>	Ignored ^b	20	20
<code>hfs_ra_per_disk</code>	Ignored ^b	256	256
<code>hfs_revra_per_disk</code>	Ignored ^b	256	256
<code>maxdsiz</code>	268435456	3221225472	3221225472
<code>maxdsiz_64bit</code> (64-bit only)	1073741824	274877906944	274877906944
<code>max_fcp_reqs</code>	Ignored ^b	512	512
<code>maxfiles</code>	Ignored ^b	2048	2048
<code>maxfiles_lim</code>	Ignored ^b	2048	2048
<code>maxssiz</code>	8388608	100610048	100610048
<code>maxssiz_64bit</code> (64-bit only)	8388608	1073741824	1073741824
<code>maxswapchunks</code>	Ignored ^b	1024	16384
<code>max_thread_proc</code>	Ignored ^b	2048	2048
<code>maxtsiz</code>	67108864	1073741824	1073741824
<code>maxtsiz_64bit</code> (64-bit only)	1073741824	4294967296	4294967296

Table 6-5 Kernel Parameters Changed by TechSysConf

Parameter	Parameter Value ^a <256MB	Parameter Value ^a <1024MB	Parameter Value ^a >=1024MB
maxuprc	Ignored ^b	819	3277
maxvgs	Ignored ^b	80	80
msgmap	Ignored ^b	5122	5122
msgmax	Ignored ^b	32768	32768
msgmnb	Ignored ^b	65536	65536
msgmni	Ignored ^b	512	512
msgseg	Ignored ^b	20480	20480
msgssz	Ignored ^b	128	128
msgtql	Ignored ^b	5120	5120
nfile	Ignored ^b	2048	8192
nlocks	Ignored ^b	2048	2048
ninode	Ignored ^b	4000	8192
nkthread	Ignored ^b	2048	6000
nproc	Ignored ^b	1024	4096
npty	Ignored ^b	200	200
nstrpty	Ignored ^b	200	200
nswapdev	Ignored ^b	25	25
semmni	Ignored ^b	1024	4096
semmns	Ignored ^b	2048	8192
semmnu	Ignored ^b	1020	4092
semume	Ignored ^b	512	512
semvmx	Ignored ^b	32767	32767
shmmni	Ignored ^b	512	512
shmseg	Ignored ^b	512	512
shmax (32-bit only) ^d	Ignored ^b	1073741824	1073741824

Table 6-5 Kernel Parameters Changed by TechSysConf

Parameter	Parameter Value ^a <256MB	Parameter Value ^a <1024MB	Parameter Value ^a ≥1024MB
shmmax (64-bit only) ^d	Ignored ^b	2147483648	2147483648
strmsgsz	Ignored ^b	65535	65535
swapmem_on	Ignored ^b	1	1
vps_ceiling	Ignored ^b	64	64
vx_fancyra_enable	Ignored ^b	1	1
vx_ncsize	Ignored ^b	8000	8000
vxfs_max_ra_kbytes	Ignored ^b	1024	1024
vxfs_ra_per_disk	Ignored ^b	1024	1024

- a. Kernel parameter value is changed only if it increases the current setting, except as noted below.
- b. Kernel parameter is not changed.
- c. The value should be determined by the formula: MIN (15, MAX (3, 40000/Memory)) where Memory is in Megabytes. This formula sets 20 percent of memory for static buffer cache up to a maximum of 400MB (when system has 2667MB memory). However, the minimum allowable parameter value is 3 percent, which takes effect when a system of 13333MB is encountered. The formula is applied only if the current value of dbc_min_pct and dbc_max_pct are the defaults (5 and 50 respectively).
- d. Changed for September 2002.

HP-UX 11i Technical Computing Operating Environment (TCOE)

Like the Minimal Technical Operating Environment, the **Technical Computing Operating Environment (TCOE)** contains all the base functionality that is common to the other four OEs, including the base 32/64-bit HP-UX Operating System, network drivers, and other always-installed functionality. While it is *not* a superset of the Foundation 11i OE, it *is* a superset of the Minimal Technical OE. Unlike the Minimal Technical OE, however, the Technical Computing OE is available on both technical servers and workstations.

In addition to the features found in the HP-UX 11i Minimal Technical OE, the HP-UX 11i Technical Computing Operating Environment includes these always-installed or default-installed applications:

- HP CIFS Client and HP CIFS Server (see page 107)
- High Performance Math Libraries (HP MLIB) (see page 143)
- HP 3D Technology for the Java 2 Platform (see page 144)
- HP Message-Passing Interface (MPI) (see page 144)
- HP Visualize Conference (see page 145)
- HP-UX Runtime Environment for the Java 2 Platform (see page 110)
- HP-UX Web Server Suite (see page 112)
- Pluggable Authentication Module (PAM) Kerberos (see page 120)
- Plug-In for the Java 2 Platform for Netscape/Mozilla (see page 122)

For the available selectable products for this OE, see Table 6-1 on page 99.

High Performance Math Libraries (HP MLIB)

The High Performance Math Libraries (HP MLIB) product contains the Linear Algebra Package (LAPACK) and the Vector Library (VECLIB) subprograms, and with the September 2002 release, ScaLAPACK and the Distributed SuperLU library. HP MLIB provides mathematical software and computational kernels for engineering and scientific applications involving linear equations, least squares, eigenvalue problems, and the singular value decomposition.

**updated for
September 2003**

New features for Version 8.5 include the following:

- Full METIS Functionality

This implementation provides the METIS Version 4.0.1 library. It is based on the public-domain METIS, which was developed at the University of Minnesota, Department of Computer Science, and the Army HPC Research Center. The library contains a set of subroutines for graph partitioning, mesh partitioning, and sparse matrix reordering, as well as auxiliary routines. HP MLIB contains the full METIS functionality as that in the public domain METIS; however, the routine names are different. HP MLIB METIS routine names have been prepended with `mllib_` to avoid name conflict on applications and libraries that contain their own local version of METIS.

NOTE

For documentation about HP MLIB in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2003 Release Notes*, available at <http://docs.hp.com>.

Documentation

For more detailed documentation and additional product information, see the *HP MLIB User's Guide* and the *HP MLIB Release Notes* available at the following URLs:

<http://docs.hp.com/>

<http://www.hp.com/go/mlib>

HP 3D Technology for the Java 2 Platform

The HP 3D Technology for the Java 2 Platform contains the classes for creating 3D applications. The HP 3D Technology for the Java Platform may be distributed with your Java applications as long as you adhere to the terms of the LICENSE file. Vendors also need to include an installer.

**updated for June
2003**

HP 3D Technology for the Java Platform version 1.3 contains the classes for creating 3D applications on systems with Java 1.3 and 1.4 and the HP-UX 700 OpenGL 3D Graphics Runtime Environment. HP 3D technology for PA-RISC solutions version 1.3 is supported with the Java Runtime Environment 1.3 and 1.4.

The current Java3D product version 1.2 is being replaced by 2 new Java 3D products (T1868AA and T1869AA). Both these new Java 3D products are the same version 1.3, the only difference is in the way they install. One Java 3D will install into the Java Runtime Environment version 1.3, and the other Java 3D will install into Java Runtime Environment version 1.4.

Documentation

For prerequisites, installation requirements, and other information, read the release notes included in the HP 3D software. Or for the most up-to-date information, go to the Web at <http://www.hp.com/go/java>.

HP Message-Passing Interface (MPI)

HP Message-Passing Interface (MPI) is a high-performance implementation of the Message-Passing Interface Standard. HP MPI complies fully with the 1.2 standard. As of September 2003, HP MPI also complies fully with the 2.0 standard, with restrictions. HP MPI provides an application programming interface and software libraries to support parallel, message-passing applications that are efficient, portable, and flexible.

**updated for
December 2003**

HP MPI Version 2.0 includes the following new features:

- MPI-2 Standard functionality including:
 - Dynamic processes
 - Extended collectives
 - One-sided communications

- Thread safety
- *MPI_BOTTOM* language interoperability
- Updated ROMIO
- Interconnects supported include:
 - HyperFabric
 - TCP/IP on clusters
 - Shared memory for intranode communication
- Visual MPI for debugging and analysis
- Support for truncated messages
- Limited H/A mode
- MPI versioning
- `mpirun` global environment variable settings via command line
- New `mpirun` command line options

**updated for June
2003**

HP MPI has been updated to version 1.8.3 to enhance performance tuning. No new functionality has been added since version 1.8.1.

NOTE

For documentation about HP MPI in previous releases of HP-UX 11i v1, see *HP-UX 11i December 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

The *HP MPI User's Guide, Eighth Edition* and the *HP MPI Release Notes* are available at the following Web sites:

- www.hp.com/go/mpi
- <http://docs.hp.com>

HP Visualize Conference

HP Visualize Conference is a collaborative conferencing solution for HP Workstations that can interoperate with Microsoft's NetMeeting, Sun's SunForum, and SGI's SGImeeting products.

**updated for
December 2003**

HP Visualize Conference version 1.5 adds support for the XFree86 X server running on HP-UX platforms. Support has been added so that HP Visualize Conference now runs on PA-RISC as well as Itanium-2 platforms. Backward compatibility with earlier versions of HP Visualize Conference and NetMeeting 3 has been maintained. Backward compatibility to HP Visualize Conference 1.2 and NetMeeting 2 has been maintained via two running modes:

- T.120 Compatibility mode (HP Visualize 1.2 and NetMeeting 2)
- NetMeeting Compatibility mode

updated for March 2003 HP Visualize Conference version 1.4E (B.11.13.xx) now contains corrections to the permissions and ownerships of some directories, files, and symbolic links.

updated for September 2002 HP Visualize Conference has been updated to version 1.4E to incorporate minor defect fixes. (Versions 1.4A—1.4D also incorporated minor changes.)

Impact

The HP-UX 11i release of HP Visualize Conference is functionally identical to HP Visualize Conference 1.4 for HP-UX 10.20. There is no impact on other system performance or other system components.

Compatibility Issues

HP Visualize Conference 1.4 (B.11.11.06) on HP-UX 11i is compatible with HP Visualize Conference on HP-UX 11.0 and 10.20, Microsoft's NetMeeting, Sun's SunForum, and SGI's SGImeeting.

Documentation

Online help was enhanced at HP Visualize Conference version 1.3 to cover how to utilize NetMeeting 3 functionality:

- TrueColor Application Sharing
- NetMeeting 3 Application Sharing and Control
- Microsoft variant of the T.126 Whiteboard protocol

Selectable Applications

The following applications are selectable and not automatically installed with the 11i Operating Environments. Table on page 99 lists which applications are available for each Operating Environment.

- HP-UX Host Intrusion Detection System (HIDS) (see page 147)
- HP-UX IPFilter (see page 148)
- Ignite-UX (IUX) (see page 148)
- Java Out-of-Box (JAVAOOB) (see page 149)
- Netscape Directory Server (J4258CA) (see page 150)
- PPU Percent Utilization (see page 151)
- Selectable Networking and Mass Storage Drivers (see page 152)

HP-UX Host Intrusion Detection System (HIDS)

The HP-UX Host Intrusion Detection System (HIDS; formerly IDS/9000) provides continuous and near real-time surveillance for HP-UX servers to help identify potential malicious activities on the host.

**updated for
December 2003**

HP-UX HIDS has been updated to version 2.2 as a maintenance release containing defect fixes and a few enhancements. No new functionality is included in this version.

This maintenance release (v2.2) is the actively supported version. All older versions are discontinued. Customers using older versions of the product are strongly encouraged to update to this version.

For more details and specific information, please refer to the product Release Notes (see the following “Documentation” section).

NOTE

For documentation about HP-UX HIDS in previous releases of HP-UX 11i v1, see *HP-UX 11i June 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

All documentation is available on the Web at <http://www.docs.hp.com/hpux/internet/> (select “Intrusion Detection System”), including:

- *HP-UX Host Intrusion Detection System Administrator's Guide*
Updated and enhanced for version 2.2.
- *HP-UX Host Intrusion Detection System Version 2.2 Release Notes*
Product changes and installation.

HP-UX IPFilter

The security product, HP-UX IPFilter (formerly known as IPFilter/9000), provides system firewall capabilities by filtering IP packets to control traffic in and out of a system. HP-UX IPFilter includes support for Static Linking, Gigabit Ethernet, Auto Port Aggregation (APA), and Virtual Local Area Network (VLAN).

**updated for
December 2003**

Version A.03.05.08 includes defect fixes to the product and the documentation.

**updated for
September 2003**

Version A.03.05.07 includes the following:

- Dynamic Connection Allocation (DCA) functionality
- Network Address Translation (NAT) functionality fully supported

NOTE

For documentation about HP-UX IPFilter in previous releases of HP-UX 11i v1, see *HP-UX 11i September 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

For detailed, updated information, see the documents and Web sites listed below:

- Documents (available at <http://docs.hp.com>):
 - *HP-UX IPFilter Administrator's Guide* (B9901-90016)
 - *HP-UX IPFilter Release Note* (B9901-90017)
- Manpages:

<i>ipf</i> (4)	packet filtering kernel interface
<i>ipf</i> (5)	IP packet filter rule syntax
<i>ipf</i> (8)	alters packet filtering kernel's internal lists
<i>ipl</i> (4)	data structure for IP packet log device
<i>ipmon</i> (8)	monitors /dev/ipl for logged packets
<i>ipstat</i> (8)	reports on packet filter statistics and filter list
<i>iptest</i> (1)	test packet rules with arbitrary input
- Web Sites:
 - <http://software.hp.com>
 - <http://docs.hp.com>

Ignite-UX (IUX)

Ignite-UX (IUX) is an HP-UX administration toolset to help you do the following:

- install HP-UX on multiple systems in your network
- create custom install configurations
- recover HP-UX systems remotely
- monitor system-installation status

The complete Ignite-UX product, with support for HP-UX 11i, 11.0 and 10.20, is available on the first CD of the 11i OE media kit.

**updated for
December 2003**

Ignite-UX install environment has been enhanced to include the Gigabit Ethernet libraries to allow lanadmin to configure these network interfaces during installation.

**updated for
September 2003**

Ignite-UX has been updated to version B.4.4 to support the following new drivers. Be sure to configure these new devices before attempting to install HP-UX with Ignite-UX.

- RAID160, `ciss`

For more information about the RAID160 driver, see “HP RAID160 SA Controller Driver (RAID-01 Driver Bundle)” on page 170.

- Fibre Channel, `fcd`

For more information about the Fibre Channel driver, see “Fibre Channel `fcd` Driver” on page 164.

NOTE

For documentation about Ignite-UX in previous releases of HP-UX 11i v1, see *HP-UX 11i March 2003 Release Notes*, available at <http://docs.hp.com>.

Documentation

The *Ignite-UX Administration Guide* has been updated for HP-UX 11i, and is available on the HP-UX Instant Information CD and on the <http://docs.hp.com/> Web site. Another excellent source of information on Ignite-UX is the following Web site:

<http://software.hp.com/products/IUX/>

Java Out-of-Box (JAVAOOB)

**new for March
2002**

Java Out-of-Box (JAVAOOB), version 1.0.00, is a small, installable product that modifies HP-UX kernel parameters and system tunables to allow large server-side Java applications to run more efficiently.

While no claim is made that JAVAOOB will enable *all* Java applications to run (or that it will cause any particular Java application to exhibit optimum performance), the JAVAOOB parameter values were chosen to enable the widest range of Java applications to run successfully without significant impact on other (non-Java) processes. (The original default settings were too low to run the majority of Java applications.)

JAVAOOB modifies the following kernel parameters and system tunables:

<code>maxusers</code>	512
<code>nproc</code>	2048
<code>max_thread_proc</code>	3000
<code>nkthread</code>	6000
<code>nfile</code>	3000
<code>maxfiles</code>	2048
<code>maxfiles_lim</code>	2048
<code>ncallout</code>	6000
<code>maxdsiz</code>	2063835136
<code>tcp_conn_request_max</code>	2048

NOTE

JAVAOOB will not lower a parameter setting. If the current value of a parameter is higher than the value that JAVAOOB would set, then JAVAOOB leaves the parameter value unchanged.

In addition to being provided through the OE media, JAVAOOB is available for download from <http://www.hp.com/go/java>.

Impact

Installing JAVAOOB will increase the amount of memory used by the kernel by approximately 8Mb above that used by the default settings. In theory, a system that is memory-bound, close to the edge, and running memory-intensive applications could experience additional paging activity, thereby lowering system or application performance.

Installation Requirements

Since it is intended for large, server-side Java applications, JAVAOOB is recommended only for systems with at least 512 Mb of physical memory (and not for systems used solely as desktops.)

Documentation

For further information, see the Java web pages at <http://www.hp.com/go/java> and the release notes that are part of the product.

For techniques, tools, and tips on tuning HP-UX for Java applications, visit the following websites:

- Performance Tuning Java on HP-UX at http://h21007.www2.hp.com/dspp/tech/tech_TechDocumentDetailPage_IDX/1,1701,1602,00.html.
- For technical articles and papers, visit the Java topic on the DSPP portal at http://h21007.www2.hp.com/dspp/tech/tech_TechDocumentDetailPage_IDX/1,1711,10202,00.html.
- For HP performance tools for Java products, visit Java Products for HP-UX at <http://www.hp.com/go/java>.

Netscape Directory Server (J4258CA)

The Netscape Directory Server Version is an industry-standard Lightweight Directory Access Protocol (LDAP) directory server. Netscape Directory Server for HP-UX is a selectable product for the HP-UX 11i Foundation OE.

updated for June 2003

The Netscape Directory Server 6.11 for HP-UX is a minor release that contains enhancements and bug fixes from Netscape Directory Server 6.02 and 6.1. This new version contains the following new features:

- faster and more reliable Multi-master replication
- a new HTML-based interface for monitoring replication
- a new script, `template-cl-dump.pl`, is provided to troubleshoot replication by viewing log contents

- logging enhancements
- support for virtual directory information tree views
- virtual attribute search
- support for data interoperability feature to use a proprietary database plug-in
- provides a new plug-in, named Space Insensitive String Syntax plug-in to support space and case insensitive values

**updated for
September 2002**

Netscape Directory Server has been updated to version 6.02, a major release that includes new features and defect fixes. Changes from version 4.16 to 6.02 include the following:

- new and improved management console
- performance improvements
- support for IPv6
- improved scalability
- multi-master replication
- legacy consumer replication
- new and improved “roles” function (including the class of service feature)
- improved access control mechanism
- support for the Plugin API
- new DSML Import/Export Tool
- new distribution and chaining functionality
- implementation of multiple databases

**updated for June
2002**

Netscape Directory Server has been updated to version B.04.16.

**updated for
September 2001**

Version B.04.13 includes features from earlier versions in addition to defect repairs.

Impact

You must purchase Extranet Client Access Licenses to use the Netscape Directory Server for HP-UX if the directory contains any entries for Extranet Users. An Extranet User is an entry in the Netscape Directory that represents a person that is neither an employee nor a full-time independent contractor of the company to which the Netscape Server is licensed. Contact your HP sales representative to purchase licenses. For contact information, see <http://eproducts.hp.com/buy2/index.html>.

Documentation

For more information, refer to the *Netscape Directory Server 6.11 for HP-UX Release Notes* (J4258-90009) available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com/>.

PPU Percent Utilization

PPU Percent Utilization provides cost savings by charging only for the percent utilization of the processors. As computing demands vary, you are charged according to the processor usage. See “On Demand Solutions” on page 200.

**updated for
December 2003**

PPU has been updated to version B.06.03 to incorporate a security improvement.

updated for September 2003 The PPU version B.06.02 software is new for September 2003. There is no functional change to the software from version B.06.00. There are only enhancements to improve the software's operation.

new for June 2003 PPU version B.06.00 for June 2003 is a selectable product available on the 11i v1 Operating Environment and Application Release media.

Documentation

See “On Demand Solutions” on page 200.

Selectable Networking and Mass Storage Drivers

For information on selectable networking and mass storage drivers, see Chapter 7, “Networking and Mass Storage Drivers,” on page 155.

Software Package Builder

Software Package Builder (SPB) provides a visual method to create and edit software packages using the HP-UX Software Distributor (SD) package format. Once software is packaged, it can easily be transferred to a distribution medium, mass produced, and installed by administrators.

The SPB graphical user interface (GUI) provides a window into the software package structure, showing attributes that can be set for each package element. SPB dynamically loads packaging policies and validates software package attributes against these policies. The SPB command line interface (CLI) can also perform validation of software package attributes against policies and supports automated edits to the software package specification.

Currently, most customers do not choose to package software in SD format due to its complexity. SPB should significantly reduce your learning curve and time required to package software. By packaging software in SD format, you gain the ability to easily tell what software is installed on the system, making software management easier.

IMPORTANT

Java Swing behavior may cause navigational inconsistencies when running SPB through an emulator. If your mouse click behavior setting is too slow, it can prevent SPB from buffering all mouse clicks. This could potentially lead to data loss. The SPB product release notes contain a detailed procedure for correcting this performance issue. It is highly recommended that you complete the procedure prior to using SPB.

For this and other troubleshooting topics, refer to the SPB Help system.

updated for December 2003 SPB has been updated to version A.01.00.04 to allow the use of OR relationships when setting corequisite and prerequisite dependencies.

new for September 2003 SPB is now available in the Operating Environments as a selectable product.

Documentation

For further information on Software Package Builder, see the following:

- the `spb` manpage, *spb* (1M)
- the SPB Web site at <http://software.hp.com/products/SPB/>
- the *Software Package Builder 1.0 User's Guide* found at <http://www.docs.hp.com>

What's in this Chapter?

This chapter covers the following topics:

- Always-Installed Networking Drivers (see page 156)
 - Gigabit Ethernet Drivers (see page 157)
 - Fast Ethernet Network Driver btlan (see page 159)
- Selectable Networking Drivers (see page 161)
 - HyperFabric2 PCI Fiber Adapter (see page 162)
 - HSC FDDI Driver (see page 163)
- Always-Installed Mass Storage Drivers (see page 164)
 - Fibre Channel fcd Driver (see page 164)
 - Fibre Channel Tachlite Driver (see page 165)
 - Ultra320 SCSI Adapter Driver (scsiU320-00 Driver Bundle) (see page 167)
 - HP RAID 4Si Driver (see page 167)
- Selectable Mass Storage Drivers (see page 170)
 - HP RAID160 SA Controller Driver (RAID-01 Driver Bundle) (see page 170)
- Online Addition and Replacement of Networking and Mass Storage Cards (see page 171)

Always-Installed Networking Drivers

The drivers of all of the following networking cards are always installed with (or built into) each of the HP-UX 11i Operating Environments.

Check the latest HP-UX Ethernet and Combo Card System-Driver Matrix to see the systems that support each card, how many cards per system and if any software updates are needed. The system-driver matrix is available at <http://www.docs.hp.com> under “Networking and Communications.”

Table 7-1 Always-Installed Networking Drivers^a

Networking Driver Bundle	Driver	Card Number	Description
FDDI-00	fddi4	A3739A/B	PCI FDDI card
FibrChanl-01 and GigEther-01	fcd and igelan	A9782A	PCI-X 2Gb Fibre Channel/1000Base-SX (Fibre) Combination Card
FibrChanl-01 and GigEther-01	fcd and igelan	A9784A	PCI-X 2Gb Fibre Channel/1000Base-T (Copper) Combination Card
GigEther-00	gelan	A4924A, J1642AA	HSC 1000Base-SX (gigabit over fiber) card
GigEther-00	gelan	A4925A	HSC 1000Base-SX (gigabit over fiber) card
GigEther-00	gelan	A4926A	PCI 1000Base-SX (gigabit over fiber) card
GigEther-00	gelan	A4929A	PCI 1000Base-T (gigabit over copper) card
GigEther-01	igelan	A6825A	PCI 1000/Base-T (gigabit over copper) card
GigEther-01	igelan	A6847A	PCI 1000/Base-SX (gigabit over fiber) card
GigEther-01	igelan	A7109A	PCI Gigabit Ethernet BaseT/Ultra 160 combo card
HPUXBase64, HPUXBase32	btlan (btlan6 for 10.20/11.0)	A3738A	PCI 10/100Base-TX card
HPUXBase64, HPUXBase32	btlan (btlan5 for 10.20/11.0)	A5230A	PCI 10/100Base-TX card for servers
HPUXBase64, HPUXBase32	btlan	A5506A	PCI 4-port 10/100Base-TX card
HPUXBase64, HPUXBase32	btlan	A5506B	PCI 4-port 10/100Base-TX card
HPUXBase64, HPUXBase32	btlan (btlan3 for 11.0)	A5838A	PCI Combination Dual port 10/100Base-TX and Wide Ultra2 SCSI card

Table 7-1 Always-Installed Networking Drivers^a (Continued)

Networking Driver Bundle	Driver	Card Number	Description
HPUXBase64, HPUXBase32	btlan (btlan5 for 10.20/11.0)	B5509BA	PCI 10/100Base-TX card for workstations
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3514A opt #001	HSC 10/100Base-TX 2-port for K-Class and T600 servers
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3514A opt #002	HSC 10/100Base-FX (fiber) 2-port for K-Class and T600 servers
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3515A	HSC 10/100Base-TX 1-port for C, J workstations and A, D, R-Class servers (except D200)
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3516A opt #001	HSC 10/100Base-TX 2-port for C, J workstations and A, D, R-Class servers (except D200)
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3516A opt #002	HSC 10/100Base-FX (fiber) 2-port for C, J workstations and A, D, R-class servers (except D200)
HPUXBase64, HPUXBase32	btlan (btlan4 for 10.20/11.0)	J3850A	HSC 10/100Base-TX card for T-Class server
IEther-00	iether	A7011A	PCI-X 2-Port 1000Base-SX (Fibre) card
IEther-00	iether	A7012A	PCI-X 2-Port 1000Base-T (Copper) card

a. The `HWEnable11i` bundle, which is normally installed by default on the 11i OE media, provides the patches that are required for the installation of these networking bundles. When updating an existing 11i system, you can install the `HWEnable11i` bundle *and* the desired networking bundle from the OE media in the same install session to meet software dependencies.

Gigabit Ethernet Drivers

new for December 2003 The `iether` driver now supports two new Gigabit Ethernet cards: the A7011A is a PCI-X 2-Port 1000Base-SX (fiber-based) card; the A7012A is a PCI-X 2-Port 1000Base-T (copper-based) card. If you have purchased either of these cards as a factory-installed card, the driver and its patch dependency (PHNE_28923) will already be on your system. If you are adding either of these cards to an existing system, please make sure you use the December 2003 application media to install patch PHNE_28923 and the required driver bundle (IEther-00).

In the December 2003 release of HP-UX 11i, the Gigabit Ethernet driver `gelan` incorporates defect fixes listed in patch PHNE_28883.

In the December 2003 release of HP-UX 11i, the Gigabit Ethernet driver `igelan` incorporates defect fixes listed in patch `PHNE_29631`.

In the December 2003 release of HP-UX 11i, the Gigabit Ethernet drivers are updated to support various new systems and system upgrades including the `rp4440`, `rp8620`, `rp7420`, and `rx2600`.

The A7012A card does not interoperate with older switches containing a BCM 5400 PHY with a version earlier than C-5. The problem occurs when interfacing with the HP Procurve Module J4115A; version J4115B fixes the problem.

To determine the number of allowable cards per system, the required driver, and the associated software bundle for current Ethernet or combination cards, please see the "HP-UX Ethernet and Combo Card System-Driver Matrix" under the "Networking and Communications" area of <http://docs.hp.com>.

**updated for
September 2003**

With the September 2003 release, the Gigabit Ethernet driver `igelan` has been updated to work with the copper and fiber versions of the PCI-X Combination 2-Gigabit Fibre Channel and 1000Base-SX/T card (A9782A is fiber-based and A9784A is copper-based).

Beginning in September 2003, please check <http://www.docs.hp.com> for online Gigabit Ethernet release notes and installation guide. The `/opt/networkdocs` directory of an HP-UX system will no longer be updated.

On HP-UX 11i, the `ioscan` output will now show the 5 by 5 part number of core (built-in) I/O cards.

Fixed a defect in transmitting NFS READ of 32 Kbytes over a link with a maximum transmission unit of 576 bytes. This affected the A4924A, A4929A, and A4926A Gigabit Ethernet cards on HP-UX 11.0.

NOTE

For documentation about Gigabit Ethernet in previous releases of HP-UX 11i v 1.0, see *HP-UX 11i September 2002 Release Notes*, available at <http://docs.hp.com>.

Documentation

Check the latest HP-UX Ethernet and Combo Card System-Driver Matrix to see the systems that support each card, how many cards per system and if any software updates are needed. The system-driver matrix is available on the Web at <http://www.docs.hp.com> under "Networking and Communications."

For detailed information on advanced features and for troubleshooting Gigabit and Fast Ethernet products, see the *Ethernet Support Guide* formerly called *Using PCI 1000Base-T and HSC/PCI 1000Base-SX* available on the Instant Information CD or under "Networking and Communications" at <http://docs.hp.com>. The *Ethernet Support Guide* is new for December 2003.

For information on installing and configuring the Gigabit Ethernet, see *PCI 1000Base-T and 1000Base-SX Quick Installation and Configuration Guide* (for A6794A, A6825A, and A6847A) or *PCI 1000Base-T and HSC/PCI 1000Base-SX Quick Installation* (for A4942/5/6A and A4929A), available at <http://docs.hp.com>.

Beginning with the June 2002 release, Gigabit Ethernet release notes are also available on the Instant Information CD and at <http://docs.hp.com>.

Fast Ethernet Network Driver `btlan`

new at 11i original release

Starting with HP-UX 11i v 1.0, all of the previous PCI and HSC Fast Ethernet network drivers are combined into a single driver called `btlan`. Also, the new `btlan` driver is always-installed as part of the kernel. This simplifies installation and upgrade.

For HP-UX 11i, the PCI and HSC-based Fast Ethernet network cards previously supported by HP-UX 10.20 and 11.0 drivers `btlan`, `btlan3`, `btlan4`, `btlan5` and `btlan6` are now supported on HP-UX 11i by the `btlan` driver.

Impact

The `btlan` driver works seamlessly with existing HP LAN link administrative commands such as `lanadmin`, `lanscan`, `linkloop`, and `NetTL`.

The `btlan` driver supports the same functions and features as the previous HP-UX 10.20 and 11.0-based drivers. In addition, it also supports the online addition and replacement of networking and mass storage cards on various systems including L-Class, N-Class and Superdome servers.

IMPORTANT

If you have HP-UX 10.20 and 11.00-based scripts that specifically refer to `btlan3`, `btlan4`, `btlan5` or `btlan6`, and if you migrate to HP-UX 11i, you need to change those scripts to refer to `btlan`.

You use the new driver name `btlan` with the following commands:

- `what string`
For example: `what /stand/vmunix | grep btlan`
- `ioscan`
For example: `ioscan -kfc lan | grep btlan`

You will also see the driver name `btlan` as the output in:

- the system file `/stand/system`
- `nettlgen.conf` and in the file `/var/admin/sw/nettl.LOG00`

Files Changed

The following files have changed to include the new `btlan` driver name (most involve just name changes):

- kernel library is now called `/usr/conf/libbtlan.a`
- `nettl formatter/catalog` files (no change except instead of `btlan3`, `btlan4`, `btlan5`, `btlan`, or `btlan6`, it will just refer to `btlan`)
- `debug/q4`
- `lanscan/lanadmin support libraries/catalog` files now have names to reflect `btlan` such as `libdsbtlan.a`, `dsbtlan.cat`, etc.
- master file
- `init scripts/conf` file

- The init script will be `hpbtlan` and the configuration file will be called `hpbtlanconf`.
- The configuration files under `/etc/rc.config.d/` will be replaced by `hpbtlanconf`. When a cold install is performed, this file will be installed for all `btlan` driver claimed cards. If, however, an upgrade is done, you can choose to merge the files using pre-update scripts. If you do not elect to merge during an upgrade, then the files will, by default, be saved as `.obsolete` files which can be later merged manually into the `hpbtlanconf` file.

Selectable Networking Drivers

The drivers of all of the following networking cards are **selectable** on HP-UX 11i, which means you select the ones you want to install. Selectable drivers are not installed with (or built into) the HP-UX 11i Operating Environments.

The following table indicates which drivers are selectable during HP-UX 11i installation.

updated for June 2002

The local and remote recovery features of EMS HA-ATM are now supported for HP-UX workstations (7xx series).

TermIO drivers have been updated to repair defects.

updated for September 2001

ATM drivers have been updated to repair defects and improve performance for PCI and HSC.

TermIO drivers have updated to include 3.3Volt support and to repair defects for PCI MUX and EISA MUX.

updated for June 2001

As of June 2001, several new I/O adapters are fully supported: A6684A, A6685A, A6748A, A6749A, and A6386A.

Previously supported on HP-UX 11.0, the HyperFabric2 PCI fiber adapter A6386A (for A400, A500, L-, N-, V-Class, and Superdome servers, B1000, C3000, J5000, J5600, J6000, and J7000 workstations) is now supported on HP-UX 11i. See "HyperFabric2 PCI Fiber Adapter" on page 162.

Table 7-2 Selectable Networking Drivers

Networking Driver Bundle	Driver	Card Number	Description
100BaseT-00	btlan0	A4308B, A3658A	EISA 100BaseT Card
100BaseT-01	btlan1	A3495A	HPPB 100BaseT card
ATM-00	atm2pci atmpci	A5483A, A5513A, A5515A, J3557A	PCI ATM cards
ATM-01	atm2gsc	J2468A, J2469A, J2499A, J3420B, J3573A	HSC ATM cards
FDDI-01	fddi3	A3722A A3723A	HSC FDDI cards
FDDI-02	fddi	J2157B	HP-PB FDDI card

Table 7-2 Selectable Networking Drivers (Continued)

Networking Driver Bundle	Driver	Card Number	Description
FDDI-03	fddi0	A3659A, B5502BA	EISA FDDI cards
HyprFabrc-00	clicd	A4919A A4920A A4921A A6092A, A6386A	PCI HyperFabric HSC HyperFabric HSC HyperFabric PCI HyperFabric
TermIO-00	pci_mux0	J3592A, A6748A J3593A, A6749A	PCI MUX (8-port) PCI MUX (64-port)
TermIO-01	eisa_mux0	J2482A, J2483A	EISA MUX
TokenRing-00	pcitr	A5783A, A4930A	PCI Token Ring card
TokenRing-01	token2	J2166B	HP-PB Token Ring card
TokenRing-02	token1	J2165B	EISA Token Ring card

HyperFabric2 PCI Fiber Adapter

HyperFabric is a high-speed network link that runs on various HP servers and workstations. HyperFabric supports the IP network protocol stack, TCP/IP and UDP/IP, and NFS. HyperFabric also supports HP's Hyper Messaging Protocol (HMP).

updated for September 2002

- The A6386A HyperFabric2 PCI fiber adapter is now supported on HP-UX 11i on the following HP systems:
 - rp5430, rp5450, rp5470, rp7400, rp7410, and rp8400
- The HSC HyperFabric adapter card for K-Class systems (part number A4920A) has been discontinued.
- The HSC HyperFabric adapter card for D- and R-Class systems (part number A4921A) has been discontinued.

new for June 2001

- The A6386A HyperFabric2 PCI fiber adapter is now supported on HP-UX 11i on these HP systems:
 - A400, A500, L-, N-, V-Class, and Superdome systems
 - B1000, B2000, B2600, C3000, C3600, C3700, J5000, J5600, J6000, J6700, and J7000 workstations
- The clic_ping command is replaced by the clic_probe command

Documentation

For more information, see the HyperFabric User Guide for September 2002, *Installing and Administering HyperFabric* (part number B6257-90031), and the *HP HyperFabric Release Notes* for AR0902 (part number B6257-90032).

HSC FDDI Driver

HP-UX 11i includes code that enhances the HSC FDDI driver. These driver modifications increase performance of the FDDI link by up to 20%.

The performance enhancement was done by making the driver MBLK-based, whereas previously it was MBUF-based. Other code-path and function-call reductions have further improved performance and scalability. These changes are not directly visible to the user and have no effect on current documentation or support.

Always-Installed Mass Storage Drivers

The drivers of all of the following mass storage cards are always installed with (or built into) each of the HP-UX 11i Operating Environments.

Table 7-3 Always-Installed Mass Storage Drivers^a

Mass Storage Driver Bundle	Driver	Card Number	Description
FibrChanl-00	fcT1 fcp fcT1_cntl td fcparray	A5158A	PCI Tachyon TL Fibre Channel card
FibrChanl-00	td fcp fcparray	A6684A	HSC Tachlite Fibre Channel card
FibrChanl-00	td fcp fcparray	A6685A	HSC Tachlite Fibre Channel card
FibrChanl-00	fcT1 fcp fcT1_cntl td fcparray	A6795A	PCI Tachyon XL2 Fibre Channel card
FibrChanl-01	fcd	A6826A	PCI-X Dual Port 2 Gb/1 Gb Fibre Channel Adapter
FibrChanl-01 and GigEther-01	fcd and igelan	A9782A	PCI-X 2Gb Fibre Channel/1000Base-SX (Fiber) Combination Card
FibrChanl-01 and GigEther-01	fcd and igelan	A9784A	PCI-X 2Gb Fibre Channel/1000Base-T (Copper) Combination Card
RAID-00	iop_drv	A5856A	PCI RAID 4Si controller
scsiU320-00	mpt	A7173A	PCI-X 2-Channel Ultra320 SCSI Adapter

- a. The `HWEnable11i` bundle, which is normally installed by default on the 11i OE media, provides the patches that are required for the installation of these mass storage bundles. When updating an existing 11i system, one can install the `HWEnable11i` bundle and the desired mass storage bundle from the OE media in the same install session to meet software dependencies.

Fibre Channel fcd Driver

The `FibrChanl-01` bundle contains the Fibre Channel (`fcd`) driver. `FibrChanl-01` is always-installed in all Operating Environments.

**updated for
December 2003**

With the December 2003 release, the Fibre Channel `fcd` driver now also supports the new A9782A and A9784A Fibre Channel/Gigabit Ethernet Combo HBAs. The A9782A is a new 2-port HBA with a 1 x optical Fibre Channel port and a 1 x optical Gigabit

Ethernet port. The A9784A is a new 2-port HBA with a 1 x optical Fibre Channel port and a 1 x copper Gigabit Ethernet port. Support for the A9782A and A9784A begins with `fcd` driver version B.11.11.02 in bundle `FibrChan1-01`.

new for September 2003 The `fcd` driver supports the Dual Port Fibre Channel adapter A6826A, which is a dual port 2Gb-capable adapter that operates in PCI 33MHz/66MHz and PCI-X 66MHz/100MHz/133MHz bus speeds with a 64-bit bus width.

Documentation

For more information on the A6826A Dual Port Fibre Channel adapter, see the *HP Fibre Channel Mass Storage Adapters Support Guide* located at <http://www.docs.hp.com>, under “Networking and Communications.”

Fibre Channel Tachlite Driver

new for December 2001 Now available is the new 2Gb, single port Fibre Channel Host Bus Adapter. The A6795A PCI Tachyon XL2 adapter operates at bus speeds of up to 66 MHz with 64 bits bus width and can transfer data at a 1Gb or 2Gb transfer rate. The adapter has auto-speed negotiation that enables it to negotiate for the highest speed (1Gb or 2Gb) that is common to the port and to the infrastructure connecting the port. Using the `fcmsutil` diagnostic tool, you can display link speed and Vital Product Data (VPD) information programmed on the adapter.

The A6795A adapter operates on the following platforms running HP-UX 11.00, 11i, or later Operating Environments:

- A400, A500, L-class, N-class, and Superdome servers
- J6000 workstations

The A6795A adapter will support all of the fabric topologies currently supported by the existing Tachlite adapter. Boot support for the first release will be only on the N- and L-class systems.

Summary of Changes

- As of December 2001, the HP-UX 11i Fibre Channel driver version is B.11.11.09.

Although this driver is pre-installed with each of the HP-UX Operating Environments, you can also obtain it from the December 2001 application release CD. The Fibre Channel 11i driver is a common driver for the following Fibre Channel Host Bus Adapters:

- A5158A PCI 1Gb Tachyon TL adapter
- A6684A HSC Tachlite adapter
- A6685A HSC Tachlite adapter
- A6795A PCI 2Gb Tachyon XL2 adapter

- HP has created a new Fibre Channel Storage Network Industry Association (SNIA) Host Bus Adapter (HBA) Application Programming Interface (API). The SNIA HBA API is a C library interface that provides both a common HBA API library for all HP-UX HBA vendors and a vendor-specific API library for HP's Tachyon/Tachlite

Fibre Channel adapters. The API software is part of the driver and is installed at the same time. The intended users of this API are programmers who want to create applications for managing SANs networks.

- As of December 2001, you can use the HSC Tachlite adapters (A6684A and A6685A) on the following additional platforms:
 - D320
 - D330
 - D220
 - D230

The HSC Tachlite adapters (A6684A and A6685A) will also support boot on K260, K360, K460, D390, R390, K370, K570, and K580.

- Changes have also been made to the Fibre Channel online diagnostic tool, `fcmsutil`, to support the A6795A adapter. When you use the command, `fcmsutil/dev/tdx` (where `x` is the number assigned to the adapter), the following additional information will display:
 - Link Speed (1Gb or 2Gb)
 - Dino Present on Card
 - Maximum Frame Size
 - Driver Version

By using the command, `fcmsutil/dev/tdx vpd`, you can display Vital Product Data (VPD) information on the adapter. This information includes the following:

- Product description
- Part number
- Engineering date code
- Part serial number
- Miscellaneous information
- Manufacturing date
- Check sum
- EFI version
- Asset Tag

Documentation

Effective December 2001, the following documents (available at <http://docs.hp.com>) have changed or have been added:

- *Hewlett-Packard Fibre Channel Mass Storage Adapters Manual*
- *HP Fibre Channel Fabric Migration Guide*
- *HP FC SNIA HBA API Programmer's Guide* (new)
- `fcmsutil` (1M) manpage

**updated for
September 2001**

The Tachlite driver enables the HSC Tachlite adapters (A6684A and A6685A), used in the K-, R- and D-Class servers, to have the same fabric capabilities as the PCI Tachlite adapter.

For a current list of driver versions, go to the ITRC web site, <http://itrc.hp.com>. Click *navigate knowledge trees and response center FAQs*. After logging in (if necessary), scroll to the Hardware area and navigate the links to *networks/mass storage connectivity/fibre channel/technical support*. Once you are on the Fibre Channel page, select the Tachlite driver table in the “at a glance” box.

Summary of Changes

- Boot support for the A6685A and A6685A HSC adapters on selected platforms will be available later in 2001. For the latest information on boot support for these adapters and other support information, see the web site mentioned above.

This version of the driver continues to support the following features:

- Fabric zoning and cascading
- Fabric boot and dump for supported platforms (PCI A5158A only)
- Supported configurations
 - Arbitrated private loop
 - Direct fabric attachment
 - QuickLoop (translative mode)
 - Public Loop

Documentation

For more information on supported Fabric topologies, see the *HP Fibre Channel Fabric Migration Guide* located at <http://docs.hp.com>.

The following documents have been revised:

- *HP Fibre Channel Fabric Migration Guide*
- *HP Fibre Channel Mass Storage Adapters Manual*
- *femsutil* (1M) man page

Ultra320 SCSI Adapter Driver (`scsiU320-00 Driver Bundle`)

The HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter fits in a single PCI or PCI-X slot. Each of its two Ultra320 SCSI-3 connectors allows you to form a channel by daisy chaining up to 15 SCSI devices onto each connector for a total of 30 per card.

new for December 2003

The December 2003 release of HP-UX 11i provides support for the HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter. The `scsiU320-00` bundle is always installed and provides the driver `mpt`.

When the A7173A is available, the driver (`mpt`) will also be available at <http://software.hp.com>.

Documentation

For more information, including supported systems and HP-UX versions, see the *HP A7173A PCI-X Dual Channel Ultra320 SCSI Host Bus Adapter Support Guide* at <http://docs.hp.com> as well as the `mptconfig` and `mptutil` manpages.

HP RAID 4Si Driver

HP RAID 4Si (A5856A) combines multiple small, inexpensive disks into an array that appears as a single logical unit or drive. The data is distributed across the disks in order to provide a method for data recovery or reconstruction in the event of a drive failure.

updated for March 2002 A new firmware version (U.01.06) for the RAID 4Si controller is available as a patch from the HP IT Resource Center (ITRC), at <http://itrc.hp.com>. This version supersedes the version (U.01.04) that is currently shipping with the HP RAID 4Si software.

As always we **strongly recommend** that you upgrade to the latest firmware at your convenience.

Summary of Changes

- Boot support (new feature)
 - Ability to boot over the RAID controller.
 - The customer can install the OS onto the logical drives configured on the RAID controller.
 - There is an option now in Ignite-UX called “Configure A5856A” which brings up the configuration tool called IRM that helps in configuring logical drives.
- OLA/R (new feature)
 - Ability to perform Online Addition/Replacement of the RAID controller.
 - The customer can do an OLA/R of the RAID controller using SAM or the `rad` command.
- New firmware revision (U.01.04) of the RAID controller includes the following new features and fixes since earlier released version (U.01.01)
 - Provides support for disk firmware download.
 - Provides capability to handle NVRAM vs. Disk mismatch on replaced boot cards.
 - Provides fix for a problem which causes logical drives to become unavailable when a reconstruction is started from IRM (for example, when changing RAID levels).
 - Provides fix for I/O hang due to cache deadlock.
 - Provides fix for the problem of HOTSPARE sometimes not rebuilding when the disk that is part of the logical drive is pulled out.
 - The firmware image `a5856a_01_04.img` is present in the `/opt/raid4Si/firmware` directory on the system on which you install the RAID software. A help text file, `a5856a_u_01_04.txt`, for installing the image is available in the same directory.
- Diagnostic improvements
 - You can now make use of the new `-v` option of the `irdiag` command. Also, you can use the `irdfd` command to perform disk firmware downloads and the `irconcheck` command to perform consistency checks.

Documentation

updated for June 2001 For more information see the *HP A5856A RAID 4Si PCI 4-Channel Ultra2 SCSI Controller Installation and Administration Guide* at <http://docs.hp.com> and the following manpages:

- `irdfd` (1M) (new)
- `irconcheck` (1M) (new)

- *irdisplay* (1M) (revised)
- *irmd* (1M) (revised)
- *irdiag* (1M) (revised)
- *irm* (1M)
- *i2outil* (1M)

Selectable Mass Storage Drivers

The drivers of all of the following mass storage cards are **selectable**, which means you select the ones you want to install. The selectable mass storage drivers are not installed with (or built into) the HP-UX 11i Operating Environments.

HP RAID160 SA Controller Driver (RAID-01 Driver Bundle)

HP A7143A PCI 4-Channel RAID160 SA SCSI Controller combines multiple small disk drives into an array (logical unit) that functions as a single drive. Data is distributed across the disks providing a way to recover from drive failure and reconstruct data.

**updated for
December 2003**

HP RAID160 SA Controller driver has been updated to improve diagnostic capabilities.

**new for September
2003**

HP RAID160 SA Controller driver (RAID-01 driver bundle) has been added as a selectable driver on all Operating Environments.

The name of the driver for the A7143A is `ciss`.

Documentation

For more information, see the *HP A7143A RAID160 SA Controller Support Guide* at <http://docs.hp.com> and the following manpages: `saconfig` and `sautil`.

Online Addition and Replacement of Networking and Mass Storage Cards

Online Addition and Replacement (OLAR) is a new HP-UX software feature that allows for adding and replacing PCI I/O cards (adapters) while a system is running, eliminating the need to reboot.

This feature enhances overall high-availability since the system can remain active while an I/O adapter is being added or replaced. When combined with other high-availability products, such as MC/ServiceGuard¹, system availability is significantly improved.

Systems Administration Manager (SAM) provides the system administration interface for OLAR.

**updated for
December 2003**

The following new systems now support OL* (OLAR):

- hp 9000 rp7410
- hp 9000 rp7420
- hp 9000 rp8400
- hp 9000 rp8420
- hp 9000 Superdome SD16A, SD32A, SD64A

In addition, hp 9000 rp7420 and rp8420 support attention buttons (“doorbells”).

For a more complete list of systems that support OL*, see the *Interface Card OL* Support Matrix*, available at <http://docs.hp.com>.

**updated for
September 2001**

See “New Attention Indicator Behavior” on page 66 in Chapter 4.

updated June 2001

SAM patch PHCO_23004 for 11i (included in the HWEnable11i patch bundle and automatically installed) changes the behavior of the PCI card slot LED (Attention Indicator) to conform with the newly implemented PCI SHPC (Standard Hotplug Controller) specification.

**new at 11i
original release**

The first release of OLAR in HP-UX 11i provides support for L-Class, N-Class, and Superdome systems. Many future HP systems are being designed with this feature as well.

Documentation

For more information about the OLAR feature, see:

- “Changes to System Administration Manager (SAM)” on page 190
- “New Attention Indicator Behavior” on page 66

For further information, refer to the following documents available at <http://docs.hp.com>:

- *Interface Card OL* Support Guide*

1. For further information on MC/ServiceGuard, see “MC/ServiceGuard” on page 133.

- *Interface Card OL* Support Matrix*
- *Configuring HP-UX for Peripherals*
- *HP System Partitions Guide*
- *Managing Systems and Workgroups: A Guide for HP-UX System Administrators, Edition 6*

What's in This Chapter?

This chapter describes new and changed aspects of installation. (For further current information, see the *HP-UX 11i Installation and Update Guide*.)

- Cold Install Changed (see page 174)
- Ignite-UX (see page 175)
- Update-UX (see page 176)
 - Update-UX Product (see page 176)
 - Update-UX Command Replaces swgettools (see page 176)
- Software Distributor (SD-UX) (see page 177)
 - Multiple Target Management Capabilities Enabled (see page 177)
 - POSIX Enhancements and Exceptions (see page 177)
 - Change in swlist Hides Superseded Patches by Default (see page 177)
 - 64-bit Capability Determined from System, Not /etc/.supported_bits (see page 177)
 - CD Searched For Only When Requested (see page 178)
 - GUI Streamlined (see page 178)
 - Products Rather than Bundles Shown After Auto-Selection (see page 178)
 - Software Groups Added to GUI (see page 178)
 - Layout Version No Longer Converted Automatically (see page 178)
 - Messages Improved or Eliminated (see page 179)
 - Output of swlist Changed (see page 179)
 - swpackage Produces Note Vs. Warning (see page 179) Newest Bundle Selected by Default (see page 179)
 - Newest Bundle Selected by Default (see page 179)
 - control_utils File Improved (see page 179) New Environment Variable, SW_COMPATIBLE, Created (see page 180)
 - SD-UX Changes to Patch Installation (see page 180)
- set_parms Enhanced (see page 182)

Cold Install Changed

**new at 11i
original release**

The HP-UX operating system is now delivered as part of an operating environment. (For more details, see “The HP-UX 11i Operating Environments (OEs)” on page 52, as well as Chapter 6, “HP-UX 11i Version 1.0 Operating Environment Applications,” on page 97.)

Although HP-UX 11i can be cold-installed with or without an Operating Environment (OE), HP strongly recommends installing a complete OE. If you choose to install without an OE, a minimum OS installation must include the following bundles: HPUXBase32 or HPUXBase64, HPUXBaseAux, and OnlineDiag.

CAUTION

Omitting the OnlineDiag bundle may prevent some of your peripheral devices from working since they require the hardware monitors included with the Online Diagnostics. Installing or removing individual products in the OE may lead to dependency issues.

The cold install program is used on all HP-UX systems to initialize a system from scratch. The program is supplied as part of the bootable core/install CD-ROM media set and is the first interaction in the install process.

The major changes to cold install are in response to the changing media structure and the new Operating Environments. Key differences from pre-HP-UX 11i cold install include the following:

- There is no longer a single core/install CD-ROM. Instead, there are two-CD-ROMs and with most installations, software will be loaded from both. The user is prompted when to insert the second CD-ROM.
- In addition to the base operating system, you can also select:
 - Operating Environments
 - some additional networking drivers previously available only on the Application Release media
 - other optional products previously available only on the Application Release media
- Other assorted software will always be loaded and will not be de-selectable.

Ignite-UX

For information about Ignite-UX, see “Ignite-UX (IUX)” on page 148.

Update-UX

Update-UX Product

**updated for
December 2003**

Update-UX has been updated to incorporate defect fixes and to support changes to the Operating Environments.

**updated for
September 2003**

Starting with the September 2003 release, the Update-UX product includes a “default selections” file, `update-ux.selections`, which is installed in `/usr/lib/sw`. This file provides a list of bundles that will be selected for install during an OS update to the September 2003 release.

Also new with the September 2003 version of Update-UX is support for the `-f selection_file` option on the `update-ux` command line. This allows you to create your own selections file and specify that your file be used in place of the “default selections” file. This provides you with the flexibility to “deselect” any bundles listed in the `update-ux.selections` file by providing your own file, which doesn’t contain these bundles. In order to do this, you must first install the September 2003 version of the Update-UX product onto your target system, then copy and edit the `/usr/lib/sw/update-ux.selections` file as desired. Then, when executing `update-ux`, your custom selections file can be specified on the `update-ux` command line via the `-f selection_file` option.

**updated for June
2003**

Update-UX, starting with June 2003 OEUR, includes its own copy of Software Distributor (SD). This allows the system being updated to end up with an HP-UX 11i v1 SD which preserves NIS+ functionality.

**new for March
2002**

The `update-ux` script, once a part of the `SW-DIST.SD-UPDATE` fileset, has been moved to the new Update-UX product in the `Update-UX.UUX` fileset. As a result, customers can now install the `update-ux` script and its accompanying `update-ux` manpage on a 10.20 or 11.00 system (using instructions in the *HP-UX 11i Installation and Update Guide*).

Documentation

For more information, see the *HP-UX 11i Installation and Update Guide* at <http://www.docs.hp.com>, and the manpage `update-ux` (1M).

Update-UX Command Replaces `swgettools`

**new at 11i original
release**

You update an existing HP-UX 10.20 or 11.0 system to 11i using the new `update-ux` command. Beginning at 11i, this command replaces `swgettools` to perform OS updates. With it, you can also add a new Operating Environment (OE), change an OE, or change the OS word-width from 32- to 64-bit on appropriate systems.

For more information on the `update-ux` command, see the *HP-UX 11i Installation and Update Guide*.

Software Distributor (SD-UX)

**new at 11i
original release**

Many changes have been implemented in Software Distributor since 11.0. The following sections detail the changes. (For additional Software Distributor information, see also Chapter 12.)

Multiple Target Management Capabilities Enabled

As part of the Servicecontrol Manager integration, capabilities previously only available through the OpenView Software Distributor version of SD-UX have been enabled. These include the ability to distribute software to multiple remote targets (individually or together), as well as job management capabilities for scheduling jobs and viewing (local or remote) agent logfiles.

POSIX Enhancements and Exceptions

Software Distributor has been enhanced to meet the IEEE Std 1387.2-1995 standard (also referred to as POSIX 7.2) This affects the behavior of the command line interface and the number of options. (See `/usr/lib/sw/sys.defaults` for a complete list of supported options, their descriptions, and default values.)

Exceptions to the POSIX 7.2 standard are as follows:

- Filesets are not allowed to span media.
- The command `swcopy` has not been modified to copy to tape (`swpackage` can be used for this instead).
- User interaction for tape changes is not handled in the command line of SD-UX.
- The only known exception to the distributed option of the POSIX 7.2 standard is that `swmodify` cannot be run against distributed systems.

Change in `swlist` Hides Superseded Patches by Default

In 11.0, `swlist` shows all installed patches including superseded ones. However, the 11i default behavior is *not* to show superseded patches. This can be overcome, returning to 11.0 standard behavior, by setting `-x show_superseded_patches=true` on the `swlist` command line or in the defaults files.

64-bit Capability Determined from System, Not `/etc/.supported_bits`

In 11.0, SD-UX reads the `/etc/.supported_bits` file to map model strings to either 32-, 32/64-, or 64-bit capability. From time to time, synchronization breakdowns between the model command and the contents of `/etc/.supported_bits` have created trouble on 64-bit systems.

To prevent synchronization breakdowns, SD-UX in 11i has changed to get the necessary information directly from the system, rather than using a look-up table.

CD Searched For Only When Requested

With the release of 11.0, SD-UX introduced the automatic discovery and mounting of a CD. However, SD-UX always looked for the CD even if that was not what was wanted. This made the start-up of the GUI slower than necessary.

While the functionality is still available in the GUI, SD-UX now only performs this action when you push a new button in the Source Dialog called “Find Local CD.”

GUI Streamlined

For 11i, the SD-UX GUI requires fewer confirmations. It has been streamlined to reduce the number of verification and informational popups.

Products Rather than Bundles Shown After Auto-Selection

In 11.0, GUI software selection using “Match What Target Has” or “Automatically select patches for software installed on target” could be confusing because the products in the bundles were not automatically marked for selection in the GUI.

The new 11i behavior provides a product-level view that shows which software has been matched. After inspecting the results of the automatic selection, you can then continue with the installation or change the view back to a bundle level.

See “SD-UX Changes to Patch Installation” on page 180 for details.

Software Groups Added to GUI

The `-f` option to `swinstall`, `swremove`, `swcopy` and `swlist`, which has allowed users to specify collections of software through a file, has been incorporated into the GUI. New actions have been added to allow SD-UX GUI users to save selected software in a “Software Group” (which creates a group) and to select that “Software Group” in subsequent sessions.

Layout Version No Longer Converted Automatically

In 11.0 SD-UX, commands automatically converted Installed Product Database (IPD) and depot catalogs to layout version 1.0 or the layout version specified via the `-x layout_version=...` option on the command line.

In 11i, no SD-UX command will automatically convert the layout version of an existing target, IPD, or depot catalog, even if the `-x layout_version=...` option is specified on the command line. To change the layout version of the IPD or depot, an explicit `swmodify` command is needed to make the conversion.

To convert a 0.8 depot or root to layout version 1.0, use the following:

```
swmodify -a layout_version=1.0 @ <depot_or_root>
```

To convert a 1.0 depot or root back to layout version 0.8 use the following:

```
swmodify -a layout_version=0.8 @ <depot_or_root>
```

As a result of this, the `-x layout_version` option should no longer be needed except when creating a depot that is to be in layout version 0.8 format. Then the `-x layout_version=0.8` option is needed for the `swpackage` and/or `swcopy` commands used to initially create the depot. (By default, SD-UX commands that create depots will create them in layout version 1.0 format.)

Messages Improved or Eliminated

To eliminate unnecessary messages—and to make remaining messages more useful in diagnosing the problem or condition being recorded—many error, warning, and information messages have been removed from or have changed in the SD-UX log files.

Output of `swlist` Changed

The output of `swlist` has changed in the following ways:

- The `control_file` attribute is no longer displayed at the product- or fileset-levels by default when using the `-v` option, unless the `-l` file-level is also specified on the command line. Also, a new level, `control_file`, has been created to show just `control_file` attributes.
- Listing the product or fileset `control_file` attribute via `-a control_files` is unchanged. This provides performance improvement when listing products and filesets.
- The `source_path` attribute no longer exists in depots and is not displayed with the file-level attributes.
- The command `swlist -l bundle ...` (once used to list non-bundle products if there were no bundles in the source) has been changed so that it now lists nothing.

`swpackage` Produces Note Vs. Warning

The command `swpackage` no longer produces a warning when an unknown attribute name is encountered. Instead, it now produces a note stating that the attribute is being packaged as a “vendor defined attribute.”

Newest Bundle Selected by Default

Previously, when you specified an unqualified bundle name for selection and the bundle name was ambiguous due to multiple revisions, SD-UX printed out an “ambiguous bundle” error message. Now, SD-UX selects the newest version of the bundle by default.

This change in behavior makes bundle selection consistent with what SD-UX does for products and filesets when multiple versions of these are available in the source.

`control_utils` File Improved

New functionality has been added and defect repair has been done to the `/usr/sbin/sw/control_utils` file. Documentation on the `control_utils` functions can be found at http://software.hp.com/SD_AT_HP/information_library.html. The `control_utils` library is a collection of shell functions which can help packagers produce better software packages.

New Environment Variable, `SW_COMPATIBLE`, Created

A new environment variable, `SW_COMPATIBLE`, has been created for use during the execution of a verify script that is called by the `swverify` command. If the software being considered is compatible with the system it is installed on, the variable will be set to `TRUE`. If it is incompatible, it will be set to `FALSE`. This new variable will help control-script writers determine if installed software is incompatible and should be removed from a system.

SD-UX Changes to Patch Installation

The SD-UX patch installation paradigm has changed for HP-UX 11i. To install patches on HP-UX 10.x systems, HP recommended that you use the `match_target` (Match What Target Has) option to match patches to the target. However, 10.x SD-UX could not identify specific software as patches.

With HP-UX 11i, SD-UX can recognize patches based on their “internal attributes.” This provides more control over patch management than in previous releases.

`patch_match_target`

The `match_target` option still functions, but no longer matches patches to targets. With 11i, setting the `patch_match_target` option to `TRUE` automatically selects the latest patches that correspond to software on the target. The default setting is `patch_match_target=false`.

NOTE

Since the `patch_match_target` and `match_target` options cannot both be set to `TRUE` in the same `swinstall` command, you should use the `match_target` option to update from HP-UX 10.x, but use `patch_match_target` to install new patches on systems already running HP-UX 11i. (This option selects patches that apply to software already installed on an 11i system.)

The 11i `autoselect_patches` option (`TRUE` by default) automatically selects patches to match software selected for installation. It lets you install patches at the same time you install base software. In addition to the base software selected by the `match_target` option, the `autoselect_patches` option provides the means for selecting appropriate patches during the update process.

Patch Filtering

With 11i, you can more interactively manage your patch process via Patch Filtering. By using the `category_tag` and `patch_filter` options plus various version qualifiers, you can select patches based on pre-defined criteria.

Category Tag Information

With 11i, SD-UX category tags are used to identify types of patches. These category tags can be used to select various patches for installation. The category tags include the following:

```
general_release
critical
hardware_enablement
defect_repair
```

```
corruption
enhancement
memory_leak
panic
halts_system
```

By specifying the category (c) tag in the SD-UX version specification, you can select all patches that contain that specific category tag. For example, using the SD-UX command line interface, you can select all patches in the depot that correspond to currently installed software (and that contain the category tag “critical”) by entering the following:

```
swinstall -x autoreboot=true -x patch_match_target=true \
-x patch_filter="*.*,c=critical" -s depot_name
```

By using the pipe (|) function, you can combine category tags. For example, to install patches that are either critical OR hardware_enablement, enter the following:

```
swinstall -x autoreboot=true -x patch_match_target=true \
-x patch_filter="*.*,c=critical|hardware_enablement" \
-s depot_name
```

To preview the patches that are selected for a particular swinstall session, the -p (preview) option can be used. The -p option will cause SD-UX to analyze the installation, then exit (that is, the actual installation will not be performed). Look in the /var/adm/sw/swinstall.log file to determine which patches were selected.

To use category tags with the SD-UX Graphical User Interface, do the following:

- Step 1.** Under the Options menu, select Manage Patch Selection.
- Step 2.** Then select the box labeled “Automatically select patches for software installed on the target.”
- Step 3.** In the “Filter...” text field, add the desired filters to the *.*. (For example, to select only the critical patches, the Filter... field would appear as *.* ,c=critical. Likewise, to install all the patches that are critical OR hardware_enablement, the Filter... field should appear as *.* ,c=critical|hardware_enablement.)
- Step 4.** Select OK.

Clicking the Filter... button will display a list of the predefined category tags already formatted for use in the Filter... field. Selecting the desired category tag from this list and then selecting OK will add that, and only that, category tag to the Filter... field. (Also shown under the Filter... field is the list of all category tags found in the source depot.)

The list of patches that were selected for install can then be viewed by double-clicking on the bundle in the main SD-UX window. You can then deselect any patches that you may not want to install. (Be careful not to break any documented patch dependencies.) Continue with the install (analysis) as with any other patch installation.

For more complete information on 11i Interactive Patch Management, refer to the manual *Software Distributor Administration Guide*, part no. B2355-90699.

Documentation

The *Software Distributor Administration Guide* has been extensively updated for accuracy and completeness (including many new examples) for HP-UX 11i and is available on the HP-UX Instant Information CD and on the <http://docs.hp.com> web site. Another excellent source of information on SD-UX is the SD-UX web site:

http://software.hp.com/SD_AT_HP/

set_parms Enhanced

**new at 11i
original release**

The `set_parms` program is a GUI/TUI interface that normally runs only the first time any HP-UX system is booted after installation if hostname/networking information has not been set up in advance.

For HP-UX 11i, `set_parms` has been enhanced to allow you to select which networking interface to set up. In prior releases, `set_parms` would pick the lowest numbered LAN interface to configure in the absence of any other information. This was often the wrong choice, especially when FDDI interfaces or other optional interfaces were present on the system, forcing users into extra steps to configure the system properly.

This change will allow you to pick the LAN interface to be configured in both the case of enabling DHCP (the user picks just after the decision to use DHCP) and in the normal mainline case of setting an IP address (the user picks the interface just before setting the IP address). With this change, no additional configuration steps are immediately needed to get the system operational.

This change does not fix any previous defects.

There is a new manpage, `set_parms` (1M), delivered at HP-UX 11i. However, the program itself is not new.

What's in This Chapter?

This chapter describes changes that may be of particular interest to system administrators.

- Compressed Dump Available on Software Pack (see page 184)
- Interrupt Migration Available on Software Pack (see page 185)
- Processor Sets Available on Software Pack (see page 186)
- The uname Command Outputs B.11.11 (see page 188)
- New Option for top (see page 189)
- Changes to System Administration Manager (SAM) (see page 190)
 - Disks and File Systems Area (see page 190)
 - Kernel Configuration (see page 190)
 - Networking and Communications (see page 191)
 - Network File Systems (see page 191)
 - Network Interface Cards (see page 191)
 - Peripheral Devices (see page 192)
 - System Properties (see page 193)
 - Printers and Plotters (see page 193)
 - Terminal and Modems (see page 193)
 - Documentation Change (see page 193)
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 - Additional SAM Changes (see page 194)
- syslog File Logging Changes for su and login (see page 195)
- Process Resource Manager (PRM) Disk Bandwidth Control (see page 196)
- HP Distributed Print Service Deprecated (see page 197)
- Diagnostics: EMS Hardware Monitors (see page 198)
- Improved ioscan Description Field for PCI Devices (see page 199)
- On Demand Solutions (see page 200)

Compressed Dump Available on Software Pack

new for September 2003 NEWADB11i delivers an enhanced version of *adb* (1), which supports the new crashdump format used by Compressed Dump, in addition to providing other features. NEWADB11i is available for download from Software Depot (<http://software.hp.com>). Select enhancement releases, and then newadb.

new for June 2003 As of June 2003, Compressed Dump is available on Software Pack. The goal of the Compressed Dump feature is to speed up the memory dump for HP-UX in the event of a system crash, so that dumps are taken faster and system availability is improved. This feature is primarily targeted for “large memory machines” running HP-UX 11i v1.

For more information about Software Pack, see “Software Pack -- Optional HP-UX 11i Core Enhancements” on page 54.

Interrupt Migration Available on Software Pack

new for June 2002 As of June 2002, Interrupt Migration is available on Software Pack. Interrupt Migration allows migration of external I/O interrupts from one processor to another and provides an interface to enable or disable CPUs to handle interrupts.

For further information, see *Interrupt Migration Product Note*, available at <http://docs.hp.com>.

For more information about Software Pack, see “Software Pack -- Optional HP-UX 11i Core Enhancements” on page 54.

Processor Sets Available on Software Pack

new for
December 2001

What are Processor Sets?

HP-UX Processor Sets offer a flexible mechanism for managing system processor resources among multiple workloads, users, and departments within an enterprise.

A processor set represents a set of processors grouped together for exclusive access to applications assigned to that processor set. Each application is assigned to a processor set and will run only on processors in the assigned processor set.

Processor sets allow partitioning of the system into multiple Scheduling Allocation Domains, such that workloads running in different processor sets do not contend with one another for system processor resources. This capability makes server consolidation on large systems more efficient.

Resource management based on processor sets is completely hardware platform independent and can be used on any HP-UX 11i multiprocessor system.

Processor sets are integrated with HP-UX Process Resource Manager. A PRM group can now be mapped to a processor set for processor resources rather than processor shares.

NOTE

Any application that programatically uses the processor sets system call interfaces must be compiled with the header files installed with the Processor Sets product.

Where to Find Information

For detailed information about the Processor Sets feature see the following documentation:

- Processor Sets Manpages:
 - *pset_create* (2)
 - *pset_assign* (2)
 - *pset_bind* (2)
 - *pset_destroy* (2)
 - *pset_ctl* (2)
 - *pset_getattr* (2)
 - *pset_setattr* (2)
 - *psrset* (1M)
 - *pstat_getpset* (2)
 - *pthread_pset_bind_up* (3T)
- The Processor Sets documentation at the HP Documentation web site:
<http://docs.hp.com/hpux/11i/index.html#Processor%20Sets>
- The *HP Process Resource Manager User's Guide* available on the September 2001 HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com> and <http://www.hp.com/go/hpux>.

- For details on using processor sets on nPartition systems, refer to the *HP System Partitions Guide*, available on the HP-UX 11i Instant Information CD and on the Web at <http://docs.hp.com>.
- For more information about Software Pack, see “Software Pack -- Optional HP-UX 11i Core Enhancements” on page 54.

The `uname` Command Outputs B.11.11

**new at 11i
original release**

The `uname` command for identifying the version of HP-UX that your system is running will return the following version name on an 11i system:

```
B.11.11
```

To guarantee compatibility on current and future platforms, you can use the new interfaces to `getconf` and `confstr` to retrieve unique machine identifiers. For more information, see the manpages and in Chapter 15, “Programming,” in the section “Machine Identifier Changes to `confstr`” on page 299. See the `getconf` (1) and `confstr` (3C) manpages for more information on these commands.

You can also determine what versions of software and patches are installed on your system by using the following `swlist` command:

```
$ /usr/sbin/swlist -l bundle
```

New Option for top

A new `-h` option to the `top` command is provided to suppress the individual CPU state information for multiprocessor systems. If the `-h` option is specified, only the average of all CPU activities will be displayed.

The change enables `top` to display more processes on a standard (80x24) screen without the screen being dominated by state information of individual CPUs.

The `top` (1) manpage has been updated to include the new option.

Changes to System Administration Manager (SAM)

The `/usr/sbin/sam` command starts a menu-driven System Administration Manager (SAM) program that makes it easy to perform system administration tasks with only limited, specialized knowledge of the HP-UX operating system.

SAM has been enhanced to support new devices and features in the following areas within its interface: Disks and File Systems, Kernel Configuration, Networking and Communications, Network File Systems and Interface Cards, Peripheral Devices, Printers and Plotters, and Terminals and Modems. HP-UX and SAM discontinued support of NFS Diskless as of HP-UX 11.0.

Disks and File Systems Area

**updated for
March 2003**

- With the release of patch PHCO_27374, HP VERITAS Enterprise Administrator (VEA) can now be launched from SAM.

**updated for
December 2002**

- Added support for HP SureStore Virtual Array 7400 and 7405 disk arrays.

**updated for
September 2002**

- HP VERITAS Volume Manager (VxVM) has been upgraded to version 3.5. HP VERITAS Enterprise Administrator (VEA) has replaced HP VERITAS Manager Storage Administrator (`vmsa`). VEA can be launched from the command line with the command `/opt/VRTSob/bin/vea`. For further information, see “Base VERITAS Volume Manager (VxVM)” on page 105.

**updated for
June 2001**

- Added support for the new HP SureStore Virtual Array 7100 (A6188A) disk array and will now identify Hitachi XP48 and Array LUNs.

**new at 11i
original release**

- Added support for the HP SureStore Disk Array FC60. This allows you to manage larger volumes of mass storage. This support was also added in a patch to 10.20 and 11.0.
- Added support for the HP SureStore Disk Array XP256. This allows you to manage larger volumes of mass storage (up to 11 Terabytes). This support was also added in a patch to 10.20 and 11.0.
- Added recognition of disks being used by HP VERITAS Volume Manager (VxVM) and their associated Disk Groups and Volumes. You can launch the HP VERITAS Manager Storage Administrator (`vmsa`) tool from within the SAM Disks and File Systems area.

Kernel Configuration

- Added support for dynamic tunables. These changes allow a user to tune dynamic tunables using SAM and have the values take effect immediately. The user will see differences in modifying tunable parameters and in applying tuned parameter sets. When modifying a tunable, the value/formula selected by the user will take effect

immediately if the tunable is dynamic. In applying tuned sets, the entire tuned set will take effect immediately if every tunable in the set is dynamic. Otherwise, the tuned set won't take effect until the kernel is rebuilt and the system is rebooted.

- Added support for kernel logging. Kernel logging is a new feature for 11i. Through SAM, system administrators will be allowed to modify options associated with this feature, such as turning logging ON and OFF, for many of the kernel subsystems (such as VxFS File System, virtual memory, etc.) The subsystems are capable of recording information at various levels ranging from simple status messages to catastrophic failures. These logs can be read through SAM, either from kernel memory or from a file on a disk.

Networking and Communications

updated for
December 2002

- Added support for IPv6. SAM can be used to configure IPv6 addresses for network interfaces. IPv6 support is also added to HOSTS, DNS, and Name Service Switch functional areas of SAM.
- Added support to add default routes. SAM can be used to configure default routes to the system. Both IPv6 and IPv4 default routes can be added, modified, and administered through SAM.
- Added support for configuring VLAN (Virtual LAN). SAM can be used to configure and administer VLAN through a patch in HP-UX 11i version 1.0.

Network File Systems

- Support for NFS over TCP/IP. NFS supports exporting a file system using the TCP/IP protocol. Accordingly, the Network File Systems area in SAM has been enhanced to support this new NFS feature. Now, a user can choose between TCP and UDP protocols to export file systems.

Network Interface Cards

updated for
December 2002

- Added support for IGELAN card, an Intel-based network interface card.
- Added support for Gigabit Ethernet card. A system administrator can configure, modify the supported parameters, and also unconfigure Gigabit Ethernet cards. This new SAM support is provided to both 1000Base-T and 1000Base-SX Gigabit Ethernet cards. This support is also available only on 11.0 through patches.
- Added support for 100-BaseT cards. The system administrator can configure 100-BaseT cards, modify any of the supported parameters, and unconfigure 100-BaseT cards. This support is also available on 10.20 and 11.0 through patches.
- Added support for Independent Hardware Vendor (IHV). The system administrator can configure network interface cards manufactured by third party vendors that conform to the exported SAM Networking interface. Users can configure, unconfigure, and modify any of the supported parameters of the card.

Peripheral Devices

**updated for
March 2003**

- The HP-UX iSCSI (SCSI over TCP/IP) Software Driver is now supported by SAM. With SAM, system administrators can add/remove iSCSI drivers from the kernel and can manage storage accessible by the iSCSI Software Driver. SAM provides system administrators with a user interface to view statically configured iSCSI targets, add new iSCSI targets, and delete existing iSCSI targets from the kernel registry. This functionality is available from SAM -> Peripheral Devices -> iSCSI subarea.

**updated for
June 2001**

- Added support for PCI Card Online Addition and Replacement (OLAR) on systems with OLAR-capable hardware, for Superdome systems, N-Class, and L-Class systems.

This change allows you to add or replace PCI cards online without requiring a reboot. SAM shows the I/O slot number and the OLAR driver state (active, suspended, error, not OLAR-capable). Through the Actions menu in the Peripheral Devices / Cards screen, you can replace a card, turn on the I/O slot attention LED (so you can locate the slot more easily), bring a suspended card online, and view OLAR-specific information about the card and slot. In addition, different instructions are provided depending on whether or not the card is in a slot that is capable of OLAR.

NOTE

SAM patch PHCO_23004 for 11i (included in the HWEnable11i patch bundle and automatically installed) changes the behavior of the PCI card slot LED (Attention Indicator) to conform with the newly implemented PCI SHPC (Standard Hotplug Controller) specification.

Essentially, the meanings for OLAR “FLASHING” (BLINKING) and “ON” LED are reversed to meet the specification.

See “New Attention Indicator Behavior” on page 66 in Chapter 4 for more details.

- Modified cards screen layout to be hierarchical.

You can open mass storage interface cards (SCSI, fibrechannel) to view storage devices attached to a card. This enables you to quickly identify devices controlled through a particular card resource and therefore affected if the card were suspended.

Because only the attached devices are displayed, the hierarchical view is more convenient and easier to use than backtracking to the Devices List from the Peripheral Devices area.

- Added new Actions menu item, Analyze Critical Resources.

This menu item displays a dialog listing all resources, including devices, file systems, device files, and processes that are affected if the selected card fails or is suspended from operation. It will work on systems and cards that are capable of OLAR, as well as those that are not. It determines if any of the resources are critical to HP-UX or SAM (and this would cause either to fail if the resources were lost). This menu item properly accounts for resources that have alternates, backups, or mirrors.

- Added support for DLT device tape densities (DLT_42500_24, DLT_42500_56, DLT_62500_64, DLT_81633_64).

- In the `Tape Devices` and `Backup and Recovery` areas, added support for the following new tape drives:
 - HP C7145/C7146 Autochangers
 - HP Surestore SDKT 220 tape drive
- Added device support for PCI multiplexer in `Terminals and Modems` area.
- Added device support for HP SureStore Disk Array FC60 and the HP SureStore Disk Array XP256 (as described in the section “Disks and File Systems Area” on page 190).

System Properties

**new for
June 2001**

- In the `System Properties` area, SAM recognizes new processors, if available on the system, and displays information.

Printers and Plotters

- Added support for the Super I/O parallel interface. This allows SAM to recognize this parallel interface and configure a printer for it.
- Updated the software products supported by SAM that allow the user to configure a network printer that has a JetDirect interface card.
- Removed obsolete JetDirect software (`/usr/lib/admin/hpnpcfg`) and added support for the new HP JetDirect Printer Installer (`/opt/hpnp1/admin/hppi`) software. You can now use SAM to configure a network printer using the new HP JetDirect Printer Installer. SAM still supports the HP JetAdmin Software (`/opt/hpnp/admin/jetadmin`).

Terminal and Modems

- Added support for PCI multiplexer cards.
- Added support for modems with hardware flow control.

Documentation Change

- The `sam` (1M) manpage and online help have been updated.

Possible Future Changes

Performance improvements are planned for Card OLAR code in the `Peripherals Devices` area.

In the future, SAM is planning to obsolete the following:

- `Instruments` section under the `Peripheral Devices` area - HP-IB instruments will no longer be supported.
- Run SAM on `Remote Systems` area - The ServiceControl Manager product will be handling multi-system management.
- The `Process Management` area

- The Routine Tasks area
- Backup and Recover - The `fbackup` and `frecover` commands will still be available from the command line.
- In the Performance Monitors area, the following areas will be removed as SAM provides no added value above the existing commands (listed in parenthesis):
 - Disk and Terminal Activity (`iostat`)
 - Inter-Process Communication Facility Status (`ipcs`)
 - Process with the Highest CPU Usage (`top`)
 - System Activity (`sar`)
 - Virtual Memory Activity (`vmstat`)

Additional SAM Changes

The Guardian Service Processor was introduced for the N4000 mid-range servers with the May 1999 Extension Pack and subsequently on all new servers. (See “Service Processor (GSP or MP)” on page 84 in Chapter 3 for more information.) The new card has a port for the system console, as well as optional ports that can be used to connect terminals, modems, and Uninterruptable Power Supplies (UPS). SAM has been modified to aid in the configuration of these optional ports.

SAM allows you to launch the Partition Manager (`parmgr`), the new system administration tool that supports the initial and ongoing configuration of Superdome systems. See “Partition Manager (`parmgr`)” on page 62 in Chapter 2 for details.

In this release, SAM allows selecting workstation kernel parameter sets to tune your system for CAE/ME or EE applications. See “Workstation Tuned Kernel Parameters” on page 93 in Chapter 3 for more information.

syslog File Logging Changes for su and login

**new at 11i
original release**

This change will only affect you if you write or use programs or scripts that parse the syslog file.

The format of text messages logged in the syslog file by the `su` and `login` commands has changed slightly. Specifically, `su` events are now preceded by `'su:'` and `login` events are now preceded by `'login:'`. As a result, syslog output is now more consistent with the format of messages generated by other commands. It is also easier for programs to operate that parse syslog output.

Aside from affecting the text logged in the syslog file, this change may possibly impact any programs that parse the syslog file, such as certain security monitoring tools.

Programs that read syslog files looking for `su` and `login` events will need to take this change into account.

Process Resource Manager (PRM) Disk Bandwidth Control

This release allows Process Resource Manager (PRM) to report and control disk I/O bandwidth per LVM device and VxVM device. (VxVM is the VERITAS Volume Manager.) Based on user-configured priorities, PRM will reorder LVM or VxVM disk queues to enforce the percentage of disk bandwidth a PRM group receives in an I/O-constrained environment. The functionality is documented in the PRM manpages.

HP Distributed Print Service Deprecated

**new at 11i
original release**

The HP Distributed Print Service (HPDPS) print environment is being deprecated at 11i and will be removed in a future release. HPDPS, however, will continue to be supported for HP-UX 11.0 and 10.20 until further notice.

Four options are available for print services in 11i:

1. the LP spooler, which is part of the HP-UX operating system
2. the HP DirectJet 4000 Printing Appliance
3. the HP Document Router
4. the HP/Dazel Output Server

Each option beyond the first is additive and increases in cost. Option 1 will provide base-level print services. Option 2 will spool print jobs from Windows clients and provide Web-accessible print queues, management, and configuration. Option 3 will automate the delivery of documents and provide a Web-based administrative interface for TCP-connected network printers, fax, and email. Option 4 will provide an enterprise-wide information delivery infrastructure to enable reliable document delivery and centralized print management across the entire enterprise.

Options 2 through 4 are available directly from HP; contact your local HP office for further information about functionality, platform support, and prices. Migration from HPDPS to Options 2 through 4 will require reconfiguration and setup of the print environment. Contact HP for assistance in performing this migration.

Option 3, the HP Document Router, most closely replicates the services that were provided by HPDPS although there is not a one-to-one mapping of commands.

HPDPS commands that are being deprecated are listed here for quick reference:

pdclean, pdcreate, pddcesetup, pddelete, pddisable, pdenable, pdgwcfg, pdls, pdmod, pdmsg, pdmsghlp, pdpause, pdpr, pdpromote, pdps, pdq, pdresubmit, pdresume, pdrm, pdset, pdshutdown, pdstartclient, pdstartspl, pdstartsub, and pdstopd.

Diagnostics: EMS Hardware Monitors

The Event Monitoring System (EMS) Hardware Monitors allow you to monitor the operation of a wide variety of hardware products.

When monitors encounter failure or other unusual events, they generate messages with Description, Cause, and Action statements which can be used to prevent and reduce downtime caused by hardware failures.

EMS Hardware Monitors are installed automatically with the Support Tools Manager (STM). After installation, monitors must be enabled to begin operation. Most hardware monitors are supplied with a default configuration; additional configuration is optional. A few hardware monitors, such as the Fibre Channel Arbitrated Loop Hub Monitor, have special requirements. See the *EMS Hardware Monitors User's Guide* for details.

EMS Hardware Monitors require minimal maintenance once installed and enabled. Default notification definitions are provided so additional configuration is not necessary. New hardware resources added to the system are automatically included in the monitoring structure.

For more information, see <http://docs.hp.com/hpux/diag>.

Integration with Other Applications

The Event Monitoring System (EMS) Hardware Monitors can be integrated with applications responsible for maintaining system availability, such as MC/ServiceGuard. If configured to do so, they can provide event notification to system management applications such as HP OpenView IT/O and HP Network Node Manager.

The EMS Hardware Monitors use the same EMS framework as the EMS High Availability (HA) monitors, a separate set of monitors available at additional cost.

Some of the hardware monitors for fibre channel products write event information to text logs read by a new Predictive scanner, emsscan, which in turn may send events to the Response Center via On-line Predictive.

Improved `ioscan` Description Field for PCI Devices

The `ioscan` command displays I/O devices, memory modules, and CPUs in a tabular form for users.

Previously, PCI interface cards were listed in the `ioscan` output by cryptic values in the `ioscan description` field. These values have been replaced by PCI device header fields which provide a clearer description for most (common) devices. See the example provided below.

The changes are:

- Dropped “FRU” info. When PCI drivers update the description fields (as the SCSI interface driver `c720` currently does), this gets lost anyway. For more information on the SCSI interface driver, see “SCSI Drivers `scsi3` and `c720`” on page 82 in Chapter 3.
- Added lookup of the class/subclass headers for most PCI specified devices (for example, PCI Ethernet). This provides useful and correct information when a device driver is **not** loaded or does not update the description.
- Dropped “PCI Bus Bridge” to shorten the CDIO description string. Epic CDIO would result in “EPIC Bridge.” “PCItoPCI” is the name of the new CDIO for PCI-to-PCI Bridges (PPBs).

This is the old output:

H/W Path	Class	Description
8	bc	Pseudo Bus Converter
8/0	ba	PCI Bus Bridge - GSCToPCI
8/0/1/0	ba	PCI (10110024)
8/0/1/0/4/0	lan	PCI (10110019)
8/0/1/0/5/0	ext_bus	Ultra Wide SCSI
8/0/1/0/5/0.1	target	
8/0/1/0/5/0.1.0	disk	HP C2247WD

Here’s the new output:

H/W Path	Class	Description
8	bc	Pseudo Bus Converter
8/0	ba	GSCToPCI Bridge
8/0/1/0	ba	PCItoPCI Bridge
8/0/1/0/4/0	lan	PCI Ethernet (10110019)
8/0/1/0/5/0	ext_bus	Ultra Wide SCSI
8/0/1/0/5/0.1	target	
8/0/1/0/5/0.1.0	disk	HP C2247WD

The `ioscan -F` option provides the same as well as additional information, separated by colons for parsing by scripts. This remains unchanged. Scripts can (and should) continue to use the `-F` option.

If scripts are parsing this output, the most significant “keys” remain the vendor/device ID (hex digits) and “PCI” string.

On Demand Solutions

Instant Capacity on Demand (iCOD) and Pay Per Use (PPU)

The iCOD and PPU software products are a part of the HP On Demand Solutions program. The iCOD product is a purchase model in which processor capacity can be instantly increased to accommodate increasing demands. PPU is a lease model in which customers are charged only for actual processor usage.

There are four products associated with HP's On Demand Solutions program:

- **Original iCOD** (versions 5.x - HP product number B9073AA): You initially purchase a specified number of activated processors and pay a right-to-access fee for a specified number of inactive processors. After you activate an inactive processor, you pay an enablement fee.
- **Codeword iCOD** (version 6.0 - HP product number B9073BA): You initially purchase a specified number of activated system components and license deactivated system components for activation through the application of right-to-use codewords.
- **PPU Active** (versions 4.x - HP product number T1322AA): You pay only for the average processor usage, based on averaging the amount of activated processors.
- **PPU Percent Utilization** (versions 6.x - HP product number T2351AA): You pay only for the percent utilization of processors.

Temporary capacity (TiCOD) is available for both iCOD software products. TiCOD is an HP software product that enables iCOD customers to purchase (prepaid) processor activation rights, for their iCOD processors, for a limited duration of time. See the appropriate *Instant Capacity on Demand (iCOD) User's Guide* for details of the TiCOD product.

All of the iCOD and PPU software products are available from the HP Software Depot located on the HP web site: <http://software.hp.com>. Both Codeword iCOD and PPU Percent Utilization are also available on the Operating Environments media: Codeword iCOD as an always-installed product and PPU Percent Utilization as a selectable product. (See "Codeword iCOD" on page 106 and "PPU Percent Utilization" on page 151.)

For details of the iCOD and PPU software products, see the appropriate User's Guide located on the HP web site: <http://docs.hp.com> (under **Network and Systems Management -> On Demand Solutions**).

What's in This Chapter?

This chapter covers the following topics:

- HP-UX Gang Scheduling (see page 202)
- Kernel Threads vs. CMA Threads (see page 203)
- Large Private Data Space (see page 204)
- Memory Windows (see page 206)
- HP-UX SCA Process and Memory Management (see page 208)
- Dynamic Tunables (see page 209)
- Asynchronous Disk Pseudo Driver (async) Compatibility (see page 210)
- System-V InterProcess Communications (IPC) (see page 211)
 - System-V IPC Message Queue Enhancement (see page 211)
 - System-V IPC SEMMSL Dynamic Kernel Tunable (see page 212)
- SCSI Queue Depth Management (see page 214)
- Changes to mpctl() System Call (see page 215)

HP-UX Gang Scheduling

**new at 11i
original release**

This release includes the ability to “gang schedule” MPI (Message Passing Interface) applications and multi-threaded processes. The gang scheduler permits a set of MPI processes, or multiple threads from a single process, to be scheduled concurrently as a group.

Only applications using the HP-UX 11.0 (or later) MPI or pthread libraries can be gang scheduled. Because HP compiler parallelism is primarily built on the pthread library, programs compiled with HP compilers can benefit from gang scheduling.

The gang scheduling feature can significantly improve parallel application performance in loaded timeshare environments that are oversubscribed. (Oversubscription occurs when the total number of runnable parallel threads, runnable MPI processes, and other runnable processes exceeds the number of processors in the system.)

Gang scheduling also permits low-latency interactions among threads in shared-memory parallel applications.

The HP-UX gang scheduler is enabled or disabled by following environment variable:

```
MP_GANG [ON] | [OFF]
```

Setting `MP_GANG` to `ON` enables gang scheduling; setting `MP_GANG` to `OFF` disables it. No action is taken if `MP_GANG` is not set, or if it is set to an undefined value. After the `MP_GANG` environment variable is set to `ON`, any MPI or pthread application executing and finding this variable will enable gang scheduling for that process.

You also can launch a program with gang scheduling enabled for it by using the `/usr/bin/mpsched -g...` command. (See “HP-UX SCA Process and Memory Management” on page 208 for details.)

Thread and process priorities for gangs are managed identically to timeshare policy. That is, the timeshare priority scheduler determines when to schedule a gang and adheres to the timeshare policies.

Although it is likely that scheduling a gang will preempt one or more higher priority timeshare threads, over the long run the gang scheduler policy is generally fair. All threads in a gang will have been highest priority by the time a gang is scheduled. Because all threads in a gang must execute concurrently, some threads do not execute when they are highest priority (the threads must wait until all other threads have also been selected, allowing other processes to run first).

Refer to the `mpsched` (1) or `gang_sched` (7) manpages for details about HP-UX gang scheduling.

Kernel Threads vs. CMA Threads

new at 11i original release

The CMA threads (`libcma`) package, which is POSIX P1003.1a (Draft 4) compliant, is based on Concert Multi Thread Architecture (CMA). CMA is a user-level threads package in which thread scheduling and synchronization are handled within the user space without the kernel's assistance.

CMA threads have been deprecated (slated for future obsolescence) at HP-UX 11i. This development environment will not be shipped in a future HP-UX release. Also, there is no plan to release native Itanium® CMA threads on Itanium-based platforms. Therefore, HP now strongly recommends that you use the currently supported kernel threads libraries and development tools. Thus, applications using CMA threads should start migrating to kernel threads.

Multi-threading is also supported in the HP-UX kernel at 11i and is known as kernel, POSIX or 1x1 threads. This kernel threads implementation, `libpthread`, is compliant with the approved POSIX 1003.1c (POSIX.1-1996 Draft 10) standard and will be replacing the CMA threads package.

The kernel threads implementation allows the application to take advantage of multiple processors in the system to parallelize execution of threads.

Compatibility Issues

It is expected that all existing CMA applications will continue to run on future releases. However, CMA applications may have to be ported to HP-UX POSIX threads in future releases, including those supporting Itanium, as there are differences in certain APIs between CMA threads and HP-UX POSIX threads.

As a POSIX standard, the kernel thread implementation facilitates better application portability on to POSIX-compliant vendor platforms.

Documentation

A white paper *Porting DCE Threads Programs to HP-UX 11.0 POSIX Threads* is available to help move from CMA threads to kernel threads (http://h21007.www2.hp.com/dspp/tech/tech_TechDocumentDetailPage_IDX/1,1701,970,00.html). The HP-UX Software Transition Kit (STK) for 11.0/11.x/Itanium® is also available (<http://devresource.hp.com/STK/>) for assistance. The STK contains documents that explain how to perform a source code or system transition. For more information see http://devresource.hp.com/STK/toc_trans.html.

Large Private Data Space

**new at 11i
original release**

An additional 1 to 2GB of private address space is now supported for 32-bit programs (if enabled on a per process basis), at the expense of shared memory address space. This change increases the amount of private data space available for a process.

New Options

Two new options have been added to the `chattr` command that allow the user to control whether the 3rd quadrant (the 1GB of address space from `0x80000000-0xBFFFFFFF`) and the 4th quadrant (the 1GB of address space from `0xC0000000-0xFFFFFFFF`) of a process are part of the processes private address space or are shared with other running processes. Previously, the 3rd and 4th quadrants were dedicated for shared object usage. For example, System V shared memory and memory mapped files using a shared mapping (`MAP_SHARED`).

The new options are as follows:

- `+q3p <enable/disable>`
- `+q4p <enable/disable>`

See the `chattr (1)` manpage for more details.

In order to use this new feature, the `maxdsiz` kernel configurable variable will need to be increased appropriately. Also, the system will have to enable enough swap space to support processes with large private address spaces.

Compatibility Issues

Processes that enable a private 3rd quadrant (`q3p` processes) will reduce the amount of address space available for shared objects by 1GB. Also, `q3p` processes will not be able to share objects that were created by another, non-`q3p` process, even in the 4th quadrant, unless those objects were created by the non-`q3p` process using the `IPC_GLOBAL` flag (System V shared memory) or `MAP_GLOBAL` flag (`mmap`). If recompiling is not an option, it will be necessary to make *all* processes that share objects with the `q3p` process into `q3p` processes (`chattr +q3p enable <a.out>`).

Processes that enable a private 4th quadrant (`q4p` processes) will have no address space available for shared objects. This means that the process will not be able to use System V shared memory, shared mapped files, etc. Shared libraries will still work, although the kernel will map them as private. Note that a `q4p` process implies that the 3rd quadrant is private also. In other words, the kernel will not execute a process that only enables a private 4th quadrant.

Because the system call gateway page has to remain at address `0xC0000000` for binary compatibility reasons, the data segment cannot be extended past the beginning of the 4th quadrant. Therefore, the `brk()` and `sbrk()` system calls will only allow the data segment to be expanded up to that address.

To take advantage of private address space in the 4th quadrant, memory will need to be allocated using the `mmap()` system call with the `MAP_PRIVATE` option. The system call `malloc()` has been modified to do this automatically. No re-link will be necessary to take

advantage of the new `malloc()` for a program that uses a shared version of the C library. A program that was linked with a non-shared library version of the C library, however, will need to be re-linked.

These changes have no compatibility impacts if the feature is not enabled.

This feature can only be enabled for 32-bit programs running on the 64-bit version of HP-UX. The 32-bit version of HP-UX will silently ignore the request for a private 3rd or 4th quadrant.

Memory Windows

Running without memory windows, HP-UX has limitations for shared resources on 32-bit applications. All applications in the system are limited to a total of 1.75GB of shared memory (2.75GB if compiled as `SHMEM_MAGIC`). In a system with 16GB of physical memory, only 1.75 can be used for shared resources.

To address this limitation, a functional change has been made to allow 32-bit processes to create unique memory windows for shared objects like shared memory.

The memory window for default executables is 1GB.

This allows cooperating applications to create 1GB of shared resources without exhausting the system-wide resource. Part of the virtual address space remains globally visible to all processes, so that shared libraries are accessible no matter what memory window they are in.

Summary of Changes

The following customer-visible changes have been made for memory windows:

- A new kernel tunable, `max_mem_window`, allows you to configure the number of memory windows a system can have.
- A new set of commands and files (`setmemwindow`, `getmemwindow`, `/etc/services.window`) enables you to start applications in different memory windows.
- Three manpages for the new functionality have been created: `getmemwindow` (1M), `setmemwindow` (1M), and `services.window` (4).

See the *Memory Windows in HP-UX 11.0 White Paper* on <http://docs.hp.com> for details.

Compatibility Issues

Incorrect use of memory windows can lead to application failure. Although memory windows can be applied to any application, that does not mean the application is able to run in memory windows. Some interfaces may break when used under memory windows. (Since only the application owner or software provider can certify how and if an application can run under memory windows, HP does not consider this failure a compatibility failure.)

CAUTION

Errors due to incorrect usage may be subtle and normally not associated with memory windows.

In many cases software providers may have already certified their applications with memory windows. Contact HP to see if this is the case.

Configuration

By default, HP-UX ships with memory windows disabled.

To enable memory windows, set the kernel tunable parameter `max_mem_window` to the desired amount. Customers can change this value by placing the desired value in their kernel configuration file. The system must be rebooted for the new value to take effect.

As detailed below, `max_mem_window` represents the number of memory windows beyond the global default window:

- Setting `max_mem_window` to one (1) creates a single memory window to accompany the existing global memory window (or, a total of two memory windows: one default and one user-defined).
- Setting `max_mem_window` to two (2) produces a total of three memory windows: the default and the two user-defined.
- Setting `max_mem_window` to zero (0) leaves only one memory window: the default or global memory window.

What should the value be? That depends on the application requirements and the applications installed on the system. (HP recommends that each ISV/application should document how many windows it intends to use.)

Use of memory windows does not affect the performance of processes. There is no size requirement associated with memory windows. Any machine running HP-UX (32-bit or 64-bit) and any hardware supporting HP-UX release 11i can use memory windows.

HP-UX SCA Process and Memory Management

**new at 11i
original release**

For compatibility reasons, the HP-UX 11i release supports the Scalable Computing Architecture (SCA) programming, locality management, and memory management features that were introduced at HP-UX 11.10 for the HP V-Class SCA servers. However, these features do not provide any potential performance benefits and no previous HP-UX SCA features have changed.

NOTE

The HP V-Class SCA servers themselves are not supported by the HP-UX 11i release, and all 11i supported systems are non-SCA servers that consist of single “locality domains” that includes all of the systems’ hardware resources. Consequently, any use of the HP-UX SCA features on HP-UX 11i systems will result in the default locality placement and memory allocation behaviors.

However, at the HP-UX 11i release you can use the `/usr/bin/mpsched` command to inquire about system processors; you can launch programs with “gang schedule” enabled; and you can bind or unbind processes to processors (CPUs). You also can use `mpsched` to inquire about process bindings.

Useful `mpsched` command options include:

- `-c` (bind command or PID to specified processor ID)
- `-g` (launch command with gang scheduling enabled)
- `-p` (specific PID: process ID)
- `-q` (inquire about process, requires `-p`)
- `-s` (list system status, including processor IDs)
- `-u` (unbind specified process, requires `-p`)

You should not use the `mpsched` command’s locality placement policy features because they provide no benefits on supported HP-UX 11i systems.

See the `mpsched` (1) manpage for details.

Dynamic Tunables

**new at 11i
original release**

A new facility has been added which will allow the retrieving of all tunable values and the setting of a limited number of tunables. If a tunable is dynamic, a change will take place immediately, without the need to reboot the system. Such changes will persist across reboots.

Three parts of the system have been changed to allow retrieving and setting of dynamic tunable values:

- System Administration Manager (SAM). For details, see “Changes to System Administration Manager (SAM)” on page 190 in this document and the SAM Online Help Facility.
- `kmtune`. This command has been enhanced to allow the changing of dynamic tunables. See the `kmtune` (1M) manpage for further details.
- Three new system calls have been added: `gettune`, `setttune`, and `tuneinfo`. For the function and use of each of these system calls, see their manpages: `gettune` (2), `setttune` (2) and `tuneinfo` (2).

Currently, the following tunables are dynamic:

- `maxuprc` - maximum number of user processes
- `msgmax` - message maximum size in bytes
- `msgmnb` - maximum number of bytes on a message queue
- `shmmax` - maximum shared memory segment size in bytes
- `shmseg` - shared memory segments per process
- `maxtsiz` - maximum text segment size in bytes for 32-bit programs
- `maxtsiz_64bit` - maximum text segment size in bytes for 64-bit programs
- `maxfiles_lim` - hard file limit per process
- `core_addshmem_read` - include readable shared memory in process core dump
- `core_addshmem_write` - include writable shared memory in process core dump

For more information, see the white paper *Dynamically Tunable Kernel Parameters in HP-UX 11i* at <http://docs.hp.com>.

Asynchronous Disk Pseudo Driver (async) Compatibility

**new at 11i
original release**

The `async` driver is used mostly by databases for doing asynchronous I/O to the disk.

Applications that use the `async` driver must be owned by the superuser, or by a user who is a member of a group for which the privileges include `MLOCK`.

To check a group's privilege capabilities, issue this command:

```
/usr/bin/getprivgrp group_name
```

If the output of `getprivgrp` does not show that the group has the `MLOCK` privilege, set the group's privilege by issuing this command as root:

```
/usr/bin/setprivgrp <group_name> MLOCK
```

Impact

If the application accessing the `async` driver is not owned by superuser or by a user who is a member of a group that has `MLOCK` privilege, `ASYNC_CONFIG` and `ASYNC_ADDSEG` `ioctl()` will fail and `errno` will be set to `EPERM`.

Compatibility

An application running on HP-UX 11.0 with patch `PHKL_22126` (or any patch that supersedes it) installed will operate correctly when upgraded to 11i.

If the application using the `async` driver has been operating on a 11.0 system without `PHKL_22126` (or any patch that supersedes it), then, when migrating to HP-UX 11i, the group associated with that application must be modified to include the `MLOCK` privilege.

System-V InterProcess Communications (IPC)

System-V IPC Message Queue Enhancement

**new at 11i
original release**

System-V IPC is the System-V InterProcess Communications package developed by AT&T and comprises mechanisms for arbitrary processes to send and receive data “messages,” share virtual address space, and use semaphores to synchronize execution. This enhancement applies only to the message subsystem.

The System-V IPC kernel tunable MSGMNB, which sets the maximum number of bytes on a queue, has had its maximum upper limit increased from 64KB to 64MB. New or recompiled applications will automatically use new, larger fields in the `msgqid_ds` structure which describes queue sizes. However, if queue sizes greater than 64KB are desired, a compilation feature macro, `__BIGMSGQUEUE_ENABLED`, must be defined. This may be done using the `-D` compiler option or the `#define` pre-processor directive prior to any `#include`. (This requirement is temporary and used to maintain compatibility during a transition period.)

As hardware system capacities (including CPU speed and memory) have increased, some customer and third-party applications have been placing a greater demand upon the System-V IPC message queues. By increasing the capacity of these queues, applications are able to transfer large messages in a much more efficient manner. You will be able to dedicate more system memory for this purpose. Also, this may ease porting of some applications from other vendors’ platforms which use message queues.

This enhancement is available on all systems.

Impact

There is no impact on system resources unless you increase system memory dedicated to System-V IPC message queues. To do this, the size of message memory segments (MSGSSZ) kernel tunable and/or the number of these segments (MSGSEG) kernel tunable may need to be increased.

An individual message queue cannot exceed the maximum queue size (MSGMNB) kernel tunable. The size of an individual message cannot exceed the MSGMAX kernel tunable.

Compatibility Issues

This change allows execution of existing binary programs. However, as described in the *msgget* (2) and *msgctl* (2) manpages, if binaries built on pre-11i HP-UX are used, the queue should not be created in excess of 64KB. To ensure this, the programs which create the queue (that is, via the `IPC_CREAT` option to `msgget`) should not be recompiled with the symbol “`__BIGMSGQUEUE_ENABLED`” defined. Also, the `IPC_SET` command to `msgctl` should not specify a `msg_qbytes` value in excess of 64KB.

The reason for this is that pre-11i binaries use 16-bit fields in the `msgqid_ds` structure for `msg_qbytes` and `msg_cbytes` queue size information. If the actual queue sizes exceed 64K, these fields are capped at 64K (that is, 65535 - the maximum value 16 bits can represent). It should be noted that binary programs which don’t use these fields will

operate properly even with larger queues. Even some of those programs which do use the fields may do so in such a manner that the inaccuracy does not adversely affect program behavior.

These concerns arise only for separately-built binaries which share common message queues. A group of binary programs which uses queues less than or equal to 64K are not affected by a separate group of programs which may be using other queues greater than 64K.

The special compile-time symbol, `__BIGMSGQUEUE_ENABLED`, selects the enhanced capabilities. It is anticipated that, at the major release to follow 11i, the default will be switched so that programs recompiled without this symbol will create big queues. Programs recompiled on 11i will be capable of handling the larger queue size fields, even if not compiled with `__BIGMSGQUEUE_ENABLED`. You should consider whether your applications should be recompiled on 11i to prepare for that future release.

Performance Issues

The purpose of increasing the size limits on System-V IPC message queues is to improve performance of applications which pass large messages between processes. Specifically, increased size limits eliminate the necessity to break messages into smaller pieces, as well as reduce the high rate of context switching associated with such techniques.

Documentation Changes

The *msgget* (2), *msgctl* (2), and *glossary* (9) manpages have been modified to reflect these changes.

System-V IPC SEMMSL Dynamic Kernel Tunable

**new at 11i
original release**

The System-V IPC kernel tunable configuration parameter SEMMSL, which sets the maximum number of semaphores per ID which can be grouped within a single System-V IPC semaphore set, has changed from a hard-coded value of 2048 in kernel code to a dynamic kernel tunable. Its minimum and default value is 2048 while its upper limit is 10240. For 11i, dynamic tune adjustments to SEMMSL may only be done using System Administration Manager (SAM).

With the increase in system sizes, applications have the ability to handle greater numbers of cooperating processes. Some applications synchronize operations of these processes by semaphores within a single set. Thus, the increase in the possible size of a semaphore set means that these applications may increase the number of processes they use.

This enhancement is available on all systems.

Impact

Increasing the SEMMSL kernel tunable to allow larger System-V IPC semaphore sets does not itself consume any additional kernel resources such as memory. However, in conjunction with increasing this tunable, you may need to increase the total number of semaphores in the system by increasing the SEMMNS kernel tunable. This will consume additional system memory.

Compatibility Issues

The change from a hard-coded SEMMSL to a dynamic tunable is transparent to applications.

In releases prior to 11i, a “SEMMSL” symbol was hardcoded to 2048 in `sys/sem.h`. This symbol will no longer always be an accurate representation of the maximum number of semaphores in a set. Uses of the symbol in programs should be removed. The `pstat` interface can return an accurate value for this kernel tunable.

Performance Issues

Some applications will be able to scale to utilize larger systems, where scaling depends upon the size of a semaphore set.

SCSI Queue Depth Management

new at 11i
original release

If you have multiple active paths to a SCSI device (LUN), you might need to manage your device queue depths to maximize the device's performance. This is particularly true with dynamic multi-pathing applications—such as EMC's PowerPath application—which allow all multiple paths to a LUN to be in use simultaneously. In such cases, you should check the queue depth specified on each path. If it is set to a value that is more appropriate for an environment where only one path is active at any point in time, you might need to lower the value.

Even in single-pathing or static multi-pathing environments, management of device queue depths can be important to maximize the performance and throughput of the storage device.

A single hard-coded default queue depth of 8 existed originally on 11.0 and could be changed only one device at a time via an `ioctl` to the device. But, it does not meet the needs of all devices and configurations. So, HP-UX 11i contains the following enhancements to the SCSI device queue depth management:

1. A dynamic tunable called `scsi_max_qdepth` has been added. This tunable allows you to set the default queue depth that will apply to devices that have not been individually set via the `SIOC_SET_LUN_LIMITS ioctl` or `scsictl` commands. This tunable is “dynamic,” which means that it can be changed and will be applied without having to reboot the system.
2. On 11.0, the queue depth could be changed on a per-device basis via the `SIOC_SET_LUN_LIMITS ioctl` or the `scsictl` command. However, the settings were not persistent across device opens and closes. That is, on 11.0, the queue depth setting on a device would disappear on the last close of the device and would go back to the system default of 8 when the device was re-opened. On 11i, the per-device queue depth settings will persist across opens and closes. This allows you to set the queue depth only once during or after boot up to maintain a desired value.

The 11i `scsi_max_qdepth` tunable can be changed or read via the `kmtune` command. See the `kmtune (1M)` manpage for details. The only change in the behavior of the per-device queue depth settings is the persistence across device opens and closes, as described above. Otherwise, these can be set or read in the same way as they could on 11.0 via the `SIOC_SET_LUN_LIMITS` and `SIOC_GET_LUN_LIMITS ioctl` command or the `scsictl` command.

Changes to mpctl() System Call

**new at 11i
 original release**

Some extensions have made to the `mpctl()` system call interface to pre-enable processor set functionality in the HP-UX 11i release.

The `mpctl()` interface provides command requests to query system information, such as the total number of processors and locality domains in the system, and the IDs of all processors and locality domains. When processor set functionality is implemented in HP-UX, these command requests will return information about the processor set of the calling thread, and not the entire system.

A new set of `mpctl()` command options query for system-wide topology information, regardless of which processor set contains those resources. The following seven new command requests are provided in HP-UX 11i:

Table 10-1 New mpctl() Command Requests

New Request	Its Equivalent in 11i
MPC_GETNUMSPUS_SYS	MPC_GETNUMSPUS
MPC_GETFIRSTSPU_SYS	MPC_GETFIRSTSPU
MPC_GETNEXTSPU_SYS	MPC_GETNEXTSPU
MPC_GETNUMLDOMS_SYS	MPC_GETNUMLDOMS
MPC_GETFIRSTLDM_SYS	MPC_GETFIRSTLDM
MPC_GETNEXTLDM_SYS	MPC_GETNEXTLDM
MPC_LDOMSPUS_SYS	MPC_LDOMSPUS

The new command requests are mapped to their current equivalent requests in the 11i release, so applications in the 11i release are not affected.

When the processor set functionality becomes available, applications that rely on `mpctl()` to return system level information will need to be changed to use new command requests. For these applications we recommend using the new commands in the 11i release to avoid any issues when processor sets are available.

All applications that use `mpctl()` to query the available processors and locality domains to scale and bind for optimal performance will not require any changes when the processor set functionality is made available. The `mpctl()`'s existing commands will return information about what processors are available for binding.

When processor set functionality becomes available, if the system is not partitioned into more than one processor sets, no applications using the `mpctl()` interface with current command requests will be affected.

What's in This Chapter?

This chapter covers the following topics:

- VERITAS VxFS 3.5 Available on Software Pack (see page 218)
- Additional Support for Striping and Mirroring (see page 218)
- New Whitepaper on File and File System Sizes (see page 218)
- New Version of Journaled File System (JFS) (see page 219)
- Network File System Support on TCP/IP (see page 221)
- Other NFS Changes (see page 223)
- Mounting and Unmounting NFS File Systems Automatically Using AutoFS (see page 224)
- HP Fibrechannel High Availability Disk and Closure (see page 227)
- Fibre Channel Mass Storage Diagnostic Message and Kernel Tunable (see page 227)

VERITAS VxFS 3.5 Available on Software Pack

**new for
December 2002**

The VERITAS File System 3.5 (HP OnlineJFS/JFS 3.5) product is an extent-based, intent-logging file system. This product is particularly geared toward UNIX environments that require high performance and availability, and that deal with large volumes of data. The VERITAS File System 3.5 (HP OnlineJFS/JFS 3.5) product is the next generation of the product known as HP OnlineJFS/JFS 3.3.

The base VERITAS File System 3.5 (HP JFS 3.5) is a new version of the base journaled file system for HP-UX 11i and is available at no charge as part of the December 2002 release of Software Pack. The full VERITAS File System 3.5 (HP OnlineJFS 3.5) enables advanced file system features and is ordered as a separate product.

For further information, see *VERITAS File System 3.5(HP OnlineJFS/JFS 3.5) Release Notes*, available at <http://docs.hp.com>.

For more information about Software Pack, see “Software Pack -- Optional HP-UX 11i Core Enhancements” on page 54.

Additional Support for Striping and Mirroring

**new at 11i
original release**

Logical Volume Manager (LVM) now supports striping and mirroring for shared volume groups. Previously under HP-UX 11.0, a volume group could not be activated in shared mode if any of its logical volumes were striped or mirrored. This restriction has now been lifted.

Shared volume groups are provided to support ServiceGuard Oracle Parallel Server (OPS), so this change only affects customers using OPS. Those customers are now free to stripe their logical volumes (to improve throughput) or mirror them (for higher availability).

NOTE

Where performance is limited by I/O throughput, striping may help.

See also “MirrorDisk/UX” on page 127.

New Whitepaper on File and File System Sizes

**new for
June 2001**

There is a new whitepaper, *Supported File and File System Sizes for JFS and HFS*, (5971-2383) available at the HP Documentation web site: <http://docs.hp.com>.

New Version of Journaled File System (JFS)

**new for
December 2002**

See “VERITAS VxFS 3.5 Available on Software Pack” on page 218.

**new at 11i
original release**

HP-UX 11i includes a new version of the Journaled File System (JFS): version 3.3, as opposed to the previous version 3.1. (JFS is also known as the VERITAS File System or VxFS).

New features in JFS 3.3 include the following:

- support for access control lists (ACLs), the only HFS feature unavailable in JFS 3.1 (see *aclv* (5), *getacl* (1), *setacl* (1), *acl* (2), and *aclsort* (3C)).
- a new disk layout (that is, version 4)
- a new command for tuning a VxFS file system: *vxtunefs* (see *vxtunefs* (1M) and *tunefstab* (4))
- a new command, *vxfsconvert*, for converting an HFS file system to a JFS file system. This command also converts HFS ACLs to JFS ACLs, with some limitations (see *vxfsconvert* (1M)).
- performance enhancements
- new packaging and licensing strategy for HP OnLineJFS 3.3 (see *vxlicense* (1M) and *vxenablef* (1M))
- a better solution for the file system shrink limitation when using the version 4 disk layout

With the HP-UX 11i release, JFS becomes a superset of the functionality available in HFS now that JFS includes support for ACLs. This enables all users to consider migration from HFS to JFS.

In HP-UX 11i, one kernel library contains the kernel functionality for both the JFS and the OnLineJFS products. When you install the JFS product, all the software for OnLineJFS is also installed, but its features are not enabled unless you also purchase it.

Having all the kernel functionality for both products in one library resolves many of the patching problems that existed in previous releases.

With the JFS version 4 disk layout in JFS 3.3, you are much less likely to encounter the file system shrink limitation that existed in earlier JFS versions in HP-UX 10.20 and 11.0. In other words, JFS previously could not shrink a file system if there were file extents residing in the area being reduced. Now, JFS 3.3 (with the version 4 disk layout) will attempt to move extents off the area of the file system being reduced. This provides a greater chance of success when shrinking JFS file systems. However, there may still be some occasions where JFS cannot move extents off the area of the file system being reduced, in which case a shrink will still fail.

Documentation

All VxFS manual pages are updated, as are the manual pages for generic HP-UX commands and functions which accommodate ACLs (`cp` and `find`, for instance). See *Managing Systems and Workgroups: A Guide for HP-UX System Administrators*, part no. B2355-90742, for a description of JFS ACLs and how to use them.

The *HP JFS 3.3 and HP OnLineJFS 3.3 VERITAS File System 3.3 System Administrator's Guide* is available on HP's documentation web site at <http://docs.hp.com> and on the Instant Information CD, in both HTML and PDF formats.

Compatibility Issues

JFS ACLs use a different format from HFS ACLs. However, the new command, `vxfsconvert` (1M) will convert an HFS file system to a JFS file system, as well as HFS ACLs to JFS ACLs (with the limitation that HFS ACLs with no JFS ACL equivalents are not converted). See *Managing Systems and Workgroups: A Guide for HP-UX System Administrators*, part no. B2355-90742, for a description of the procedure for converting a file system.

Note that JFS ACLs require a file system with the new disk layout (version 4). To upgrade a file system from an older disk layout to version 4, you can use the `vxupgrade` command.

JFS 3.3 uses new header files. As far as the JFS module is concerned, a well-behaved application will not need to be recompiled. However, a kernel-intrusive application will need to be recompiled with the new header files, and possibly with some corresponding code changes. You should check with the application provider before upgrading.

Performance Issues

JFS 3.3 generally outperforms previous releases, as design changes have reduced the number of bottlenecks resulting from globally shared locks. JFS includes tunables and features to support improved performance in the OLTP, DSS, and technical computing markets. With appropriate tuning, JFS 3.3 also outperforms HFS in all categories.

JFS 3.3 includes a new command, `vxtunefs`, for tuning a VxFS file system. See `vxtunefs` (1M) and `tunefstab` (4). Also see the *HP JFS 3.3 and HP OnLineJFS 3.3 VERITAS File System 3.3 System Administrator's Guide* for information on tuning a JFS file system.

NOTE

The `volcopy` and `labelit` commands will be obsoleted in a future release. You should use `vxdump` and `vxrestore` for backup and restore, or you can use an application-specific utility. You can use `dd` to make a literal copy of the file system.

Network File System Support on TCP/IP

**new at 11i
original release**

With versions 2 and 3, Network File System (NFS) is now supported over the connection-oriented protocol, TCP/IP, in addition to running over User Datagram Protocol (UDP).

As a result of this new functionality, NFS is now supported over wide-area networks (WANs). As long as TCP is supported on the WAN, then NFS is supported also. (TCP transport increases dependability on WANs. Generally, packets are successfully delivered more consistently because TCP provides congestion control and error recovery.)

The `mount_nfs` command now supports a `proto=` option on the command line where the value for `proto` can be either UDP or TCP. (In the past, this option was ignored.) This change allows administrators to specify which transport protocol they wish to use when mounting a remote file system.

If the `proto=` option is not specified, then NFS, by default, will attempt a TCP connection. If that fails, it will then try a UDP connection. Thus, by default, you will begin using TCP instead of UDP for NFS traffic when you begin using the 11i version of HP-UX. This should have little impact you. You do, however, have the option to specify either UDP or TCP connections.

If you specify a `proto=` option, only the specified protocol will be attempted. If the server does not support the specified protocol, the mount will fail.

The `nfsd` daemon now opens TCP transport endpoints to receive incoming TCP requests. For TCP, `nfsd` is multi-threaded. For UDP, `nfsd` is still multi-processed.

Kernel TCP threads execute under the process `nfskdtcp`. When counting the number of `nfsd` processes, keep in mind the following algorithm: An equal number of `nfsds` that support UDP will be created per processor, but only one `nfsd` that supports TCP will be created. In the case of a four-way machine and `NUM_NFSDS=14` (set in `/etc/rc.config.d/nfsconf`), 17 `nfsds` will be created: 16 for UDP (4 per processor) and 1 for TCP.

The `nfsstat` command now reports TCP RPC statistics for both client and server. The TCP statistics are under the connection-oriented tag and the UDP statistics are under the connectionless-oriented tag.

AutoFS supports the `proto=` option in the Automounter maps and has the same behavior described above under the `mount_nfs` command. In the past, this was an invalid option.

However, Automounter will not support NFS over TCP.

Unlike the 11.0 patch release of NFS over TCP, there is no enablement flag in the 11i release for NFS over TCP. By default, NFS will attempt to use TCP.

The kernel RPC layer has been modified to support TCP connections over NFS. A new streams module, `rpcmod`, has been added to manage the TCP connections. These changes are internal to the NFS implementation and are not user accessible.

Documentation Changes

The following manpages have been modified for this new feature:

Network File System Support on TCP/IP

- *mount_nfs* (1M)
- *nfsd* (1M)
- *automount* (1M)
- *nfsstat* (1M)

Other NFS Changes

new at 11i
original release

Three additional features have been added to NFS:

- Loopback transport support has been added to transport-independent RPC.
- Automatic user-space thread generation has been enabled in the RPC library.
- NFS server-side performance enhancements have been added.

Loopback Transport Support

Loopback transport provider devices (`tlclts`, `tlcots`, and `tlcotsod`) have been added to the TI-RPC definition file, `/etc/netconfig`. Also, the system now has the following new loopback transport-specific directories and files:

```
/etc/net/loopback_transport_name/hosts
```

```
/etc/net/loopback_transport_name/services
```

The following ONC/NFS daemons support loopback transport requests:

- `/usr/sbin/rpcbind`
- `/usr/sbin/keyserv`
- `/usr/sbin/rpc.nisd`
- `/usr/sbin/nis_cachemgr`

The `netid` and `address` fields in the `rpcinfo` call (which queries `/usr/sbin/rpcbind` to determine what services have been registered) now give the loopback device name plus an address name, rather than just the `netbuf` address provided by `udp` and `tcp` transport.

Additionally, the `tlclts` loopback transport device has a randomly generated string address.

User-Space Thread Generation

To process incoming RPC requests, the `svc_run()` function call in the RPC library automatically generates a thread on behalf of the application. The threads are managed by the RPC library software. RPC threads may be created when calling the RPC library.

NFS Server-Side Performance Enhancements

The NFS server daemon, `/usr/sbin/nfsd`, has been modified to enhance performance. As a result, the user may see more `nfsd` daemon processes running than requested, depending on the number requested and the number of processors configured. This change is documented in the `nfsd` (1M) manpage.

The NFS client-side buffer cache management has been modified to improve server performance from a VxFS file system mounted on the client.

The performance enhancements included have given HP industry leading NFS SPECsfs benchmark values on our V-Class platforms.

Mounting and Unmounting NFS File Systems Automatically Using AutoFS

HP-UX 11i provides a daemon that mounts and unmounts NFS file systems automatically. This feature is known as AutoFS.

AutoFS coexists with automount and performs the same functions as automount, but has a new, more reliable design. Additionally, AutoFS supports the NFS PV3 protocol whereas the automounter does not. The automount command has been replaced with a shell script that will either invoke the old automount daemon or the new AutoFS automount command, depending on the variable AUTOFS in `/etc/rc.config.d/nfsconf`.

- `AUTOFS=1` causes `/sbin/init.d/nfs.client` to start the AutoFS daemon (`automountd`) and run the AutoFS automount command.
- `AUTOFS=0` starts the old automount daemon. This is the default on newly installed or updated systems.

The old automount executable is located at:

```
/usr/lib/netsvc/fs/automount/automount
```

The new AutoFS executables are located at:

```
/usr/lib/netsvc/fs/autofs/automountd /usr/lib/netsvc/fs/autofs/automount
```

When AutoFS is executed, a process used by its kernel code for kernel thread support is also started. The `autofs_proc` process cannot be killed, except by a shutdown of the system.

Impact

From an operational standpoint, AutoFS functions comparably to the old automounter and returns the same values.

From the system administrator's standpoint, however, AutoFS is started, stopped, and updated differently than its predecessor. The `nfs.client` start-script automatically starts and stops the correct daemons depending on the value of AUTOFS in `/etc/rc.config.d/nfsconf`.

NOTE

If you do not use this script, you need to remember which implementation of automatic NFS file mounting you are using. Starting both AutoFS and automounter can lead to problems accessing the remote file system. You must reboot to switch between AutoFS and the old automounter.

Other Operational Differences

Any user-written scripts that expect the automount command to remain running as a daemon will have to be updated either to not expect this behavior or to check explicitly that `automountd` is running. AutoFS can no longer be shut down by killing the automount process; instead, you must shut it down by executing the following command:


```
/sbin/init.d/nfs.client stop
```

This will unmount all mounted AutoFS filesystems and then kill the automountd process.

To stop AutoFS without using the `/sbin/init.d/nfs.client` script, you must enter the following:

```
/usr/sbin/umountall -F autofs
```

```
kill automounted_pid
```

The `automount -n`, `-M`, and `-tw` options are not supported in AutoFS. The `-m` and `-tm` options are also not supported, but their behavior can be configured in different ways:

- by modifying the `nsswitch.conf` file to get the `-m` behavior
- by modifying the automount map entries to specify the time-out for the `-tm` option. The `-tl` option is accessed using `-t`.

Another difference between automounter and AutoFS is that AutoFS no longer uses symbolic links to access the mount points. Applications that depend on this explicit behavior will no longer work as expected.

Additional Information

The existing 11.0 automounter can be re-enabled, if desired, by setting the `AUTOFS` variable to 0 or by removing the `AUTOFS` variable from `/etc/rc.config.d/nfsconf`. In this configuration, automounter will not mount file systems via the NFS version 3 protocol.

For more information on how to migrate to AutoFS, see Chapter 2 in the *Installing and Administering NFS Services* manual.

Configuration

To enable AutoFS, you must add or set the `AUTOFS` variable to 1 in `/etc/rc.config.d/nfsconf`. Here is an example of this change:

```
#autofs configuration. See autofs(1m)
#
#For the 11.0 Release line both AUTOFS and the old Automount
#are delivered. In order to invoke the AUTOFS instead of
#you must set the AUTOFS flag to 1.
#
#/usr/sbin/automount is now a script that sources in this file
#Depending on the variable AUTOFS, either AUTOFS or the old
#automount process will execute. The nfs.client start script
#will also use this variable to start the appropriate process
#during the boot sequence.
#AUTOFS= 0 - use the old automount process.
#      1 - use the new AutoFS.
#AUTOMOUNT_OPTIONS= - options to the AutoFS automount command
#AUTOMOUNTD_OPTIONS= - options to the AutoFS automountd daemon
#
#The AUTOMOUNT flag still needs to be set for either the old
#automount or new AutoFS to be started by the nfs.client script.
#
```

```
AUTOFS=1
AUTOMOUNT_OPTIONS=""
AUTOMOUNTD_OPTIONS=""
```

Documentation Change

A new manpage, *automountd* (1M), describes the AutoFS automount daemon. The *automountd* (1M) manpage has been modified to describe both the old automount daemon and the new AutoFS command.

Obsolescence

Although all 11.0 patch bundles contain both AutoFS and automounter, AutoFS will replace automounter in a future release of HP-UX.

HP Fibrechannel High Availability Disk and Closure

The HP Fibrechannel High Availability Disk and Closure, also referred to as the FC10, is a Mass Storage Subsystem disk enclosure. This is the design center for Fibre Channel-Arbitrated Loop and future SCSI Enclosures (SES). Some of the features of the FC10 are as follows:

- enclosure temperature, fan speed, and power supply monitoring
- fault tolerance through redundancy of disk paths, IO modules, fans, and PSs
- FC-AL interconnect redundancy to disks and host
- hot pluggable disk modules, fans, and power supplies
- support for proactive maintenance

Fibre Channel Mass Storage Diagnostic Message and Kernel Tunable

The Fibre Channel Mass Storage product will return the following diagnostic message if the disk device violates the Fibre Channel Standard: `ECB_FRAME_RECV_BEFORE_ADISC`

You will see the this error message in the kernel log file. If this message is received frequently and persistently, please contact your HP Customer Support Representative.

Fibre Channel Mass Storage has a new kernel tunable: `fcp_large_config`. In a Fibre Channel Mass Storage configuration, if this parameter is set to 1, it allows for large loops with up to 126 nports. For example:

```
fcp_large_config 1
```

If the parameter is set to 0, you are limited to less than 64 nports.

New and Changed Disk and File Management Features
Fibre Channel Mass Storage Diagnostic Message and Kernel Tunable

What's in This Chapter?

This chapter covers the following topics:

- HP-UX Web Server Suite: HP-UX Apache-based Web Server, HP-UX Webmin-based Admin, HP-UX Tomcat-based Servlet Engine, HP-UX XML Web Server Tools (see page 230)
- IPv6 Available on Software Pack (see page 231)
 - What is IPv6? (see page 231)
 - What's Included in HP-UX 11i IPv6? (see page 231)
 - Identifying IPv6 Systems (see page 232)
 - Where to Find Information (see page 233)
- Base HP-UX Internet Services (see page 234)
 - Sendmail-8.9.3 (see page 234)
 - BIND 8.1.2 (see page 235)
 - “PAM-ized” rexecd and remshd (see page 236)
 - Changes for GateD (see page 237)
 - DHCP with Nonsecure DNS Updates (see page 237)
- Network Transport (see page 239)
 - ifconfig (see page 239)
 - ndd (see page 239)
 - netstat (see page 241)
 - Virtual IP (VIP) Address for the System (see page 242)
 - setsockopt() (see page 242)T_OPTMGMT (see page 242)
- New Versions of FTPD (see page 243)
- Changes to rwhod (see page 245)
- STREAMS/UX (see page 246)
- Low Bandwidth X Extension (LBX) (see page 247)
 - Performance Issues (see page 247)
 - Proxy Manager (proxymngr) (see page 247)
 - Remote Execution (RX) Service (see page 247)
 - Security Extension (see page 248)
 - Application Group Extension (XC-APPGROUP) (see page 248)
 - SLS/d - Distributed SLS (HP Visualize Center Support) (see page 248)

HP-UX Web Server Suite: HP-UX Apache-based Web Server, HP-UX Webmin-based Admin, HP-UX Tomcat-based Servlet Engine, HP-UX XML Web Server Tools

new for June 2003 The HP-UX Web Server Suite is a free product that can be downloaded for the HP-UX platform. It contains key software products necessary to deploy, manage, and implement mission critical web servers. The following components can be separately installed:

- **HP-UX Apache-based Web Server** combines Apache with numerous popular modules from other Open Source projects and provides HP value-added features for the HP-UX platform:
 - Scripting capabilities: PHP, mod_perl, CGI
 - Content management: WebDAV
 - Security: authentication through an LDAP server, Chrooted environment, SSL and TLS support
- **HP-UX Webmin-based Admin** is a configuration and administration GUI with extensive enhancements for the HP-UX Apache-based Web Server.
- **HP-UX Tomcat-based Servlet Engine** provides customers with Java-based extensions for dynamic content generation via Servlets and JavaServer Pages (JSPs).
- **HP-UX XML Web Server Tools** is a collection of a Java-based XML tools used for XML parsing, stylesheet and XSL processing, web-publishing and image translating from the Open Source projects: Xerces-J, Xalan-J, Cocoon, FOP, and Batik.

For further information, see “HP-UX Web Server Suite” on page 112

IPv6 Available on Software Pack

What is IPv6?

**new for
December 2001**

Internet Protocol version 6 (IPv6) is a new generation of the Internet Protocol that is beginning to be adopted by the Internet community. IPv6 is also referred to as “IPng” (IP next generation). It provides the infrastructure for the next wave of Internet devices, such as PDAs, mobile phones, and appliances. It also provides increased connectivity for existing devices such as laptop computers.

The most visible difference between today’s commonly used version of IP (IP version 4) and IPv6 is the larger address space supported by IPv6. IPv6 supports 128-bit internet addresses, compared to the 32-bit internet address supported by IP version 4. Additionally, IPv6 offers greater ease of configuration and manageability as well as increased security.

Once the HP-UX 11i IPv6 software product bundle is installed on the server and the IPv4 and IPv6 interface(s) are configured, the server is considered to be an IPv6/IPv4 “dual stack” implementation. This implies that IPv4 and IPv6 both run concurrently and independently. The server can communicate with both IPv4 nodes and IPv6 nodes, and can identify packets as being IPv4 or IPv6. A dual stack implementation supports both IPv4 and IPv6 applications. Programmers can write IPv6 applications that communicate with both IPv6 and IPv4 peers. Existing IPv4 applications will continue to work.

The following section lists HP-UX functionality that has been IPv6-enhanced. If an area is not included in this list, then this functionality has not been IPv6-enhanced and can only run on IPv4.

What’s Included in HP-UX 11i IPv6?

This section provides only a brief summary list of what is included in the HP-UX 11i IPv6 software product bundle. For more detailed information, refer to the *HP-UX 11i IPv6 Release Notes* (T1306-90004).

New and Changed Features

- IPv6/IPv4 Dual Stack Support.
- Transition Mechanisms. These enable IPv6/IPv4 dual stack hosts and routers to connect with other IPv6/IPv4 dual stack hosts and routers over the existing IPv4 Internet. HP-UX 11i IPv6 supports the following transition mechanisms: configured tunneling, automatic tunneling and “6to4.” With tunneling, IPv6 datagrams are encapsulated within IPv4 packets.
- IPv6 Stateless address autoconfiguration. A mechanism where a host can automatically assign an address to configure an interface.
- IPv6 Neighbor and Router Discovery and Duplicate Address Detection.
- TCP and UDP over IPv6, PMTUv6, ICMPv6, IPv6 MIBs, and Sockets APIs.
- New *netconf-ipv6* file. Used to store IPv6 settings (similar to IPv4’s *netconf* file).
- Network-Interface Administration Utilities for both IPv4 and IPv6:

```
ifconfig
netstat
ping
route
ndd
traceroute
ndp (a new IPv6-only utility for neighbor-discovery; ndp is similar to the arp utility used with IPv4)
```

- Support in */etc/hosts* for both IPv4 and IPv6 Addresses. Look-up policies for IPv6 are identical to those of IPv4.
- IPv6 Name/Address Resolution for Name Service Switch: new entry (*ipnodes*) in */etc/nsswitch.conf*.
- IPv6-enhanced Internet Services:
 - Services included with the HP-UX 11i IPv6 software product bundle:

```
inetd, internet daemon
telnet
r* commands
name and address resolution resolver routines
inetd.sec over IPv6 is also supported
```
 - Services *not* included with the HP-UX 11i IPv6 software product bundle:

```
WU-FTPD 2.6.1
BIND 9.2
Sendmail 8.11.1
DHCPv6
```

(Although these services are not part of the HP-UX 11i IPv6 software product bundle, they are available independently from HP's Software Depot, at <http://software.hp.com>.)
- The Nettl utilities (*nettl*, *nettladm*, *netfmt*) have been enhanced to trace and filter new IPv6 subsystems.
- Where needed, IPv6-enhancements have been made to some C2 Audit and HP-UX commands (for example - *lp*, *syslogd*, *rlpdemon*). There are some known problems with the *who*, *last* and *finger* commands. These are documented in the *HP-UX IPv6 Release Notes* (T1306-90004).
- DCE Clients support.
- IPv6-enhanced *libc*.

Identifying IPv6 Systems

Systems with the HP-UX 11i IPv6 software product bundle installed can be identified by running:

```
swlist -l bundle IPv6NCF11i
```

where the following will be returned:

```
IPv6NCF11i          B.11.11.0109.5D IPv6 11i product bundle
```


Where to Find Information

The following customer documentation is available on the Web at <http://docs.hp.com>. Note that these documents were written for an independent Software Depot release. The information in these documents still applies; however the “Installation” details are written for a Web download only.

- *HP-UX 11i IPv6 Release Notes* (T1306-90004)
- *Installing and Administering HP-UX 11i IPv6 Software* (T1306-90001)
- *IPv6 Porting Guide*

You can find all of the above documentation as well as the *HP-UX 11i IPv6 Product Note* (T1306-90003) for Software Pack on the Software Pack December 2001 media. The product note contains additional information on known problems and how to install IPv6 from the Software Pack CD. The Software Pack CD is included in the HP-UX 11i media kit.

Base HP-UX Internet Services

NOTE

Although HP-UX 11i includes Sendmail 8.9.3, BIND 8.1.2, and WU-FTPd 2.4, you can download the following new versions of these products from HP's software depot at <http://www.software.hp.com> under "internet & security solutions": Sendmail 8.11.1, BIND 9.2.0, and WU-FTPd 2.6.1.

The release notes for these versions are available at <http://www.docs.hp.com> under "Networking and Communications."

Sendmail-8.9.3

new at 11i original release

A new version of sendmail, sendmail-8.9.3, is included with HP-UX 11i. This version provides additional features compared to the previous version. The sendmail-8.8.6 `sendmail.cf` file is compatible with the sendmail-8.9.3 binary. However, to take advantage of all the new features provided in this version, HP highly recommends that you use the default `sendmail.cf` file provided in the `/usr/newconfig/etc/mail` directory. Any site specific changes will need to be made as required.

New Features

New features in sendmail-8.9.3 include:

- Lightweight Directory Access Protocol (LDAP) support for address lookup
- New configuration file options:

`MaxHeadersLength`

Used to limit the maximum length of a mail header. The default maximum length is 32768.

`MaxRecipientsPerMessage`

Used to limit the number of recipients for a single mail message if the recipients have their mailboxes on the same mail server. The maximum value for this option is 100.

`DontBlameSendmail`

Used to enforce a security check on the mode files that sendmail reads and writes. The default value of this option is "safe."

`QueueSortOrder`

This option is NOT case sensitive.

`EightBitHeader`

Used to allow eight bit header when set to TRUE.

`PrivacyOptions=noetrn`

The `noetrn` flag will disable the SMTP ETRN, enabling sendmail to process its queue in a synchronous mode.

PrivacyOptions=noverb

The `noverb` flag will disable the SMTP `VERB` command, turning off the verbose mode.

- Support for new mailer and map class:

Mailer: `discard`

A special internal delivery agent named `discard` is now defined for use with `check_*` rulesets and header checking rulesets.

Map class: `regex`

Sendmail-8.9.3 supports regular expressions using the new map class `regex`. The `regex` map can be used to see if an address matches a certain regular expression. By using such a map in a `check_*` ruleset, you can block a certain range of addresses that would otherwise be considered valid.

- Anti-spam configuration control: To enable some of the new anti-spamming rulesets, a shell script `gen_cf` is provided in the `/usr/newconfig/etc/mail/cf/cf` directory.
- New header checks: New syntax to do limited checking of header syntax is available.

Documentation

Refer to the *Installing and Administering Internet Services* manual available on the HP-UX 11i Instant Information CD and on the web at <http://docs.hp.com/hpux/11i> for detailed information on new features.

BIND 8.1.2

new at 11i original release

BIND 8.1.2, is shipped with HP-UX 11i. This version supports Dynamic updates via the `nsupdate` utility, which is distributed with the BIND 8.1.2 product depot.

NOTE

The Dynamic updates, however, are NOT secure, and you are advised to put security mechanisms in place before using this feature.

The following lists the new features:

- DDNS Change Notification (RFC 1996)
- Completely new configuration syntax
- Flexible, categorized logging system
- IP-address-based access control for queries, zone transfers, and updates that may be specified on a zone-by-zone basis
- More efficient zone transfers
- Improved performance for servers with thousands of zones
- No more forks by server for outbound zone transfers
- Many bug fixes

New Configuration File

The BIND configuration file is now `named.conf`, with many more configurable variables than in previous releases of BIND. (The configuration file in previous versions of BIND was `named.boot`.)

There are now entirely new areas of configuration, such as, access control lists and categorized logging. Many options that previously applied to all zones can now be used selectively.

The configuration file can be obtained by following these steps:

1. Make sure that Perl is installed on the system.
2. Copy the `hosts_to_named` script to `/usr/sbin` and manually provide a link from `/usr/bin`.
3. To convert the existing `named.boot` file to `named.conf` file, use the Perl script `named-bootconf.pl` available in `/usr/bin`.
4. Create the new BIND configuration file `named.conf`. Do this in either of two ways:
 - If the configuration file `named.boot` already exists, create new config file as follows:

```
/usr/bin/named-bootconf.pl named.boot > named.conf
```
 - If a BIND configuration file does *not* exist, execute `hosts_to_named` with appropriate options.

New Configurable Resolver Options

The timeout value is a function of the `RES_RETRY` and `RES_RETRANS` options of the resolver routines. It was currently hardcoded as 5000 milliseconds for `RES_RETRANS` and 4 attempts for `RES_RETRY`. This resulted in a timeout value of 75 seconds, when one nameserver was configured. When there were multiple nameservers, the timeout value increased. Hence, to help achieve shorter timeout values, and better performance, the resolver options `RES_RETRY` and `RES_RETRANS` are now configurable.

These resolver options can be configured using any of the three methods shown below. They are listed in order of priority, from highest (first) to lowest (last).

1. Use environment variables as follows:
 - a. `RES_RETRANS=value` in milliseconds
 - b. `RES_RETRY=number` of retry attempts
2. Use resolver configuration file `/etc/resolv.conf` as follows:
 - a. `retrans` value in milliseconds
 - b. `retry` number of retry attempts
3. Use the new API, `set_resfield`.

The `RES_RETRY` and `RES_RETRANS` options can be set with any positive non-zero integer.

“PAM-ized” `rexecd` and `remshd`

The `rexecd` and `remshd` services on HP-UX 11i now use Pluggable Authentication Module (PAM) for authentication.

You can take advantage of using an authentication mechanism of your choice like DCE Integrated Login, UNIX, or Kerberos by making a change in the `/etc/pam.conf` file. By default, if you do not edit the `/etc/pam.conf` file, the `rexec` and the `remsh` services will use the authentication mechanism specified by the `OTHER` directive in the `/etc/pam.conf` file.

The earlier version of `rexecd` and `remshd` allowed only those UNIX users who were included in `/etc/passwd` to use the `rexecd` and `remshd` services. This limitation has been eliminated with the introduction of the “PAM-ized” modules. By PAM-izing `rexec` and `remsh` services, users belonging to other authenticating services like DCE Integrated Login can use the `remsh` and `rexec` services.

`/etc/pam.conf` File Changes

To use PAM-ized `rexec` and `remsh`, the following lines have to be added to the `/etc/pam.conf` file:

```
rccmds    auth required    /usr/lib/security/libpam_unix.1
rccmds    account required  /usr/lib/security/libpam_unix.1
```

Using PAM-ized `remshd` in Secure Internet Services (SIS) Environment

`rexecd` is not Kerber-ized and hence will not work in the SIS environment. However, `remshd` is Kerber-ized. To take advantage of the PAM-ized modules, add the following line to the `/etc/pam.conf` file:

```
rccmds    auth required    /usr/lib/security/libpam_dce.1
```

Also in the Kerberos environment, `remshd` has command line options for combining the UNIX method and the Kerberos method of authentication. These command line options can be set in the `/etc/inetd.conf` file for the `kremshd` service. Refer to the *kremshd* (1M) manpage for a more detailed description of the options available.

Changes for GateD

With HP-UX 11i, the HELLO protocol of GateD will be obsoleted and no longer supported.

However, the BGP protocol available with GateD-3.5.9 on HP-UX 11.0 is also available and supported on HP-UX 11i.

DHCP with Nonsecure DNS Updates

The Dynamic Host Control Protocol (DHCP) available on HP-UX 11i is capable of updating the Dynamic Domain Name Server (DDNS). This feature updates the DDNS with the name and IP address of the client. This means that for every client to which DHCP assigns a name and IP address, it also adds an “A” and “PTR” resource record (RR) of that client to the DDNS.

To assign a name for every IP address, a new, Boolean tag, `pcsn` (prioritize client sent host name), has been introduced. If this is set and the host name is not provided by the client, the DHCP server gives priority to the name (if any) provided by the client. The name should be a fully qualified domain name (FQDN). If it is *not* a FQDN, then the DHCP server will try to append the domain name (if set using the `dn` tag); otherwise, it appends a “.” and updates the DDNS.

If the `pcsn` tag is not set, then the DHCP server appends a “.” and updates the DDNS.

To enable the DHCP server to perform updates to the DDNS, you need to add a new tag, `ddns-address`.

The following is a sample of a `DHCP_DEVICE_GROUP` entry that includes the `ddns-address` tag and the `pcsn` tag:

```
DHCP_DEVICE_GROUP:\  
ba:\  
pcsn:\  
class-name=SUBNET_128_XTERMINAL_GROUP:\ class-id="xterminal:"\  
subnet-mask=255.255.255.0 :\  
addr-pool-start-address= 15.14.128.1 :\  
addr-pool-last-address= 15.14.128.254 :\  
ddns-address=1.2.3.4:\  
lease-time=604800 :\  
lease-grace-period=5
```

Network Transport

**new at 11i
 original release**

Network Transport includes `ifconfig`, `ndd`, `netstat`, virtual IP address, `setsockopt`, and `t_optmngmt`. All are discussed in more detail below.

ifconfig

The `ifconfig` subnet mask default now allows all 1's or all 0's in the masked part of the subnet field. (The subnet field is that portion of an IP address that identifies the subnet beyond the network portion of the address.) This provides up to twice as many IP addresses as before. Even though the default behavior now allows more IP address and subnet mask combinations, any addresses working before will continue working without alteration.

In the following example, a class A IP address used with the mask 255.192.0.0 (0xffc00000) has a two-bit subnet field which is the 5th and 6th bits:

```
11111111 11 000000 00000000 00000000
```

Now, `ifconfig` can assign the following IP address and subnet mask to an interface, even though the subnet field (subnet portion of the address) is all 1's:

IP address: 15.192.1.1

Subnet mask: 255.192.0.0 (0xffc00000)

In binary:

```
00001111 11 000000 00000001 00000001
```

```
11111111 11 000000 00000000 00000000
```

Also, `ifconfig` can now assign the following IP address and subnet mask to an interface, even though the subnet field is all 0's:

IP address: 15.1.1.1

Subnet mask: 255.192.0.0 (0xffc00000)

In binary:

```
00001111 00 000001 00000001 00000001
```

```
11111111 11 000000 00000000 00000000
```

To disallow subnet fields with all ones or all zeroes, set the `ndd` parameter `ip_check_subnet_addr` to 1 in the `nddconf` file.

ndd

The networking configuration tool, `ndd`, is used to customize the networking kernel. To make an 11i system more Internet friendly and easier to run “out of the box,” some of the `ndd` tunable parameters defaults have changed, some formerly unsupported tunable parameters are now supported, and some new tunable parameters have been added. In part, these modifications reflect changes to networking industry standards.

Specific Changes

1. All 1's or all 0's are now allowed in masked bits of subnet address:
`ip_check_subnet_addr` shows whether or not that RFC1122 or RFC1878 enforces the network subnet mask. If it is a 0 (zero), then the RFC1122 behavior is seen. If it is a 1 (one), then RFC1812 is seen. The default is now RFC1812 behavior. (See `ifconfig` in the preceding section for more information.)

This new behavior, an enhancement, makes available up to twice as many IP addresses than a similarly configured RFC1122 machine.
2. TCP-supported `tcp_sack_enable` now enables selective acknowledgement. This enhancement could improve performance in networks with large transmission windows by allowing TCP recipients to indicate lost segments within large transmission blocks. The TCP sender can then retransmit only the lost segments. Supported parameter values are as follows:
 - 2 Local system enables SACK if remote system first sends SACK (Default).
 - 1 Local system requests the SACK option during a `connect()` request.
 - 0 Local system never uses SACK.
3. Send and receive buffers are now limited by the following tunable:
Specifically, `udp_rcv_hiwater_max` (default 2 GB) sets the maximum *receive* buffer size that `setsockopt` or `t_optmgmt` can set for a UDP socket. The TCP version of this is `tcp_rcv_hiwater_max` (default 1 GB). On the other hand, `tcp_xmit_hiwater_max` (default 2 GB) sets the maximum *send* buffer size that `setsockopt` or `t_optmgmt` can set for a TCP socket. There is no UDP version of this value. These system-wide parameters prevent processes from keeping large amounts of data in send or receive buffers, and thereby consuming system resources.

CAUTION

Although the enhancement `tcp_fin_wait_2` may be used to set how long a connection will be in `FIN_WAIT_2`, you should use this cautiously. If the remote TCP entity is slow, but would terminate normally (is not hung nor will terminate abnormally), TCP may close the connection prematurely. This could result in the flushing of data in the remote connections receive buffer. If this happens unexpectedly, then the data could become corrupted.

For more information on using `tcp_fin_wait_2`, enter the following command:
`ndd -h tcp_fin_wait_2.`

With a new field, `ip_udp_status` now reports how many times a given UDP socket has overflowed. Although this enhancement only works on sockets currently open, it can be a very handy troubleshooting tool used when `netstat -p udp` shows socket overflows.

4. With a TimeStamps option now supported, `tcp_ts_enable` allows RFC 1323 TimeStamp extensions to TCP Headers. The TimeStamps are used for two purposes:
 - a. RTTM (Round Trip Time Measurement) of the interval between the time a TCP sends a segment and the time the return acknowledgement arrives.
 - b. PAWS (Protect Against Wrapped Sequences) on high-speed networks.

Supported parameter values are as follows:

- 2 Use Timestamps option if initiated by the remote system
- 1 Always try to initiate the use of Timestamps option
- 0 Never use Timestamps option

5. With the enablement of socket caching, `tcp_conn_strategy` can now increase performance by setting how many cached socket structures the system keeps. The default value of 0 (zero) disables the feature. A value between 1 and 512 sets a minimum of 512. Any number above 512 sets `tcp_conn_strategy` to that value. Enabling socket structure caching can increase system performance if there are many short-lived connections on the system.
6. Using the following formula, `tcp_cwnd_init` now allows you to configure the sender's initial TCP congestion window size:
$$\text{Min}(\text{tcp_cwnd_init} * \text{MSS}), \text{max}(2 * \text{MSS}, 4380),$$
where MSS is the maximum segment size for the underlying link. Default 4: (TCP implements RFC 2414). Range: 1-4
7. To prevent a type of Denial-of-Service attack, `ip_pmtu_strategy` "2" is not supported for 11i. In particular, a local system can no longer send its expected Path Maximum Transmission Unit (PMTU) value within an ICMP_ECHO request to a remote system or router.

Type `ndd -h` for an online description of tunable parameters and other documentation.

Compatibility Issues

For the following commands, `ndd` displays IP addresses using the IP version 6 (IPv6) format:

```
ndd -get /dev/ip ip_tcp_status
ndd -get /dev/ip ip_udp_status
ndd -get /dev/ip ip_raw_status
```

When `ndd` maps IP version 4 (IPv4) addresses to IPv6 addresses, `ndd` displays the IPv4 addresses with the prefix `::ffff:`. However, `ndd` displays the remainder of the IPv4 address in dotted-decimal notation. This could cause scripts that are looking for a given output to fail.

Performance

None of the features will degrade performance. Enabling socket caching using `tcp_conn_strategy` could potentially increase performance by 10 to 20%.

netstat

There are two changes to `netstat`, which displays the statistics and configuration of the networking kernel: one is to `netstat -r`; the other to `netstat -I`.

Since `netstat -r` no longer updates the "Use" field, `netstat -r` no longer displays it.

Beginning at HP-UX 11i, `netstat -I <interface>` displays statistics accumulated since the last system reboot. This matches `netstat -I` output for HP-UX releases 10.20 and earlier.

Compatibility Issues

There could be some compatibility problems with scripts where they look for the “Use” field.

Virtual IP (VIP) Address for the System

Using the loopback interface `lo0:1`, `lo0:2`, and so on, the system will respond to the IP address assigned to these interfaces using any physical interface. Thus, a system can now have a “systemIP” address that will be available as long as one interface stays usable.

In some configurations, a system needs to keep a “well known” IP address that will always be available even if an interface goes down. With the new VIP feature, a remote user can specify an IP address that will respond regardless of the local interface from which the packet arrived. This feature is an enhancement.

setsockopt()

If you determine that certain applications always ask for the largest socket buffer allowed, then you may want to set these variables and limit the amount of memory used by such applications. (When an application opens enough of these large sockets and the system does not contain a lot of memory, then the system may starve for memory if the application quits reading from the socket.)

The system-wide kernel parameters, `tcp_recv_hiwater_max` (for TCP sockets) and `udp_recv_hiwater_max` (for UDP sockets), now limit the maximum buffer sizes specified in the `SO_SNDBUF` or `SO_RCVBUF` `setsockopt()` parameters.

Applications that request sockets with send or receive buffers larger than high-water marks set by the administrator will fail. In other words, a `setsockopt()` call with a `SO_SNDBUF` or `SO_RCVBUF` option that exceeds the corresponding kernel parameter value will fail, returning the `errno` value `EINVAL`.

T_OPTMGMT

If you determine that certain applications always ask for the largest buffer or transport service data unit (`tsdu`) allowed, then you may want to set these variables and limit the amount of memory used by such applications. (When an application opens enough of these large sockets and the system does not contain a lot of memory, then the system may starve for memory if the application quits reading from the endpoint.)

The kernel parameters `tcp_recv_hiwater_max` (for TCP sockets, default 2GB) and `udp_recv_hiwater_max` (for UDP sockets, default 2GB) now limit the `XTI_RCVBUF` parameter maximum buffer size. The kernel parameter `tcp_xmit_hiwater_max` (default 2GB) now limits the `XTI_SNDBUF` parameter’s maximum buffer size.

Applications that request sockets with buffers or `tsdus` larger than high-water marks set by you will fail. In other words, a `t_optmgmt()` call with a `tsdu` or `etsdu` option that exceeds the corresponding kernel parameter value will fail with `TBADOPT`.

New Versions of FTPD

**new at 11i
 original release**

This release contains a new version of FTPD, which replaces the legacy FTPD. In addition to supporting the FTP protocol defined in RFC 959, the following new features are provided:

- Logging of transfers.
- Logging of commands.
- On-the-fly compression and archiving.
- Classification of users by type and location.
- Per-directory upload permissions.
- Restricted guest accounts.
- System-wide and per-directory messages.
- Directory alias.
- CD path.
- Filename filter.
- Virtual host support.
- Per-class limits (the ability to define “classes” of users according to their source IP addresses and/or hostnames, and to limit access according to user class).

Existing installations do not have to modify their FTP configuration unless they want to use the new features.

The major differences between legacy FTPD and the new version of FTPD are as follows:

Table 12-1 New FTP daemon options

-d	Logs debugging information in syslog.
-m <i>number of tries</i>	Specifies the number of tries for a bind() socket call.
-a	Enables the use of the ftpaccess file, which is used to configure the operation of FTPD.
-A	Disables the use of the ftpaccess configuration file.
-i	Logs all the files received by the FTPD server to xferlog.
-o	Logs all files transmitted by FTPD in xferlog.
-L	Logs all commands sent to the FTPD server into syslog.

Table 12-2 New Commands

/usr/bin/ftpcount	Shows current number of users per class
/usr/bin/ftpwho	Shows current process information for each user.
/usr/bin/ftpshut	Creates shutdown message file.

Table 12-2 New Commands (Continued)

<code>/usr/bin/ftprestart</code>	Removes the shutdown message file created by the <code>ftpshut</code> utility.
----------------------------------	--

Table 12-3 New Configuration Files

<code>/etc/ftpd/ftppaccess</code>	The primary configuration file defining the operation of the new FTP daemon.
<code>/etc/ftpd/ftpconversions</code>	Defines options for compression/decompression and <code>tar/un-tar</code> operations.
<code>/etc/ftpd/ftphosts</code>	Lets you allow/deny FTP account access according to source IP addresses and hostnames.
<code>/etc/ftpd/ftpgroups</code>	The group password file for use with the <code>SITE GROUP</code> and <code>SITE GPASS</code> commands.

Table 12-4 New Logging Information

<code>/var/adm/syslog/xferlog</code>	This file contains logging information from the FTP server daemon.
--------------------------------------	--

Virtual FTP Support

If you wish to manage an `ftp` server for two separate domains on the same machine, the virtual `ftp` server feature can be used. This allows you to configure systems, so that a user `ftp`'ing to `ftp.domain1.com` gets one `ftp` banner and `ftp` directory, and a user `ftp`'ing to `ftp.domain2.com` gets another banner and directory even though they are on the same machine and use the same ports.

NOTE

Setting up a virtual `ftp` server requires IP address aliasing. This is supported in HP-UX 10.30 and later.

Table 12-5 Support Tools

<code>/usr/bin/ckconfig</code>	Verifies path names of all FTP configuration files.
--------------------------------	---

Secure Version of FTPD

**new at 11i
original release**

At 11i, a unified binary is available for the new version of FTPD that can operate as both a Kerberos and non-Kerberos service.

To have the new FTPD operate in a secure environment, you enable the secure environment with the following command:

```
/usr/sbin/inetsvcs_sec enable
```

This updates the system file `/etc/inetsvcs.conf` with an entry `kerberos true`. At run-time, the services obtain the type of authentication mechanism to use.

Changes to rwhod

**updated for
December 2001**

The `rwhod` daemon now accepts hostnames with supported characters as per RFC 952 only. The supported characters include letters, digits, and the hyphen (-) sign. Hostnames with invalid characters, such as underscores, are now ignored by the `rwhod` daemon.

For more information on RFC952, please see <http://ietf.org>.

STREAMS/UX

**new at 11i
original release**

Several enhancements have been made to STREAMS/UX, including support for the `select()` system call, an I/O forwarding mechanism, and Function Registering:

- The `select()` system call for STREAMS/UX devices examines the files or devices associated with the file descriptors specified by the `bitmasks`, `readfds`, `writelfds`, and `exceptfds`.

The `select()` system call can detect out-of-band (OOB) data on TCP by calling an internal command, `hpstreams_select_int2()`, which contains a check in the exception case for `T_EXDATA_IND` messages.

- STREAMS/UX contains an I/O forwarding mechanism that preserves the order of messages and forwards those messages. This mechanism is particularly useful on multi-node systems where driver events can only be executed on the node where the NIC resides.
- Function Registering enables modules and drivers to work in a mixed mode system. It provides the modules and drivers within the kernel a mechanism for correctly translating data that is being sent to and from the application when STREAMS/UX determines that the application has been compiled for 32-bit execution, but is operating on a 64-bit architecture.

Function registering defines dynamic data structures and stream head flags, which will indicate when and if a dynamically specified function is to be executed. These data structures and flags can be set dynamically or on the fly.

NOTE

UP Emulation will no longer be supported on HP-UX in a future release. Therefore, drivers and modules that are configured as UP emulation drivers and modules should be made MP scalable in preparation.

For more information about these changes, see the *STREAMS/UX for the HP 9000 Reference Manual*.

Low Bandwidth X Extension (LBX)

The Low Bandwidth X extension (LBX) uses several compression and local caching techniques to improve performance on wide-area networks and on slower speed connections. These techniques reduce the amount of protocol data transported over the network and reduce the number of client-to-server round trips required for common application startup operations.

LBX is implemented in two pieces: an X server extension and a proxy application. The X server extension provides the new optimized protocol. The proxy application, `lbxproxy`, translates a normal client X protocol stream into an LBX stream. This permits any existing application to gain the benefit of the optimized protocol with no changes. The proxy is especially useful when multiple applications are running on the same local area network separated from the X server by a slower network. In this case, the full benefit of the local cache is shared by each application using the same proxy process.

The `lbxproxy` binary has been added to the `/usr/bin/X11` directory. It must be started by an end user either directly or through the Proxy Manager (`proxymngr`) and Find Proxy (`xfindproxy`).

Performance Issues

When X clients are separated from the X server by a slow connection such as a modem, performance will be improved by going through `lbxproxy`. However, when the client and X server are separated by a fast connection such as a local area network, performance may be degraded by running through `lbxproxy`.

Proxy Manager (`proxymngr`)

The Proxy Management Protocol is an ICE-based protocol that provides a way for application servers to easily locate proxy services such as the LBX proxy. (LBX is currently the only supported proxy service.)

Typically, a service called a “proxy manager” is responsible for resolving requests for proxy services, starting new proxies when appropriate, and keeping track of the available proxy services. The proxy manager strives to re-use existing proxy processes whenever possible.

The `proxymngr` executable has been added to the `/usr/bin/X11` directory. It must be started directly by the user. The `proxymngr` executable can also be used in conjunction with `xfindproxy`, which is also in `/usr/bin/X11`.

Remote Execution (RX) Service

The remote execution (RX) service specifies a MIME format for invoking applications remotely (for example, via a Web browser). This RX format specifies a syntax for listing network services required by the application (for example, an X display server). The requesting Web browser must identify specific instances of the services in the request to invoke the application.

There are two methods to demonstrate this service:

1. `xrx` (the helper program)

The `xrx` helper program has been added to the `/usr/bin/X11` directory. End users must set up their Web browsers to use this program for files with the `rx` extension.

2. `libxrx.6.3` (the Netscape plug-in)

The Netscape plug-in, `libxrx.6.3`, has been added to the `/usr/lib/X11R6` directory. End users must copy this to their `$(HOME)/.netscape/plugins` directory (or the equivalent) so that files with the `rx` extension are interpreted correctly. In order to use the plug-in, do *not* set up Netscape to also use the helper program.

Security Extension

The security extension adds the X protocol needed to provide enhanced X server security. This extension adds the concepts of *trusted* and *untrusted* clients. The trust status of a client is determined by the authorization used at connection setup. All clients using host-based authorization are considered trusted. Clients using other authorization protocols may be either trusted or untrusted depending on the data included in the connection authorization phase.

When a connection identifying an untrusted client is accepted, the client is restricted from performing certain operations that would steal or modify data that is held by the server for trusted clients. An untrusted client performing a disallowed operation will receive protocol errors.

When a client is untrusted, the server will also limit the extensions that are available to the client. Each X protocol extension is responsible for defining what operations are permitted to untrusted clients; by default, the entire extension is hidden.

Application Group Extension (XC-APPGROUP)

The application group extension provides new protocol to implement Application Groups (AppGroups). The AppGroup facility allows other clients to share the `SubstructureRedirect` mechanism with the window manager. This allows another client (called the application group leader) such as a Web browser to intercept a `MapRequest` made by a third application and re-parent its window into the Web browser before the window manager takes control. The AppGroup leader may also limit the screens and visuals available to the applications in the group.

This extension, along with the Netscape/Mozilla remote execution plug-in, allows Netscape/Mozilla to run programs remotely over the Web with the output appearing in the Web browser display.

The only way for an application to become a member of an AppGroup is by using an authorization generated using the new security extension. Whenever an application connects to the server, the authorization that it used to connect is tested to see if it belongs to an AppGroup. This means that the authorization data must be transmitted to the remote host where the application will be run. In the case of X, HTTP is used to send the authorization. Sites that have concerns about sending un-encrypted authorization data such as `MIT-MAGIC-COOKIE-1` via HTTP should configure their Web servers and Web browsers to use SHTTP or SSL.

SLS/d - Distributed SLS (HP Visualize Center Support)

SLS/d is an extension of the SLS (Single Logical Screen) functionality provided by the X server that allows the X desktop to span graphics displays that reside on distributed systems. By distributing the display across several systems, a larger *logical* array of

graphics displays can be achieved than otherwise would be possible with a single system with multiple graphics cards. SLS/d provides the X Window system support for part of the 3-D Visualize Center products.

SLS/d involves a low-level change in the X server that unites several distributed graphics displays into a *logical* X Window system. The only user-visible changes are related to system configuration. The X Window system API remains unchanged in the SLS/d system, and thus is completely transparent to 2-D X window applications. The motivation behind this new functionality is to increase the size of the *logical* screen beyond what is possible using a single system with multiple graphics cards.

A new driver and a new X server extension have been added to the X server in order to implement this change. The functionality is enabled by modifying the server's X* screens file. The full documentation for the SLS/d functionality can be found in the X server information file, `/usr/lib/X11/Xserver/info/screens/hp`, and in the *Graphics Administration Guide*.

An SLS daemon and a configuration tool are delivered to aid system configuration. The daemon is controlled via start and stop scripts that reside in the `/sbin/init.d`, `/sbin/rc1.d`, and `/sbin/rc2.d` directories. The SLS daemon is started when the system enters run-level 2 or greater, and stopped when the system enters run-level 1. See the X server documentation for more details.

The performance of SLS/d depends on the performance of the underlying network to which the SPUs in the system are connected. On a dedicated network with a 100 Base-T backbone, the 2-D X Windows performance approaches that of a single SPU SLS system.

SLS/d is transparent to applications in the same manner as SLS. Once the system has been configured, it behaves identically to a single screen X Window system, albeit with a much larger screen size. One requirement is that the underlying graphics cards in the system be homogeneous. Although not a strict requirement, it is also desirable that the systems participating in the SLS/d system be homogeneous as well.

What's in This Chapter?

This chapter describes new security features.

- HP-UX Host Intrusion Detection System (HIDS) (see page 252)
- Generic Security Services for Developing Secure Applications (see page 253)
- Execute Protected Stacks (see page 255)
- Auditing Commands/System to be Updated (see page 257)
- Configurable Security Features (see page 258)
- Password History Feature on Trusted Systems (see page 259)
- Kerberos Client Software (see page 260)
- HP-UX Kerberos Server Version 2.0 (see page 262)

HP-UX Host Intrusion Detection System (HIDS)

The HP-UX Host Intrusion Detection System (HIDS; formerly IDS/9000) provides continuous and near real-time surveillance to help identify potential malicious activities on the host. HIDS is available in the Operating Environments as a selectable product.

For more information, see “HP-UX Host Intrusion Detection System (HIDS)” on page 147.

Generic Security Services for Developing Secure Applications

**new at 11i
original release**

The Generic Security Services Application Programming Interface (GSS API) is a newly introduced product for HP-UX 11i. It contains all the GSS APIs as per RFC 2743 and is implemented as C programming language interfaces as defined in the RFC 2744, “Generic Security Service API: C-bindings.” It provides security services for applications independent of various underlying security mechanisms. GSS API is also independent of communication protocols. The GSS API is available as a separate shared library. The security services available to an application include authentication, integrity, and confidentiality services.

A set of GSS APIs is already available in `libdce` libraries, which are a part of the DCE Core product in this release, as well as in previous HP-UX releases. However, these GSS APIs are dependent on the DCE security mechanism and cannot be used as general purpose APIs.

Because of GSS API independence, an application developer writing secure applications need only write the code once and need not change it whenever the underlying security mechanism changes. This will prove to be quite advantageous during this period where security technology changes are rather frequent.

An application developer who uses the GSS API C-binding interfaces will need to include `/usr/include/gssapi.h` in the program and will need to link with `libgss.sl`. The underlying security mechanism and its library can be specified in a configuration file called `/etc/gss/mech`. The library will then dynamically load the corresponding mechanism-specific shared library (for example, `libgssapi_krb5.sl` in the case of Kerberos). The default mechanism configuration file is `/etc/gss/mech`, which can be altered with the environment variable called `GSSAPI_MECH_CONF`.

In addition to this configuration file, there are two other configuration files, namely `/etc/gss/qop` and `/etc/gss/gsscred.conf` for `libgss.sl`:

- The `/etc/gss/qop` file contains information about the GSS API-based quality of protection (QOP) for each underlying security mechanism.
- The `/etc/gss/gsscred.conf` is a configuration file that selects how the underlying mechanism stores the `gsscred` table. The `gsscred` table is used to store the mapping between a security principal and the UNIX uid. In this release, the supported `gsscred` backend mechanism is only flat files. Therefore, the entry “files” must be specified in `/etc/gss/gsscred.conf` for the successful operation of the library.

The 32-bit and 64-bit versions of `libgss.sl` library is available at the `/usr/lib` and `/usr/lib/pa20_64` directories respectively.

Symbol Clashes

Since the symbols of GSS APIs in the `libdce` libraries clash with the symbols of `libgss.sl`, application programmers who want to use GSS API and DCE together may need to resolve the symbol clashes by linking the `libgss.sl` library first and then the `libdce` library.

Size Requirements

A minimum of 32MB RAM and 1.5MB hard disk space will be required for installation and usage of the product on HP-UX 11i systems.

Compatibility

The `libgss.sl` library has been tested with the Kerberos V5 backend mechanism library (`/usr/lib/gss/libgssapi_krb5.sl`) and is fully compatible. This library is in the KRB5-Client Software. See the next section for more information.

Documentation Changes

There are new manpages for each of the APIs of the GSS API product under the `/usr/share/man` directory. These manpages are different from the manpages for DCE GSS API which is available under the `/opt/dce/share/man` directory. For general information about GSS API, refer to the *gssapi* (5) manpage and for information about `libgss.sl`, refer to the *libgss* (4) manpage.

There is also information about GSS API in *Network Security Features of HP-UX 11i* at:

<http://www.hp.com/products1/unix/operating/infolibrary/whitepapers/netsecur.pdf>

Execute Protected Stacks

**new at 11i
original release**

System security can be improved by enabling a new feature that execute protected program stacks.

A common method of breaking into systems is by maliciously overflowing buffers on a program's stack. Malicious unprivileged users often use this method to trick a privileged program into starting a superuser shell for them, or similar unauthorized actions. Detailed information on this type of attack may be found by doing a web search for “Smashing the Stack for Fun and Profit.”

HP-UX 11i provides new mechanisms to defend against this type of attack without sacrificing performance.

By setting the kernel tunable parameter `executable_stack` to zero, HP-UX systems can be configured to execute protect program stacks, providing significant protection from many common buffer overflow attacks. In the vast majority of cases, enabling this feature will not affect compatibility of any legitimate applications.

Please refer to the new `+es` option section of the `chatr` (1) manpage for additional information on how to configure this feature and how to quickly detect and resolve any (very rare) compatibility issues that may result from enabling it.

To implement this feature, changes were made to kernel `execve()` and virtual memory code, and to the `chatr`, `elfdump`, and `ld` commands.

Impact

One of the primary goals of this feature is to significantly improve system security with the minimum possible effect on performance or compatibility. It consumes essentially no disk space or memory, and has no functional impact on the vast majority of legitimate applications, other than making them less vulnerable to malicious attacks. There is no measurable performance impact from this code.

Compatibility

In the default configuration, HP-UX is unaffected by these changes. Users who want to use this feature must explicitly enable it by setting the kernel tunable parameter `executable_stack` to 0. HP strongly encourages you to enable this feature. Refer to the `+es` section of the `chatr` (1) manpage for details of the possible trade-offs between security and compatibility.

ELF-64 programs linked on previous releases of HP-UX will not benefit from this security feature until they are re-linked on HP-UX 11i or later, but will still function normally. 32-bit applications do not need to be re-linked.

The output of `chatr` and `elfdump` have changed slightly. `chatr` now supports an `+es` option.

IMPORTANT**Warning to Java Users**

Disabling stack execution will cause Java 1.2 programs to fail if using JDK/JRE 1.2.2 versions older than 1.2.2.06. To determine the Java version you are using, assuming that java is in your PATH, run `java -version`. To download the latest version of the JDK/JRE, see <http://www.hp.com/go/java>.

To allow pre-1.2.2.06 programs to run, the executable from stack attribute of the program must be set to enable. To do this, invoke `chatr +es enable file`, where *file* is the executable file. This attribute will need to be set to enable for all executables contained in the JDK and JRE. This includes all files contained in the following directories:

```
/opt/java1.2/bin/PA_RISC/native_threads  
/opt/java1.2/bin/PA_RISC2.0/native_threads  
/opt/java1.2/jre/bin/PA_RISC/native_threads  
/opt/java1.2/jre/bin/PA_RISC2.0/native_threads
```

Java 1.1 versions will execute with no problem.

Auditing Commands/System to be Updated

HP-UX auditing system will be updated to work in both standard and trusted modes in a future release. The audit trail will be in a different format. The output of the *audisp* (1M) command would also be simplified to allow parsing by automated tools.

Configurable Security Features

**new at 11i
original release**

Administrators now have a new convenient way to customize security features. A new `/etc/default/security` file is defined. Editing this file provides a way to configure new security features or to modify the behavior of existing security features.

A `PASSWORD_HISTORY_DEPTH=<n>` parameter can be added to `/etc/default/security` to enable a new password history feature, which forces users to choose passwords that do not match their most recent `<n>` passwords.

A `MIN_PASSWORD_LENGTH=<n>` parameter can be added to `/etc/default/security` to force users to choose passwords which have at least `<n>` characters.

A `SU_ROOT_GROUP=<groupname>` parameter can be added to `/etc/default/security` to allow users to `su` to root only if they are a member of the `<groupname>` group.

See *security* (4) for additional parameters and details.

Password History Feature on Trusted Systems

Password history is a new trusted-system feature of the `passwd` command, used to discourage users from re-using previously used passwords.

The system administrator enables the system-wide password history feature by creating (or opening, if it already exists) a file called `/etc/default/security` and appending an entry:

```
PASSWORD_HISTORY_DEPTH=number
```

Depending on the value of `number` (decimal integer from 1 through 10), the system checks the user's new password against that number of previously used passwords and prevents their usage. (For example, if `number=5`, the system will not allow a user to use any of the last five passwords he or she has previously used.)

Structurally, the password history feature is accomplished by a shared library, called `libpam_unix.1`, which is dynamically loaded at run time by the command. This structural characteristic is totally transparent to users; the end-user interface of the command is unchanged.

For further information, consult the `passwd (1)` manpage.

Kerberos Client Software

new at 11i original release

Kerberos is a network authentication protocol. Kerberos Client Software, now provided with HP-UX 11i, enables integrating HP-UX into a secure enterprise environment. It provides tools and libraries to perform authentication and secure communication.

The Kerberos protocol is designed to provide strong authentication for client/server applications by using secret-key cryptography. It uses strong cryptography so that a client can prove its identity to a server and vice versa across an insecure network connection. After the client and the server have established their identities, they can also encrypt all of their communications to assure privacy and data integrity.

Kerberos Client Software is based on MIT Kerberos V5 1.1.1. It consists of libraries, header files, manpages, and Kerberos utilities which help in performing command line or programmatic authentication. Data encryption APIs can be used to protect data transmitted over the Internet. Kerberos Client Software supports both 32- and 64-bit development. The 64-bit libraries are placed in the `/usr/lib/pa20_64` directory.

Libraries

The following libraries are included:

- `/usr/lib/libkrb5.sl, /usr/lib/pa20_64/libkrb5.sl:`
All of the Kerberos APIs are implemented by this library. This library implements APIs for authentication, verifying tickets, creating authenticator, context management, etc. For more information see *libkrb5* (3).
- `/usr/lib/libcom_err.sl, /usr/lib/pa20_64/libcom_err.sl:`
This library implements `com_err` APIs. The `com_err()` functions print appropriate error messages to the `stderr` based on the error code returned by Kerberos APIs. For more information see *libkrb5* (3).
- `/usr/lib/libk5crypto.sl, /usr/lib/pa20_64/libk5crypto.sl:`
This library provides APIs for encryption and decryption. Internally, it uses DES (Data Encryption Standard). Currently, it supports 56-bit DES and is used by the Kerberos APIs. For more information see *libkrb5* (3).
- `/usr/lib/gss/libgssapi_krb5.sl, /usr/lib/pa20_64/gss/libgssapi_krb5.sl:`
This contains the Kerberos support for GSS API as per RFC 2743/2744. This library is used by `/usr/lib/libgss.sl`, which is part of the GSS API product. For more information, see *libgss* (4) and *gssapi* (5) and the previous section.

Header Files

- `/usr/include/krb5.h`
- `/usr/include/profile.h`
- `/usr/include/com_err.h`

Utilities

- `/usr/bin/kinit`: obtain and cache the Kerberos ticket-granting ticket. See *kinit* (1).

- /usr/bin/klist: list cached Kerberos tickets. See *klist* (1).
- /usr/bin/kdestroy: destroy Kerberos tickets. See *kdestroy* (1).
- /usr/bin/kvno: print key version numbers of Kerberos principals. See *kvno* (1).
- /usr/bin/kpasswd: change a user's Kerberos password. See *kpasswd* (1).
- /usr/sbin/ktutil: Kerberos keytab file maintenance utility. See *ktutil* (1).

Manpages

- Manpages in /usr/share/man/man1.Z directory: *kinit* (1), *klist* (1), *kdestroy* (1), *kvno* (1), *kpasswd* (1), and *ktutil* (1)
- Manpages in /usr/share/man/man4.Z directory: *krb5.conf* (4)
- Manpages in /usr/share/man/man3.Z directory: *libkrb5* (3)

Special Considerations

Developing Secure Applications

Though Kerberos APIs are made available, these are for supporting existing Kerberos Applications to HP-UX 11i. Application developers are strongly encouraged to use GSS API for developing secure applications. See *gssapi* (5) for details.

libsis.sl

Most of the KRB-Support (*libsis.sl*) functionality is now available with Kerberos Client Software. It is recommended that developers compile and link with these libraries.

Unsupported Features

- Kerberos Client Software does not support 3 DES due to U.S. export regulations.
- Kerberos Client libraries are not thread safe.

Size Requirement

Kerberos Client Software requires 5MB of disk space.

Compatibility Issues

- Kerberos V5 1.1.1 Client Software is compatible with earlier versions of the Kerberos product supporting RFC 1510.
- Kerberos Client Software only supports the Kerberos 5 protocol as per RFC 1510. The product does not support the Kerberos 4 protocol and Kerberos 4 to Kerberos 5 request conversions.

HP-UX Kerberos Server Version 2.0

**updated for June
2002**

As of June 2002, HP-UX Kerberos Server 2.0 is available on the Application Release CD. The current version of the Kerberos server supersedes the earlier MIT based Kerberos server (version 1.0), on HP-UX 11i. This version of the Kerberos server offers many enhancements when compared to the previous version. This section discusses the salient features of HP's Kerberos server V 2.0. For further information, visit <http://docs.hp.com/hpux/onlinedocs/T1417-90003/T1417-90003.html>.

NOTE

For information on Kerberos Server version 1.0, as delivered on the Application Release CD for previous releases of HP-UX 11i v1, see the *HP-UX 11i September 2001 Release Notes*, available at <http://docs.hp.com>.

Single Sign-on

Using the Kerberos protocol, users have the foundation for secure single sign-on to applications and resources. Clients initially use a password that is used to obtain an initial ticket from the Kerberos Server. This ticket is then used to obtain further service tickets to access any Kerberized application that is located on the network. In this way, a single sign-on provides credentials to automatically access multiple applications and services wherever they reside on the network.

Cross-realm Authentication

The server provides both an authentication service as well as acts as a key distribution center (KDC). HP-UX Kerberos server supports cross-realm authentication. One use is to work with Windows clients who gain Windows 2000 Kerberos credentials. These are then used to authenticate the user to the HP-UX Kerberos server which, in turn, creates credentials for HP-UX applications and services, all with a single sign-on.

GUI Based Administration tool

In the Kerberos Server version 1.0 release, the administration tool was a command-line tool. This version of the Kerberos server (version 2.0) provides a GUI based tool to help administer the Kerberos server.

Multithreaded Server

Multithreading capability is available for servicing the user requests in the Key Distribution Center. Also, this version of the Kerberos Server uses a B+ Tree based backend database. This helps improve the performance of the Kerberos Server.

High Availability

In the event of the primary server crashing or going down, the secondary server (backup) can immediately be made the primary server. This provides for high availability in the case of mission critical applications. Also, the Kerberos server daemon (kdc) is always monitored by a parent process. If the child process dies/crashes it will automatically spawn a new server daemon.

Propagation

In the Kerberos Server version 1.0, the entire database needs to be periodically dumped and propagated (typically over the night). This will result in the databases not being in sync and reduces performance as there would be heavy traffic during propagation. However, in Kerberos Server version 2.0, the database is propagated automatically and the propagation is incremental. Only those entries that have changed/newly added will be dumped.

What's in This Chapter?

This chapter describes various compatibility issues between HP-UX 11.0 and 11i.

- Compatibility from HP-UX 11.0 to 11i (see page 266)
- Known Compatibility Exceptions from HP-UX 11.0 to 11i (see page 269)
 - Library-Related (see page 269)
 - Miscellaneous (see page 270)
 - Networking, Internet Services, and Security (see page 272)
 - Software Distributor (SD) (see page 273)
- Obsolescence and Deprecation of APIs (see page 275)
 - Rationale and Objectives (see page 275)
 - Terms and Definitions (see page 275)
 - Archive/Static Libraries (see page 276)
 - CMA Threads Obsolescence (see page 276)

Compatibility from HP-UX 11.0 to 11i

Hewlett-Packard has a long record of providing HP-UX compatibility. Because it protects your investment and allows you to upgrade easily, compatibility is an important feature that HP has always recognized and that HP customers have come to expect.

Compatibility requirements span across HP-UX products to third-party products as well. All third-party products (and those products they call) are equally important components in the complete customer environment. Customer solutions often have complex, multiple chains of dependent applications spanning the entire range of HP-UX products as well as third-party products. One broken link in the chain of dependencies may result in an application that no longer works. Support for the unbroken string of compatibility on HP-UX is one of the biggest and best benefits provided by HP.

HP-UX supports forward compatibility from 11.0 to 11i. This chapter will describe what this means for executable applications, object files, source files, data, and libraries. Compatibility exceptions will also be discussed. (For additional compatibility exceptions, see also Chapter 15, “Programming,” on page 281.)

IMPORTANT

Superdome administrators:

Use the new Superdome Machine Identifier to guarantee compatibility.

Because the `uname -i` command on your Superdome systems may not return a unique value for each system, you should use the new interfaces to *getconf*(1) and *confstr*(3C) to retrieve unique machine identifiers (and thereby guarantee compatibility on current and future platforms).

These interfaces are documented in the manpages and in Chapter 15, “Programming,” on page 281 of this document.

General Compatibility Concerns

The following types of compatibility are supported from 11.0 to 11i for well-behaved applications:

- Binary compatibility
- Source compatibility
- Data compatibility
- Relocatable object compatibility
- Upgrade compatibility

(For known exceptions to compatibility, see “Known Compatibility Exceptions from HP-UX 11.0 to 11i” on page 269.)

A well-behaved application adheres to the following characteristics:

- Uses only documented, public APIs
- Adheres to the required practices that are specifically documented

- Does not use documented features that are specifically described as having platform, architecture, or configuration limitations
- Does not decompose an HP-UX product and then reuse the results of the decomposition

NOTE

For compatibility issues relevant to a particular component, see the corresponding section elsewhere in this document.

Binary Compatibility

An application that has run on HP-UX 11.0 will continue to run with the same behavior on 32-bit and 64-bit HP-UX 11i. This includes executables, binary files that have been processed by the HP link editor with `ld` or indirectly with the compiler, and can be run by the HP-UX loader (`exec`).

Source Compatibility

Software that has been compiled on an HP-UX 11.0 release can be recompiled without change on HP-UX 11i. The term *source* includes input source to compilers, scripts, and makefiles.

Data Compatibility

An application can continue to access persistent data files (such as system files, backup/recovery formats, and HP-documented data formats) via supported APIs in the same manner as the previous release. For example, applications should access the password file information via `getpwent()` rather than directly reading the file in order to maintain data compatibility.

Relocatable Object Compatibility

A relocatable object can be a file (`.o`), shared library (`.sl`), or an archive library (`.a`). Several types of object binary compatibility are below (note that some executables are *not* supported):

- **Release-to-release relocatable object binary compatibility:** If an executable is created by linking with forward-compatible, relocatable objects from different releases—or by using `shl_load()` and `dlopen()` to dynamically load shared libraries built on a different release—than the application is *only supported* from HP-UX 11.0 to 11i.

However, linking pre-HP-UX 11.0 libraries and HP-UX 11.0 and 11i libraries in one relocatable object/executable is *not* supported.

CAUTION

Even though the linker will permit the linking of pre-HP-UX 11.0 libraries and HP-UX 11.0 and 11i libraries in one relocatable object/executable (and will not exhibit any warning or error messages), the executable may exhibit incorrect behavior.

- **Archive and shared relocatable object compatibility:** An executable that is created by linking with a shared library that has dependencies on an archive library (a situation that typically occurs when linking with archive system libraries) is *not* supported.
- **Data model relocatable object compatibility:** An executable created by linking with a mixture of 32-bit and 64-bit objects is *not* supported. The loader will not permit this.

Upgrade Compatibility

Customized configurations and data from HP-UX 11.0 are preserved upon installation and upgrade to HP-UX 11i.

HP-UX 10.x Applications on HP-UX 11i

HP-UX 10.x applications that have been compiled and ran on 11.0 can be recompiled and run on HP-UX 11i without change.

Known Compatibility Exceptions from HP-UX 11.0 to 11i

In the following sections, a short description of an 11i change is followed by details of the compatibility exception with which it is associated. Please note that all of these compatibility exceptions are *rare corner cases* for well-behaved applications. (The exceptions have been arranged alphabetically in four groups: 1) Library-Related; 2) Miscellaneous; 3) Networking, Internet Services, and Security; and 4) Software Distributor.)

Library-Related

- **Customization of `wctype` Methods**

To provide performance improvements, this change removes the ability to use customized locale methods for accessing `wctype`, wide-character classification APIs. If an application is built for locales with *localedef-m* and the method library includes custom functions for `iswalpha()`, `iswupper()`, `iswlower()`, `iswdigit()`, `iswxdigit()`, `iswalnum()`, `iswspace()`, `iswpunct()`, `iswprint()`, `iswgraph()`, `iswcntrl()`, `wctype()`, `iswctype()`, the application should now be linked with the method library and call the method functions directly.

- **`libc qsort()` Algorithm Change**

This change improves performance by enhancing `qsort()` so that it sorts “tied” elements differently than the previous implementation. Well-behaved applications are not affected, since the manpage warns that the order in the output of two equal items is unpredictable.

- **`libc SYSTEM_ID callgraph` Change**

The `callgraph` of `libc` has changed. As a consequence, applications that have been linked to the archival version of `libc` (as well as any shared libraries linked to that application) may fail.

NOTE

Linking an application with a shared library that depends on an archive library is *not* a supported configuration. Applications linked in this way do not qualify as well-behaved because this configuration is *not* supported.

- **`libc atof()` Algorithm Change**

This change fixes a defect in `atof()` to convert denormalized floating point numbers correctly. Applications which disregard the recommended coding practice of using floating point ranges (rather than relying on specific hard-coded floating point numbers) can be affected.

- **Linker Support for PBO of 64-bit Shared Libraries**

This change enables 64-bit PBO to function with shared libraries. Only those who link `-noshared` instrumented applications and try to use `HP_LD_FDP_INIT` to specify an alternative version of `fdp_init.o` will be affected. If this is the case, you will

have to use `HP_LD_FDP_INIT_NS` instead. If the `HP_LD_FDP_INIT_NS` environment variable is not set and `fdp_init_ns.o` is in the default location, the link will fail with the file not found error message.

- **ONC+/NFS Security Correction**

This change corrects a security problem in NIS+. However, applications that are linked to the archived version of the `libnsl` library may have a compatibility problem. (Applications linked to the *shared* version of `libnsl` will not exhibit these symptoms.) The symptoms include:

- Daemon registration will fail when UDP/TCP is used instead of the local loopback transport device.
- In the NIS+ environment, applications will not be able to authenticate themselves.
- NIS+ performance degradation will occur due to not being able to contact the `nis_cachemgr`.

Miscellaneous

- **DNS Bind**

This change is necessary to conform to the behavior found on other vendor platforms. Those who try to edit the file, named `.boot`, could find it missing, or if the file exists, they may try to edit the file, but will find that their changes have not taken effect. This is primarily a system administration change, but in the rare instance where scripts might be written to edit named `.boot`, the scripts would need to be modified to edit named `.conf` instead, both for the new file name and syntax.

- **ELF Undocumented Symbol Table Change**

To make some tool development easier, the ELF symbol table type of some thirteen linker-defined symbols has changed from `STT_OBJECT` to `STT_NOTYPE`. Although the names of these symbols have been documented, their types and meaning have not. However, only applications that are not well-behaved and read 64-bit ELF executable files are affected.

- **Fortran 90 GETARG Intrinsic Function**

This change causes the semantics of the `index` argument to the HP-supplied F90 intrinsic routine, `GETARG`, to be compatible with older HP F77 and other vendor implementations of this routine. Those affected will have to change and recompile their source code to use the industry-standard indexing scheme.

- **IOSCAN Usability Enhancement**

This change improves the usefulness of the `IOSCAN` output for PCI interfaces. However, because the description field for PCI interface cards has been changed to be more descriptive, scripts that scan for hard-coded values may need modifications. (The description field for non-PCI devices has remained the same.) See “Improved `ioscan` Description Field for PCI Devices” on page 199 for more information.

- **MAX_PROCS Changed to Enable 128 CPU Support**

This change enables support for 128 CPUs. The kernel macro `MAX_PROCS` has changed from 32 to 128 in the LP64 kernel and has changed the ABI for the undocumented system calls `ki_call()` and `ktest_ioctl()`.

The `MAX_PROCS` change will cause an ABI incompatibility for kernel-intrusive applications or drivers which access internal kernel arrays sized by the `MAX_PROCS` macro.

NOTE

Correction: Contrary to what was reported in previous *11i Version 1.0 Release Notes*, the maximum numbers of pids is 30000. The symbolic constant `MAXPID` was increased to 8 million in 11i version 1.0 header files; however, it is not dynamic, nor is it used directly by the HP-UX operating system to determine the maximum number of pids. This may change in a future release of HP-UX.

- **Memory Windows**

This change enables applications to access up to 1GB of shared memory that is not otherwise allocated against the system-wide limit. However, enabling Memory Windows alters the semantics of some memory APIs and some POSIX APIs. Although these APIs will function correctly for applications running within their own Memory Window, they will not function correctly for applications running in different Memory Windows.

- **Process-Private Memory: Increase in Memory Size Limit**

This change increases the memory size limit for process-private memory. However, when the 3rd quadrant private feature is enabled for a process, it can only allocate shared objects in the 4th quadrant. If the 4th quadrant fills up, the application may fail, where it would not have failed if the 3rd quadrant were available for allocation of shared objects.

- **pstat_getdynamic Interface: Change in Maximum Number of Active Processors**

This change corrects a defect in the `pstat_getdynamic` interface so it adheres to the documentation when it reports the number of processors that are active on a system. Well-behaved applications will not be affected by this change. However, ill-behaved applications may overestimate the number of processors that are active on the system. Ill-behaved applications can be corrected to reference the correct field with a simple code change. See “On Demand Solutions” on page 200 for more information.

- **strftime() Support for Week Number**

This change fixes a defect in `strftime()`. Now, applications that use the `%V` option of `strftime()` to obtain the week number will find that the return value is 52 instead of 53 when:

- December 31 falls on a Friday, in a non-leap year, when the date passed in is January 1 or January 2 of that week. Some years affected include 1999, 2004, and 2032.
- December 31 falls on a Saturday, when the date passed in is January 1 of that week. Some years affected include 2005, 2011, 2016, 2022, 2033 and 2039.

- **Support Tools Manager User Interface, EMS Hardware Monitors**

This change improves the usability for the STM User Interface and the EMS Hardware Monitors. As a result, any script that depends on the specific output of the EMS Hardware Monitors or specific commands or displays in the STM User Interface may have to be modified. See “HP-UX Support Tools (Diagnostics): STM, ODE, & EMS Hardware Monitors” on page 110 for more information.

- **System V Message Queues Expanded Beyond 64KB Limit**

This change alters the message queue data structures to support queues larger than 64KB. Consequently, if one application is built to use the larger queues, all related applications that use the same message queue must also be built to use the larger queues. See “System-V IPC Message Queue Enhancement” on page 211 for more information.

Networking, Internet Services, and Security

- **EISA Interface Cards**

Although EISA interface cards are supported on 32-bit operating systems, they are not supported on 64-bit systems.

- **IPv6 IPsec**

This change allows support for a contemporary standard. The values for the following defines were changed to support standards:

```
— IPPROTO_ENCAP
— IPPROTO_IPIP
```

- **Non-Executable Stack**

This change improves system security. The majority of your programs should be unaffected by execute-protecting program stacks. Only those that execute instructions from their stack (typically interpreters, simulators and debuggers) are affected.

When enabled, the new functionality causes the termination of any program attempting to execute code located on its stack. If this occurs, you will be given an error message pointing to relevant documentation that explains the reason for the process termination and how to remedy the situation.

See “Execute Protected Stacks” on page 255 for more information.

- **NFS Mount Access Control**

This change is necessary to conform to *de facto* industry behavior. The behavior of `access=` has been modified to conform to a common behavior. If you are using this undocumented feature to disallow the NFS mounts, it will now succeed.

NOTE

Applications that use undocumented features are not “well behaved.”

- **Tighter Security for NFS Mounts**

This change is necessary to improve the security of NFS mounts. Without this change, when you export a file system using the `root=` option of `exportfs`, NFS-clients on the `root=` option are allowed to mount the NFS file system even when they don't appear on the `rw=` list and/or `access=` list. The new behavior prevents NFS clients from mounting the file system unless they appear in either a `rw=` and/or `access=` list.

- **Export Filesystem (NFS) Security Defect Correction**

This change corrects the NFS implementation so it conforms to industry practice when exporting a file system. Well-behaved applications will not be affected by this change. However, applications that assume that exporting a symbolic link to a file system will result in the symbolic link being exported, rather than the directory to which the symbolic link points, will fail that assumption. Shell scripts and administrative processes may have to be changed to correct the assumption.

Software Distributor (SD)

- **SD Bundle Algorithm Change**

This change allows you to maintain a depot with multiple versions of a Software Distributor bundle and automatically get the latest version of the bundle without specifying a version qualifier. The install process no longer prints an error message when you do not qualify which version of the bundle is intended to be installed.

- **SD Automatic Generation of Depot or root Layout Version**

This change allows you to maintain 10.20 and 11.x depots on an 11.x system. It modifies the SD commands so they do *not* change the layout version of a depot or root automatically. Any scripts or processes that rely on the automatic conversion to `layout_version=1.0` will be broken.

- **SD Log Message Simplification**

This change makes it easier for an administrator to identify real problems when scanning the log files. The SD log files now contain less “noise” (error, warning or note messages that contain no useful information).

- **SD System Update Process**

Although you will have to learn a new process, this change gives you a more robust and easier to use the HP-UX 11i update process.

- **SD Reduces Amount of Information from Program `swlist`**

This change improves the performance of some `swlist` options. Extraneous data is no longer displayed and the listing of bundles in a depot shows only bundles. Applications that depend on the old format and behavior will have to be modified.

- **SD Changes Behavior with Unknown Attributes**

This change allows packagers to use new attributes in their software packages without requiring SD to know the attribute. Specifically, the `swpackage` program will no longer print error messages when an unrecognized attribute is encountered. However, you must be careful when naming attributes because typographical errors will no longer be reported.

Obsolescence and Deprecation of APIs

This section defines the obsolescence of core system libraries and relocatable objects. Obsolescence of other products are covered in separate sections.

Rationale and Objectives

HP's rationale and objectives for obsolescence and deprecation of APIs are as follows:

- provide common, standard APIs across UNIX vendors
- facilitate portability for our ISVs
- reduce confusion for the selection of similar APIs
- reduce the size of `libc`, thus increasing performance of shared `libc`
- reduce the continued application turbulence for future architecture changes
- remove compatibility problems for applications linked to shared libraries that have dependencies on archive system libraries
- reduce satisfaction issues with APIs that have specific defects (for example, compatibility issues)
- reduce support costs for APIs that are not moving in the strategic direction of standards, the industry, and our customers
- minimize adoption issues for new releases on PA-RISC or Itanium®

The intent is that there will be *no* gratuitous changes. Obsolescence of APIs and libraries will be acceptable only when initiated to avoid application breakage or duplicate functionality.

Terms and Definitions

Deprecated: A *deprecated* interface can have the following characteristics:

- functionality is available on the system
- deprecation is a step towards obsolescence
- the specification is in flux
- has less value to users
- functionality no longer makes sense
- functionality has been replaced
- support/enhancement expectations have been lowered
- usage is discouraged
- warnings against usage/alternatives have been provided
- the provider continues to test functionality
- migration plan/tools have been provided

The reasons for marking an interface as *deprecated* may include the following:

- marked “to be withdrawn” by standards
- support is available via more standard means
- equivalent, enhanced, more reliable counterparts exist
- any or all reasons listed in the “Obsolete” section below

Obsolete: An *obsolete* interface may have the following characteristics:

- functionality is no longer available on the system
- runtime support is undefined
- cannot develop or build with this interface
- documentation is not provided or recommends against usage
- the final stage of the product life cycle has been reached

The reasons for marking an interface as *obsolete* may include the following:

- underlying infrastructure in either the software or hardware is obsolete or not available
- changes to the system have decreased reliability
- miscellaneous business decisions such as those listed below:
 - a third-party's solution exists
 - not strategic
 - support costs are too high
 - not enough ROI

Archive/Static Libraries

Most archive system libraries, such as `libc.a` (with the exception of `libc.a`, `libcres.a`, and `libsbin.a`), will be obsolete and not shipped on future releases of HP-UX, including those supporting Intel® Itanium®. For the resulting benefits to you and to HP, refer to “Rationale and Objectives” on page 275.

NOTE

In most cases, your makefiles will continue to work without the need for modifications.

CMA Threads Obsolescence

Background

CMA threads (`libcma`) is a user-space implementation of POSIX P1003.1a (Draft 4), which was based on Concert Multi-Thread Architecture (CMA).

Starting at HP-UX 11.0, multi-threading was also supported in the HP-UX kernel and was known as kernel or POSIX threads (`libpthread`). The POSIX threads implementation supports the approved POSIX 1003.1c (POSIX.1-1996 Draft 10) standard, which facilitates application portability onto POSIX-compliant vendor platforms. POSIX threads also enable the application to parallelize the execution of threads on multiple processors in a multi-processor system.

CMA threads (`libcma`) have been deprecated (slated for future obsolescence) at 11i, and their development environment will no longer be shipped on future releases of HP-UX, including those supporting Intel® Itanium® (there is no plan to release native Itanium®-based CMA threads). Also see “Kernel Threads vs. CMA Threads” on page 203.

Options

Applications using CMA threads have the following options:

- `libcma` PA applications will continue to run on future releases of HP-UX, including those supporting Intel® Itanium®, via compatibility mode.
- Applications using `libcma` should start migrating to POSIX threads (`libpthread`).
- Where the `libcma` development environment is still available, `libcma` applications can maintain their existing development environment on 11.0 to 11i in order to continue to make application defect repairs. The applications can then be deployed on future releases of HP-UX, including those supporting Intel® Itanium®.

Customer Transition Aids

Transitioning from CMA threads to POSIX threads is not a trivial endeavor. To help you with the transition, the 11.x/Itanium®-based Software Transition Kit (STK) provides tools and documentation transition aids at:

<http://devresource.hp.com/STK>

Additional transition aids include the following:

- The *Porting DCE Threads Programs to HP-UX 11.0 POSIX Threads* white paper at:
<http://docs.hp.com>
- STK tools that can detect `libcma` usage in customer code/binaries, available at:
<http://devresource.hp.com/STK>
- The *Introduction to Kernel Threads* white paper at:
<http://devresource.hp.com/STK/partner/threads.html>

List of APIs to be Deprecated/Obsoleted

The following table provides a summary of the APIs that have been deprecated and/or obsoleted:

Table 14-1 APIs to be Deprecated/Obsoleted

Library/API	Description	Release Deprecated	Native on Itanium®	Comments
Entire Libraries				
<code>libc.a</code> <code>pa20_64/libc.a</code>	Archive/static <code>libc</code>	11i 11i	No No	
<code>libp/libc.a</code> <code>pa20_64/libp/libc.a</code>	Archive profile <code>libc</code>	11i 11i	No	
<code>libpicc.a</code>	Build custom <code>libc</code>	11i	No	
<code>libPW.a</code>	ATT Programmer's Workbench	10.30	No	Comparable APIs are in <code>libc</code> .
<code>libBSD.a</code>	BSD 4.2 library	10.30	No	Comparable APIs are in <code>libc</code> .

Table 14-1 APIs to be Deprecated/Obsoleted (Continued)

Library/API	Description	Release Deprecated	Native on Itanium®	Comments
/usr/old/ libmalloc3x.a /usr/old/ malloc3c.o	Old malloc() relocatable objects for compatibility with pre-9.x	10.01 11i	No	Use libc malloc().
libcma.a libcma.1 libcma.2	CMA threads	11.0 & 11i	No No No	Use libpthread().
libc APIs				
memorymap()	Display the contents of the memory allocator. 32-bit only (no 64-bit available)	11i	No	Use mallinfo() instead.
blockmode() family blclose(), blget(), blopen(), blread(), blset(), <blmodeio.h>	HP proprietary terminal interfaces	10.30	No	Use libxcurses() instead.
File system descriptor file entry 4.2 BSD: endfsent(), getfsfile(), getfstype(), getfsent(), getfsspec(), setfsent()	File system APIs for compatibility with 4.2 BSD.	10.30	No	Use getmntent() APIs instead.
gettxt(), setcat()	SVID message catalog facility	11i	Yes	Use catopen(), catgets() instead.
sys_errlist(), sys_nerr()	Array of message strings and largest message number in the array.	11i	Yes	Use strerror() instead.
ptrace(), ptrace64()	Process trace	11i	No	
nl_tools_16() APIs and Macros: byte_status(), firstof2(), secoof2(), c_colwidth()	Tools to process 16-bit characters.	10.0	No	

Table 14-1 APIs to be Deprecated/Obsoleted (Continued)

Library/API	Description	Release Deprecated	Native on Itanium®	Comments
Derived Definitions for Header files				
<code>_INCLUDE_AES_SOURCE</code> <code>_XPG4_EXTENDED</code>	Replaced by <code>_INCLUDE_XOPEN_SOURCE_EXTENDED</code>	11i	No	
<code>_SVID2</code>	No longer supported.	11i	No	
<code>_XPG2</code>	No longer supported.	11i	No	
<code>_XPG3</code>	No longer supported.	11i	No	
<code>_XPG4</code>	Replaced by <code>_XOPEN_SOURCE</code>	11i	No	
<code>_POSIX1_1988</code>	Replaced by <code>_INCLUDE_POSIX_SOURCE</code> .	11i	No	
<code>_CLASSIC_ANSI_TYPES</code> <code>_CLASSIC_POSIX_TYPES</code> <code>_CLASSIC_XOPEN_TYPES</code> <code>_CLASSIC_ID_TYPES</code>	Supported in HP-UX 7.x, 8.x for HP-UX 6.x compatibility. HP-UX compatibility is not required for 10.x.	11i	No	

What's in This Chapter?

This chapter covers a variety of changes that are of particular interest to programmers. (For other relevant information, also see Chapter 14, “Compatibility,” on page 265.)

- HP-UX Software Transition Kit (STK) (see page 282)
- Libraries (see page 283)
 - aC++ Runtime (libCsup*, libstd*, libstream*, librwtol*) (see page 283)
 - Changes to libc (see page 284)
 - Overall libc Performance Tuning (see page 285)
 - Performance Improvements to libc's ftw() and nftw() (see page 287)
 - Performance Improvements to libc's malloc() (see page 288)
 - The libres.a Library (see page 290)
 - Changes to libm (see page 291)
- Miscellaneous (see page 292)
 - Transition Links Deprecated (see page 292)
 - Linker and Object File Tools (ld, crt0.o, dld.sl, libdld.sl, chatr, and odump) (see page 292)
 - Changes to the linker/dld Interface (see page 294)
 - Instrumented Code Using PBO or +O4 Optimization (see page 294)
 - HP DCE/9000 (see page 295)
 - Extensions to pstat() (see page 296)
 - Changes to sendfile (see page 299)
 - Machine Identifier Changes to confstr (see page 299)

HP-UX Software Transition Kit (STK)

The HP-UX Software Transition Kit (STK) aids in transitioning your software from HP-UX 10.20 and 11.0 to HP-UX 11i, from 32-bit to 64-bit, and from PA platforms to Itanium®-based platforms. To do this, many tools are available to help you resolve issues such as those involving data models and API changes. API file scanners are provided in the HP-UX STK, while other tools are part of the HP-UX operating system, are included in HP-UX language products, or are supplied by third parties.

The HP-UX STK provides step-by-step instructions for performing transitions, a complete set of background and technical documents, and file scanners to help you identify and resolve any required API changes in your source files.

The HP-UX Software Transition Kit will scan the following types of source files:

- C and C++ programs
- FORTRAN programs
- COBOL programs
- scripts
- makefiles

The STK file scanners can help you locate and fix any of the following that have changed or become obsolete:

- functions
- commands
- path names
- macros
- structures and structure members
- language keywords
- libraries
- variables

One of the HP-UX STK file scanners, `scansummary`, can help you plan your transition by summarizing the number and type of API impacts in your source files. The other tool, `scandetail`, can help you resolve those impacts by identifying the file name and line number where each impact occurs. Both tools provide links to more detailed information about each impact. (The file scanners can also identify opportunities for using some of the enhanced features of newer versions of HP-UX.)

To use the HP-UX STK tools, you must install them. The HP-UX STK is available free of charge via the Web at <http://devresource.hp.com/STK>.

**updated for
September 2002**

Check this site often for updated content. The HP-UX STK version 1.8 is the latest version, including tools and documentation to help you successfully transition your software to HP-UX 11i (version 1.0 [B.11.11] as well as 1.6 [11.22]).

Libraries

aC++ Runtime (`libCsup*`, `libstd*`, `libstream*`, `librwtool*`)

The aC++ runtime provides the run-time environment necessary for deploying C++ based (aC++ compiled) applications on HP-UX 11i.

**new at 11i
original release**

This release of the aC++ runtime includes a new ANSI-compliant Standard C++ library. (The previous version of the runtime included the “classic” C++ STL library that corresponded to the pre-standard [Sept. 1998] definition of the C++ language and library.) Although the updated C++ runtime included for HP-UX 11i retains the “classic” C++ library functionality, it also includes new components (`libstd_v2` and `libCsup_v2`) that introduce a standard-compliant set of C++ interfaces, as required by the ISO/IEC 14882 Standard for the C++ Programming Language.

The added components, `libstd_v2` and `libCsup_v2`, are new libraries with functionality that did not exist prior to this release of the C++ runtime. The details of the newly added libraries are covered in the following files (which are available after installation of the aC++ product, version A.03.26 or later):

- `file:/opt/aCC/html/libstd_v2/stdug/index.htm`
- `file:/opt/aCC/html/libstd_v2/stdref/index.htm`

Over time, with the acceptance of the new library, the old, “classic” library is expected to be deprecated and possibly removed from future operating system releases.

Impact

Overall (file) size of the C++ runtime will increase by about 44%, with 10 new libraries.

This release provides access to the standard compliant C++ library for application developers (and deployment of such applications). This is by far the most heavily requested enhancement by the users of the aC++ compiler. However, the performance of the new library (`iostreams`) may be slower.

Compatibility

C++ application (source and binary) forward compatibility with 11.x is fully maintained by preserving the classic C++ library in the new runtime. Therefore, source files, build systems, and object files or libraries produced under HP-UX 11.0 with the previous version of C++ runtime should continue to work under the new runtime.

However, the new libraries are binary incompatible with the classic C++ libraries. The option `-AA` must be used to enable the new libraries and headers.

To preserve backward source and runtime compatibility from HP-UX 11i to 11.0, application developers who develop C++ applications with the use of the new standard C++ library must ensure that the June 2000 Application Release-dependent C++ library patches (specified below) are applied to the 11.0 system.

The C++ library and Header File patches are shown at the following web site, now a part of the Developer and Solution Partner Portal: <http://www.hp.com/go/hpc++>.

Documentation

Detailed manpages for the new library are included with the Independent Software Unit release. The new library is also discussed in aC++ Online Help.

Changes to libc

- **Large Files Support for C++ Applications**

To support large files for C++ applications, `libc` has been modified. C++ applications can now access files greater than 2 GB. This is done by setting `_FILE_OFFSET_BITS` to 64 in 32-bit mode. More details can be found in the *HP-UX Large Files White Paper* Version 1.4 on <http://docs.hp.com>.

- **HP CxDL Development Tool Support**

In both 64-bit and 32-bit `libc`, support for HP CxDL Development tool has been included in the `setjmp()` and `longjmp()` family of APIs.

- **libdbm and libndbm**

A new patch for the `dbm` libraries, *libdbm* (1) and *libndbm* (2), has been created to increase performance of `dbm_nextkey()`.

- **Header Files**

Header files, `ftw.h` and `stdio.h`, were patched to enable C++ large files support. In addition, numerous defects were fixed.

- **New Environment Variables for malloc()**

To make them thread-safe, `libc` uses a single lock in the `malloc()` routines. In a multi-threaded application, there could be contention on this single lock if multiple threads are calling `malloc` and `free` at the same time. This patch provides multiple arenas (from where `malloc()` can allocate space) and a lock for each arena. Threads are distributed among the arenas. Two new environment variables are introduced:

```
_M_ARENA_OPTS  
_M_SBA_OPTS
```

These can be used to tune the number of arenas and the arena expansion factor for threaded applications. In general, the more threads in an application, the more arenas should be used for better performance. Expansion factors control the number of pages to expand each time and assumes the page size is 4096 bytes. The number of arenas can be from 4 to 64 for threaded applications.

For non-threaded applications, only one arena is used regardless of whether this environment variable is set or not. However, you still can use this environment variable to change the expansion factor for non-threaded applications.

If the environment variable is not set, or the number of arenas is set to be out of the range, the default number of 8 is used. The expansion factor is from 1 to 4096; the default value is 32. Again, if the factor is out of the range, the default value will be used. For example:

```
$ export _M_ARENA_OPTS=8:32
```

where the number of arenas is 8, and the expansion size is 32*4096 bytes. In general, the more arenas you use, the smaller the expansion factor should be, and vice versa.

`_M_SBA_OPTS` turns on the small block allocator, and sets up parameters for the small block allocator, namely, `maxfast`, `grain`, `num_smallblocks`. Refer to `malloc()` for details about the small block allocator, and its parameters. Applications usually run faster with the small block allocator turned on rather than off.

Although a small block allocator can be turned on through `malloc()`, it is not early enough for C++/Java applications. The environment variable turns it on before the application starts.

The `malloc()` call can still be used the same way. If the environment variable is set, and no small block allocator has been used, the subsequent `malloc()` calls can still overwrite whatever is set through `_M_SBA_OPTS`. If the environment variable is set, and a small block allocator has been used, then `malloc()` will have no effect. For example:

```
$ export _M_SBA_OPTS=512:100:16
```

where the `maxfast` size is 512, the number of small blocks is 100, and the grain size is 16. You must supply all 3 values, and in that order. If not, the default values will be used instead.

The `_M_ARENA_OPTS` and `_M_SBA_OPTS` environment variables have the following impact:

- Performance is improved for multi-threaded applications.
- Threaded applications may experience increased heap storage usage (but you can adjust the heap usage through `_M_ARENA_OPTS`).

NOTE

Threaded applications that are linked with archive `libc` (or with other shared libraries that have dependencies on shared `libc`) may break.

Overall libc Performance Tuning

new at 11i original release

To decrease calling overhead, several header files have been changed in the system library `libc`, (`/usr/lib/libc.sl`). In addition, a new archive library has been added to allow linking the string and memory routines archived but an application as a whole can be linked shared.

There are now two different 32-bit system libraries. One is built for use on a PA1.1 machine and the other is built for use on a PA2.0 machine. The correct library is installed at installation time. Other changes to these libraries include a decreased calling overhead for the shared library. Also, the build process makes use of pragmas introduced in release 10.20 to decrease the calling overhead in shared libraries.

In addition to the changes to the library builds, changes have been made to selected header files to allow building applications that have decreased calling overhead. These changes apply to both 32-bit and 64-bit applications.

Two new libraries are added: `/usr/lib/libcres.a` and `/usr/lib/pa20_64/libcres.a`. These archive libraries include the common string and memory functions along with a improved performance `qsort` routine. A few other selected small routines are also included. The intent of this library is to allow an application to link to this library archived while linking the application as a whole shared. The use of this archived library is a supported link mode and will not introduce the problems normally associated with a shared/archive link.

The 32-bit system libraries now have selected APIs built with the pragmas `HP_DEFINED_EXTERNAL`, `HP_LONG_RETURN`, and `HP_NO_RELOCATION`. When these three pragmas are used in the building of `libc.sl`, it is referred to as a *fastcalled* library. The result of this is that the export stubs for the selected interfaces have been in-lined in the library code, thus reducing call overhead. Applications that have already been built will benefit from this without any effort other than the replacement of this library. The benefit a given application will gain is very dependent on the application's use of the `libc` APIs that have been fastcalled.

Along with the changes to the build process for `libc.2`, the following header files have been changed:

```
ctype.h
grp.h
mntent.h
pwd.h
stdio.h
stdlib.h
strings.h
string.h
time.h
```

These header files now contain the necessary fastcall pragmas to enable building a fastcalled application. To make use of the pragmas to build the application, `_HP_SHLIB_CALLS` needs to be defined for the application compile. With this define, the application will now have the import stubs inlined in the application code, further reducing the shared library call overhead.

CAUTION

An application that has been built with the `_HP_SHLIB_CALLS` define can *only* be used with a fastcalled `libc`. If the application also has APIs that are fastcalled and are part of the applications shared libraries, then that library must also be built with the fastcall technology

Although the build process for `/usr/lib/pa20_64/libc.2` library has not changed, the runtime architecture for PA-RISC 2.0 can make use of a reduced call overhead technology similar to that which exists with the 32-bit library. There is no restriction on matching the correct `/usr/lib/pa20_64/libc.2` with the fastcalled application like there is with the 32-bit library.

Impact

There is little to no impact from these changes, although there is a slight (125KB) increase in amount of disk space required for `libcres.a`. The changes to the system libraries are transparent to current applications.

Any performance gains for an application are highly dependent on the application's use of `libc.sl` and what interfaces in this library are used.

The fastcall technology will be delivered with all systems. If there are compatibility concerns, the applications should not be built with this technology.

More APIs in `libc` may make use of the fastcall technology in future releases. Appropriate changes to the header files will be delivered to track these changes.

Compatibility

An existing PA1.1 application will not have a compatibility issue with the new 32-bit fastcalled `/usr/lib/libc.sl`. However, if the fastcall technology is used to build an application, then that application can only be used with a fastcall technology library.

Neither an existing 64-bit application, nor a 64-bit application built with the fastcall technology, should have any compatibility issues with the existing `/usr/lib/pa20_64/libc.sl` libraries. However, to make use of the application fastcall and the `libcres.a` features, changes will need to be made to existing make files.

Documentation

The `libcres.a` (5) manpage describes use of the `libcres.a` library more thoroughly.

Performance Improvements to `libc`'s `ftw()` and `nftw()`

The `libc` functions `ftw()` and `nftw()` have been rewritten to operate faster, avoid stack overflow conditions, reduce data space usage, and improve parallelism in multi-threaded applications.

Both `libc`, itself, and the commands that call `ftw()` and `nftw()` are affected.

- **`ftw()`**

`ftw()` was rewritten to eliminate internal recursion, thus avoiding the possibility of a stack overflow on deep file trees. A single fixed-size data structure is allocated in the stack instead of using `malloc()` to separate buffers for each depth of the tree. Use of `strlen()` was eliminated, as well as trivial comparisons such as `strcmp(buf, ".")`. The file descriptor re-use algorithm was changed from most-recently-opened to least-recently-opened which can show significant performance gains on very deep file trees.

`ftw()` will typically show 8% reductions in elapsed time and 50% or more reduction in heap space used.

- **`nftw()`**

`nftw()` was rewritten similarly to `ftw()` with the same benefits. `nftw()` now fully conforms with the UNIX95 definition, including the fact that when the `FTW_PHYS` is not set, files are reported only once.

Threaded applications can obtain greater concurrency when specifying absolute path names for the starting path, and `FTW_CHDIR` is not set. In addition, an internal unbalanced binary tree was replaced with a much more efficient splay tree. The effect of this tree change becomes significant as the number of object inodes being tracked increases. Directory inodes are always tracked, and when executing in UNIX95 mode and the `FTW_PHYS` option is not set, all files and directories are

tracked. When the number of tracked objects reaches about 20,000, the user CPU time with the splay tree is about half the user CPU time for the old `nftw()`. At 100,000 tracked inodes, the user CPU time is about 90% less for the splay tree.

Another performance improvement to `nftw()` eliminated calls to `access()` by checking the mode bits in the `stat()` buffer. This decreased system CPU time by approximately 4%.

Two defects were fixed in `nftw()`:

- When the `FTW_CHDIR` option is set, directories are considered unreadable unless they have both read and execute permissions. (The old `nftw()` would try to `chdir()` into a directory without execute permissions and then abort the walk with an error).
- When the `FTW_CHDIR` option is set, a directory object is reported to the user function *before* it is `chdir()`'ed into.

`nftw()` improvements vary depending on options provided, with the most significant improvements seen in UNIX95 standard mode with the `FTW_PHYS` option not set, or when a very large number of directories exist in the file tree being traversed.

Impact

The code size of `ftw()` and `nftw()` has increased by about 40%, but the heap requirements are reduced by 50% or more.

Minimally, you should find that `ftw()` operates about 6% faster and `nftw()` 4% faster. On very large file trees where the number of tracked inodes is in the tens of thousands or more, the performance gain of `nftw()` could be 30% to 40% or more.

If you relied on the `FTW_CHDIR` defects which were mentioned above, there may need to be an application change.

Documentation

The `ftw(3C)` and `nftw(3C)` manpages have been updated, particularly with respect to the two defect fixes and means of achieving best concurrency in threaded applications.

Performance Improvements to `libc's malloc()`

A new environment variable, `_M_CACHE_OPTS`, is available to help tune `malloc()` performance in kernel-threaded applications. This environment variable configures a thread-private cache for `malloc`'ed blocks. If cache is configured, `malloc`'ed blocks are placed into a thread's private cache when `free()` is called, and may thereafter be allocated from cache when `malloc()` is called. Having such a cache potentially improves speed performance for some kernel-threaded applications, by reducing mutex contention among threads and by deferring coalescence of blocks.

The thread-private cache is only available for kernel-threaded applications, i.e. those linked with the `pthread` library. The installed shared `pthread` library version must be `PHCO_19666` or later, or the application must be statically linked with an archive `pthread` library that is version `PHCO_19666` or later, or else cache is not available.

By default cache is not active and must be activated by setting `_M_CACHE_OPTS` to a legal value. If `_M_CACHE_OPTS` is set to any out of range values, it is ignored and cache remains disabled.

There are two portions to the thread private cache: one for ordinary blocks and one for small blocks. Small blocks are blocks that are allocated by the small block allocator (SBA), which is configured with the environment variable `_M_SBA_OPTS` or by calls to `mallopt(3C)`. The small block cache is automatically active whenever both the ordinary block cache and the SBA are active. The ordinary block cache is active only when it is configured by setting `_M_CACHE_OPTS`. There are no `mallopt()` options to configure the thread-private cache.

The following shows `_M_CACHE_OPTS`'s subparameters and their meaning:

`_M_CACHE_OPTS=<bucket_size>:<buckets>:<retirement_age>`

`<bucket_size>` is (roughly) the number of cached ordinary blocks per bucket that will be held in the ordinary block cache. The allowable values range from 0 through $8 \times 4096 = 32768$. If `<bucket_size>` is set to 0, cache is disabled.

`<buckets>` is the number of power of 2 buckets that will be maintained per thread. The allowable values range from 8 though 32. This value controls the size of the largest ordinary block that can be cached. For example, if `<buckets>` is 8, the largest ordinary block that can be cached will be 2^8 or 256 bytes. If `<buckets>` is 16, the largest ordinary block that can be cached will be 2^{20} or 65536 bytes, etc.

`<bucket_size>*<buckets>` is (exactly) the maximum number of ordinary blocks that will be cached per thread. There is no maximum number of small blocks that will be cached per thread if the small block cache is active.

`<retirement_age>` controls what happens to unused caches. It may happen that an application has more threads initially than it does later on. In that case, there will be unused caches, because caches are not automatically freed on thread exit -- by default they kept and assigned to newly-created threads. But for some applications, this could result in some caches being kept indefinitely and never reused. `<retirement_age>` sets the maximum amount of time in minutes that a cache may be unused by any thread before it is considered due for retirement. As threads are created and exit, caches due for retirement are freed back to their arena. The allowable values of `<retirement_age>` range from 0 to 1440 minutes ($=24 \times 60$, i.e. one day). If `<retirement_age>` is 0, retirement is disabled and unused caches will be kept indefinitely. It is recommended that `<retirement_age>` be configured to 0 unless space efficiency is important and it is known that an application will stabilize to a smaller number of threads than its initial number.

In general, kernel threaded applications that benefit in performance from activating the small block allocator may also benefit further by activating a modest-sized ordinary cache, which also activates caching small blocks (from which most of the benefit is derived). For example, a setting that might be tried to begin with would be:

```
_M_SBA_OPTS=256:100:8
_M_CACHE_OPTS=100:20:0
```

The smallest ordinary cache that is legal and will activate small block caching (if the SBA is also configured) is

```
_M_CACHE_OPTS=1:8:0
```

It can happen that activating small block caching with this minimum level of ordinary cache gives all the performance benefit that can be gained from malloc cache, and increasing the ordinary block cache size further does not improve matters. Or, increasing cache size further may give some further improvement for a particular application.

The `malloc()` per-thread cache is a heuristic which may or may not benefit a given kernel-threaded application that makes intensive use of `malloc`. Only by trying different configurations can you determine whether any speed improvement can be obtained from per-thread cache for a given application, and what the optimal tuning is for that application.

Impact

Although there will be no impact on performance if cache is not configured (or if application is not kernel-threaded), significant speed performance improvements are possible for some kernel applications if cache is configured.

A small additional space cost (in process heap size) is associated with the cache machinery. While there is no per-block space cost for caching small blocks, there is a small space cost per ordinary block cached. Therefore, ISVs whose applications are very memory intensive may want to configure only a minimum-sized or very small ordinary cache when experimenting with this feature.

The `malloc()` thread-private cache does not change the function of `malloc()` for nonthreaded or CMA-threaded applications. It does maintain binary compatibility. However, because it is a change in allocation policy, it can cause different sequences of addresses to be emitted for the same sequence of requests than a previous version of `malloc` would have emitted. This level of compatibility is more stringent than ordinary binary compatibility and has never been guaranteed across releases of `malloc`.

The `libcres.a` Library

Provided with the original release of `11i`, `libcres.a` is a small archive library that contains string, memory and other functions, to provide customers running performance-critical applications with the benefit of a static link.

Linking statically with `libc` is not a supported method of linking an application. Any performance improvement is highly dependent on the application's use of the included functions. The functions included in this library are as follows:

```
abs(), bsearch(), div(), ffs(), insque(), labs(), ldiv(), memchr(),  
memcmp(), memcpy(), memmove(), memset(), strcat(), strchr(), strcmp(),  
strcpy(), strcspn(), strlen(), strncat(), strncmp(), strncpy(), strrchr(),  
strspn(), strstr(), swab()
```

To make use of this library, existing makefiles must be modified to include it on the link line. Existing applications must be re-linked to use this library.

The modules of this library are compiled with the HP optimizing compiler using a `+O3` flag.

The functions in this library cannot be overwritten with a user-defined function of the same name, as is the case today with `libc` names. If this library is used, user libraries cannot contain identically named functions or unexpected results may occur.

Impact

Performance of some applications may improve by using this library. The improvement is highly dependent on the application's use of the included functions.

Documentation

The `libcres.a` (5) manpage describes the `libcres.a` library's use more thoroughly.

Changes to libm

The `fesetround()` and `fehold()` functions in `fenv.h` have been upgraded to the latest ISO C9x specification. Previously the functions returned nonzero to indicate success and zero to indicate failure; now they return zero to indicate success and nonzero to indicate failure.

Any code that depended on the return value will need to change. For example:

```
if (!fesetround(FE_UPWARD))
    /* deal with failure to set rounding direction */
```

could be changed to:

```
if(fesetrod(FE_UPWARD))
    /* deal with failure to set rounding direction */
```

Previous code that depended on the return value is not compatible beginning with the 11.0 May 1999 Extension Pack.

Miscellaneous

Transition Links Deprecated

**deprecated for
September 2003**

The “Upgrade” product which contains the transition links management tools will be removed from the next HP-UX release. The transition links (tlinks) management tools were intended to be temporary transition tools for application migration from HP-UX 9.x to HP-UX 10.x file system layout. The following transition links management tools are being deprecated and will become obsolete in post-HP-UX 11i v2 releases:

- `tinstall`
- `tllist`
- `tlremove`

For the C-Dev-Tools.C-AUX fileset, the Transitions Links will not be replaced by symbolic links. The files in question are in:

```
/opt/langtools/tlinks/C-AUX
```

They include `cpp`, `cpp.ansi`, `lex`, and `yacc`, as well as links to locales in `/opt/langtools/lib/nls/msg/`. (These last two commands will be available if the contents of the file `/etc/PATH` are included in your `$PATH`.)

For the C-ANSI-C.C fileset, the Transitions Links will not be replaced by symbolic links except for `cc`. The files in question are in:

```
/opt/ansic/tlinks/C
```

They include `cc`, `c89`, and `ccom`. (The `c89` command will be available if the contents of the file `/etc/PATH` are included in your `$PATH`.)

Similarly for the C-ANSI-C.C-TOOLS fileset, the Transitions Links will not be replaced by symbolic links. The files in question are in:

```
/opt/ansic/tlinks/C-TOOLS
```

They include `cb`, `cflow`, `cxref`, and `lint`.

Linker and Object File Tools (`ld`, `crt0.o`, `dld.sl`, `libdld.sl`, `chatr`, and `odump`)

**new at 11i
original release**

The following list summarizes the changes to linker and object file tools. Details for several of the linker changes follow the lists.

Linker Changes

- Incremental linking supported in 64-bit `ld` and `elfdump`.
- Unix 98 (32-bit `d1()`* calls) supported in `libdld.sl` and `dld.sl`.
- 32-bit Filtered shared libraries supported in `ld`, `dld.sl` and in `odump`.
- GProf 32-bit shared library supported in `crt0.o` and `dld.sl`.
- `ld +filter` option creates filtered shared libraries.

- Support for `ldd32`, which lists dynamic dependencies of executable files or shared libraries in `dld.s1`.
- Plabel cache, caches PLABELS at run-time, supported in `ld` and `dld.s1`.
- `ld +dependdb` and `+dependdb_outputdir` options generate dependency database, `ldb` file.
- `ld +objdebugonly` (in both 32-bit and 64-bit) ignores debug information from non-`objdebug` objects or archives and then proceeds in `+objdebug` mode.
- Special support for OGL's TLS shared library in `dld` (both 32- and 64-bit).

Tools Enhancements

- `elfdump +ild` displays incremental linking information.
- `ar -x` option allows modules from `lib` to keep datestamp.
- `odump -tlssym` option displays the TLS (thread) symbols.
- `chatr +q3p enable/disable` and `q4p enable/disable` option supports marking 3rd/4th quadrant for private data space.
- `odump -verifyall` option suppresses stub warnings on executable.
- `odump -filtertable` to displays the filtered shared library's implementation libraries.

Details of Linker Changes

Incremental linking: Incremental linking provides significant linktime improvements for compile-link-debug development cycles by processing only those input files that are actually modified between cycles. Files that are not modified do not need to be reprocessed. For large application, incremental linking may provide up to 10x (and sometimes greater) improvements in linktime.

Unix 98: Support for the APIs `dlopen`, `dlsym`, `dLError` and `dlclose` has been added for 32-bit programs.

Filtered Libraries: Filtered shared libraries divide up a large library into one filter and several implementation libraries. The user links against the filter library, but the real definitions of data and functions actually resides in the implementation libraries. At run time, only those implementation libraries that are actually used are loaded. Filtered libraries can be nested; an implementation library can itself be a filtered library containing other implementation libraries.

GProf 32-bit support: `GProf`, an enhanced version of `prof`, produces call graph profile data (along with the data generated by `prof`). While the profiling of shared libraries was not supported in earlier releases, this release will now support profiling of shared libraries using the environmental variable `LD_PROFILE`. No recompilation is required for profiling shared libraries.

PLabel cache: `+plabel_cache` is added to 32-bit linker and `dld.s1` to control the global symbol hash mechanism.

Compatibility

Various serious and critical defects were repaired.

Forward and backward compatibility are maintained. However, use of new features in this release may break backward compatibility.

Invoking `chatr` on some binaries built with an older linker may emit the following message:

```
chatr(error): dl_header_ext.size != sizeof(dl_header_ext). Please update your version of the linker/chatr.
```

This message should be regarded as a warning rather than an error. The operation of `chatr` will be successful despite the warning.

Changes to the linker/dld Interface

updated for
March 2002

The `linker/dld` interface support for CXperf no longer applies, as the CXperf product has been discontinued. For further details, see <http://hp.com/go/cxperf>.

new at 11i
original release

Patches to the `linker/dld` interface include the following enhancements:

- Added support for the CXperf performance measuring tool in both 32-bit and 64-bit versions of the `ld` command. Both versions now recognize the `+tools` option, which enables CXperf information to be propagated to an executable program.
- Added support for huge data (`.bss > 4GB`)
- A defect was repaired whereby `+Oprocelim` removed more than it should have causing a runtime error.
- Performance shows a definite improvement:
 - 32-bit `ld`: approximately 30% link time improvement
 - 64-bit `ld`: approximately 8% link time improvement
- Support OBJDEBUG architecture in both 32-bit and 64-bit linker.
- Added support for executable stack.
- Added global symbol table support.
- Added support for object code repository reuse.

Neither functionality nor compatibility are affected by the code changes. However, for 64-bit programs, mixing object files having non-weakorder sections with object files having weakorder sections might cause the ordering of text sections to change.

The new version of the linker requires 34112 blocks.

Instrumented Code Using PBO or +O4 Optimization

This note pertains to the compilers and linker for HP C, HP aC++, HP C++ (`cfront`; obsoleted August 2001), HP Fortran 77, and HP-UX Linker.

When you compile your source code with the compiler shipped on HP-UX 11i, without any changes to source code, options, or makefiles, you might create relocatable object files or executables that are no longer backward compatible to an original 11.0 system. This condition will occur if you recompile with PBO (`+I` compiler or linker option) or the `+O4` option. You might create instrumented objects (ISOM) that an 11.0 system does not recognize.

Under these circumstances, one of the following types of error messages will be issued if you attempt to link the objects created using the HP-UX 11i compiler on an original 11.0 system.

- If you compile with +O3 or +O4 you will receive the following message and a stack trace: report error(13-12299-434) to your nearest HP service representative(8911) .
- If you compile with +O2 +I you will receive the following message and a stack trace: Backend Assert ** Ucode versions earlier than v.4 no longer supported(5172) .

NOTE

This code is not backward-compatible with the 11.0 release. Instrumented object files cannot be moved backward.

HP DCE/9000

**new at 11i
original release**

HP Distributed Computing Environment (HP DCE/9000) Version 1.8 provides a high-quality, comprehensive, standards-based framework to develop, administer, and use distributed applications.

Kernel threads application development is now supported on HP-UX. The 32-bit version of the kernel threads DCE library (`libdcekt`) is now part of the HP-UX base operating system. The 64-bit version of `libdcekt` is also included.

NOTE

While the DCE library (`libdcekt`) has been ported to 64-bit, the binaries and daemons that are part of the DCE products are still 32-bit.

The distinction between the International and US/Canada version of DCE components has been removed. That is, the 56-bit Data Encryption Standard (DES) which was earlier restricted to US/Canada is now available for all customers. This means there will only be one version of the DCE library and `dced` daemon, which is based on the 56-bit DES version.

NOTE

The number of LAN interfaces supported by DCED is limited to 32 and the LAN interfaces supported by CDS is 12. If there are more than 32 LAN interfaces, the environment variable `RPC_SUPPORTED_NETADDRES` can be used to identify the list of 32 LAN interfaces that are used by the Remote Procedure Call (RPC) application.

Listed below are new environment variables that have been added to support RPC operations and to enable better usability:

- `RPC_PREFERRED_PROTSEQ`: This variable is used to set the preferred protocol sequence.
- `RPC_SUPPORTED_PROTSEQS`: This variable helps in restricting the protocol sequence. For example, setting this variable to `ncacn_ip_tcp` will enable only connection-oriented communication.

- `RPC_DISABLE_PRIVATE`: This variable disables the “private” setting of a socket. Specifically, the datagram protocol opens up one socket for each network address family supported on a host. Once opened, these sockets are kept in a pool for use whenever the process needs to make another RPC over that particular address family. If concurrent calls are made over the same address family, the calls share a single socket from the pool. However, this is inefficient for those applications that don’t require this degree of concurrency.

To remedy this situation, 1 or 2 sockets are tagged as “private,” along with the usual shared sockets in the socket pool. You can disable this setting by exporting `RPC_DISABLE_PRIVATE=1`. The default behavior is for private socket to be enabled.

- `RPC_DISABLE_LOCAL`: For a RPC server and client on same host, UNIX domain sockets are used by default to reduce the overhead. This can be disabled by exporting `RPC_DISABLE_LOCAL=1`.
- `HPDCE_CLIENT_DISC_TIME`: With this variable (provided in the DCE RPC runtime), the idle association termination time can be tuned to be a value less than the architecture-provided value of 5 minutes (namely, any value ranging from 1 to 300 seconds). Please note that this variable is applicable only for connection-oriented protocol.
- `SCTE_UNCACHE_TIME`: This variable is applicable for datagram only and is used to reduce the server connection table (SCT) elements to be uncached sooner than the default value. The default time is 300 seconds. This would allow more SCT entries to be added to the SCT without resulting in cache exhausting heap.
- `DMS_FORCEON`: DCE Measurement Service (DMS) provides performance instrumentation for DCE servers and for the server side of applications that use DCE RPCs. When DMS is enabled, it collects data about RPCs that execute in the target process. The collected data is actually displayed using HP GlancePlus. By default, DMS is disabled. DMS can be enabled exporting `DMS_FORCEON=1`.

Also, since CMA threads are being obsoleted, it is recommended that all applications using CMA threads start migrating to kernel threads and use `libdcekt`. (See “Kernel Threads vs. CMA Threads” on page 203 for additional information.)

Compatibility Issues

All applications using the 64-bit library `libdcekt` may need to include `/usr/include/dce/dce64.h`.

DCE server products are not supported on workstations (Series 700 machines).

Documentation

The site <http://devresource.hp.com/STK> contains 64-bit porting concepts and 64-bit compiler and linker changes needed to port the application to 64-bit.

Extensions to `pstat()`

This extension provides new functionality to the `pstat()` system call, enabling various system management and measurement tools to eliminate their dependency on the `/dev/kmem` pseudo-driver.

Today, many system management and measurement tools read kernel data structures through unsupported interfaces, such as the `/dev/kmem` pseudo-driver, to get information about open files, resource usage, process activity, and so on. Because kernel

data structures change from release to release, this access method is fragile, incurring a high maintenance cost. To insulate these applications from the release-to-release variability in private kernel data structures, HP-UX 11i provides the enhanced `pstat` system call and a new set of wrappers.

The `pstat` interface is designed to allow future expansion of the interface, while preserving source and binary compatibility of programs written using `pstat` wrappers. The `pstat` interface is available in both 64-bit and 32-bit versions. Replacing the `/dev/kmem` access with calls to `pstat` wrappers will eliminate the need to re-release applications with each new HP-UX release.

Currently, the `pstat()` system call provides information about various system contexts, such as static, dynamic, virtual memory, process, open files, etc. HP-UX provides a number of `libc` wrappers (`pstat_get()*`) and corresponding structures (`struct pst_*`) to get information from the kernel using `pstat()`. As part of this enhancement, new `pstat()` wrappers and corresponding structures are added and some existing ones are extended.

Compatibility is significantly improved by introducing a well documented interface that guarantees binary compatibility for kernel intrusive applications between releases. There is no impact to legacy behavior of current `pstat()` services.

There is no impact to application performance as compared to obtaining the data from `/dev/kmem`. No impact to system performance is expected from these `pstat` extensions.

NOTE

This release includes an enhanced version of `pstat()`. This version repairs some existing defects by adding more fields in `pst_status` struct to return process children usage information. The `pstat(2)` manpage reflects this added functionality. The enhancement poses no problem for 11.0 executables running on 11.0 Extension Pack or 11i, nor for any executables running on 11.0 Extension Pack, as long as they do not rely on the additional functionality.

Note, however, relocatable objects may incorrectly presume that the size of returned information is the same pre- and post-patch. It is possible to determine the size of information returned. `pstat()` users can use the size return value of the system call to maintain relocatable object compatibility and portability across the proposed change. This is documented in the manpage.

`pstat()` is not part of an industry standard, but was designed to accommodate changes of this nature while maintaining compatibility with earlier versions.

New Modules

The following table shows new `pstat` modules and the purpose of each:

Table 15-1 **New `pstat` Modules**

<code>pstat_getfile2()</code>	Provides information about open files of a process
<code>pstat_getfiledetails()</code>	Provides <code>stat</code> equivalent information
<code>pstat_getsocket()</code>	Provides detailed socket information
<code>pstat_getstream()</code>	Provides detailed stream information

Table 15-1 New pstat Modules (Continued)

<code>pstat_getpathname()</code>	Provides full pathname of an opened file (Reverse Pathname Lookup)
<code>pstat_getmpathname()</code>	Provides a copy of the DNLC entries for a given file system

NOTE

Use of the call `pstat_getmpathname()` is limited to `uid` equal to 0. Use of the calls `pstat_getfiledetails()`, `pstat_getsocket()`, `pstat_getstream()`, and `pstat_getpathanme()` is limited to `uid` equal to 0 or effective ID match. In the case of effective ID match, access will only be granted if the target process is not and has never run as a `setuid` or `setgid` process.

New Data Structures

The following are new data structures being added to the PSTAT module:

Table 15-2 New pstat Data Structures

<code>pst_fileinfo2</code>	Describes per-file information. For the specified process, there is one instance of this context for each open file descriptor.
<code>pst_fid</code>	Used to efficiently re-access the opened files. This value is returned by <code>pstat_getfile2()</code> , <code>pstat_getproc()</code> , and <code>pstat_getprocvn()</code> calls. This ID is then passed to subsequent PSTAT calls such as <code>pstat_getsocket()</code> to efficiently re-access the opened files.
<code>pst_filedetails</code>	This data structure contains detailed information specific to a particular open file. For a specified file, there is only one instance of this structure. This information includes <code>stat</code> equivalent information.
<code>pst_socket</code>	The PSTAT socket structure contains detailed information pertaining to an opened socket, such as type, state, protocol, address family, and options of the socket. For a specified socket, there is only one instance of this structure.
<code>pst_stream</code>	The PSTAT stream structure contains detailed information pertaining to a stream entity. This includes information about the head, names of modules pushed, and the driver of the stream.
<code>pst_mpathnode</code>	This structure is returned by <code>pstat_getmpathname()</code> routine that provides a copy of the DNLC entries for a given file system. The information contained in this structure includes id of the current file or directory, parent of the current entry, and the name of the current entry. By traversing the DNLC entries in the reverse order, one can obtain the pathname for an opened file to the mount point.

In addition to the above data structures, several existing PSTAT data structures have been extended. These include: `pst_dynamic`, `pst_vminfo`, `pst_vm_status`, `pst_status`, `pst_static`, and `pstun`.

Documentation

The existing *pstat* (2) manpage has been extended to reflect the added functionality.

Changes to sendfile

The `sendfile()` system call is used to send a file directly over the network without having to perform many separate `send()` commands.

In previous releases, `sendfile()` did not work properly with large files, that is, when an application made a call to `sendfile()` and was compiled with the following compiler flags: `LARGEFILE(64)_SOURCE` and/or `FILE_OFFSET_BITS=64`. These flags allowed a 32-bit application to access large files that were over 2GB in size.

These large file applications should be recompiled on 11i. If the “nbytes” parameter is not set to zero and they are not recompiled, these applications will not execute on 11i. To work correctly, the large file applications need to be recoded with the new `bsize_t` and `sbsize_t` types. See the *sendfile* (2) and *sendfile64* (2) manpages for more information.

32-bit or 64-bit applications that use `sendfile()` and are *not* compiled with the `LARGEFILE(64)_SOURCE` or `FILE_OFFSET_BITS=64` flags do *not* need to be changed or recompiled for HP-UX 11i.

Machine Identifier Changes to confstr

new at 11i original release

New machine identifier, partition identifier, and serial number parameters have been defined for the `confstr()` library function.

The new parameters for `confstr()` are defined as follows:

`_CS_MACHINE_IDENT`

Identifier for each physical machine. Returned as an opaque string of printable ascii characters. This string has the same value for all partitions in a physical machine. For hardware classes first released with HP-UX 11i or later, this ID is unique across all hardware classes. For earlier hardware classes, the ID number is unique only within the hardware class. A null string is returned if no ID number is available; this is expected to be the case only for prototype machines or other systems improperly configured in manufacturing.

`_CS_PARTITION_IDENT`

Identifier for each partition existing on a machine. Returned as an opaque string of printable ascii characters. For any machine not supporting partitions this value will be same as `_CS_MACHINE_IDENT`.

`_CS_MACHINE_SERIAL`

Machine serial number as found labeled on the external machine chassis. The value will be a printable ascii string. This string is not available on all classes of machines; if unavailable, the string will be empty. This string is not a unique identifier of the machine, since machines of different classes can have the same serial number.

If a unique identifier is needed, use `_CS_MACHINE_IDENT` or `_CS_PARTITION_IDENT`.

The preferred method of calling these functions is defined in the *confstr* (3C) manpage as the following:

```
bufsize=confstr(_CS_MACHINE_IDENT,NULL,(size_t)0);  
buffer=(char *)malloc(bufsize+1);  
confstr(_CS_MACHINE_IDENT,buffer,bufsize+1);
```

The first line will return the length of the string to be returned, allocate memory based on this value, and then call `confstr()` again to get the actual value.

What's in This Chapter?

This chapter provides information that will be of interest to localizers or international users of HP-UX.

- **Deprecated Functionality** (see page 302)
- **Unicode Character Set** (see page 304)
- **Corrected Character Mappings to iconv(1) and iconv(3C)** (see page 307)
 - Correction for Simplified Chinese (see page 307)
 - Correction for Traditional Chinese (see page 307)
 - Correction for Japanese (see page 309)
 - Correction for Korean (see page 310)
- **EURO (ISO 8859-15 Locales)** (see page 312)
- **Euro - ISO 10646/Unicode Support** (see page 315)
- **Asian System Environment (ASE)** (see page 319)
 - New Features (see page 319)
 - Changed Feature (see page 325)
 - Deleted Features (see page 325)
 - Troubleshooting Information (see page 325)
- **Enhanced Print Capabilities in the Asian System Environment** (see page 328)
 - Changes Common to All ASEs (see page 328)
 - Japanese System Environment (JSE) (see page 328)
 - Korean System Environment (KSE) (see page 329)
 - Simplified-Chinese System Environment (SSE) (see page 329)
 - Traditional-Chinese System Environment (TSE) (see page 330)
- **Multibyte Support Extension and Unix98 Support** (see page 331)
 - Stream Orientation (see page 331)
 - Restartable APIs and the Conversion State (see page 331)
 - How to Get MSE/Unix98 Behavior (see page 332)
 - New Interfaces (see page 332)
 - Modified Interfaces (see page 333)

Deprecated Functionality

deprecated in December 2003

Several commands, library routines and lp model files that implement internationalization functionality are being deprecated as of this release. They will be removed in the next major release of HP-UX (post 11i v1 and v2).

The following table shows commands, library routines and lp model files that are considered deprecated as of this release, along with suggested replacements where relevant. Many of these functions relate to hardware that is no longer supplied or supported. Others provided character set conversions that are now obsolete (such as for C-Windows 3.1) or functionality that is available in other commands.

You should check for any usage of these items. Where applicable, you are encouraged to begin using the commands suggested as replacements.

At this release, there are no impacts to compatibility, since the functionality referenced is supplied in the current release. Future compatibility impacts are expected to be minimal since equivalent functionality is being provided for those commands which do not reference obsolete hardware or character encodings.

Table 16-1 Deprecated Internationalization Functionality

Name	Fileset	Replacement	Remarks
ATOK8	ATOK	ATOK X	
VJE-Gamma	VJE	ATOK X	
EGBridge	EGBridge	ATOK X	
sconv	STK-SCH-RUN	<i>iconv</i> (1)	
sptr	STK-SCH-RUN	None	
big5-et	TTK-TCH-RUN	None	T-Chinese Eten UDC format conversion
et-big5	TTK-TCH-RUN	None	T-Chinese Eten UDC format conversion
big5-cwin	TTK-TCH-RUN	None	Microsoft C-Windows 3.1 UDC format conversion
cwin-big5	TTK-TCH-RUN	None	Microsoft C-Windows 3.1 UDC format conversion
ptr	TTK-TCH-RUN	None	terminal transparent print tool for C2402A/B/C/D
coder	TTK-TCH-RUN	None	CNS-EUC code lookup tool
bserver	IMTERM-RUN	None	
nlio	UTILS-RUN	None	

Table 16-1 Deprecated Internationalization Functionality

Name	Fileset	Replacement	Remarks
nliostart	UTILS-RUN	None	
nlioinit	UTILS-RUN	None	
big5udfgen	TTK-TCH-RUN	<i>xudced</i> (1)	
big5udfdown	TTK-TCH-RUN	<i>udcload</i> (1)	
ccdcudfgen	TTK-TCH-RUN	<i>xudced</i> (1)	
ccdcudfdown	TTK-TCH-RUN	<i>udcload</i> (1)	
hpc1208a	PRT-LP-RUN	None	lp model file
PCL4.nloo	PRT-LP-RUN	PCL5.nloo	lp model file
PS.nlio	PRT-LP-JPN-RUN	PS2.nlio	lp model file
LIPS3	PRT-LP-JPN-RUN	LIPS4	lp model file
Japanese specific commands and library routines	CODE-JPN-RUN, IMX11-JPN-COM, IMX-JPN-RUN	<i>iconv</i> (1), <i>iconv</i> (3C), None	All commands and library routines described in /usr/share/doc/JpnCmdLib.txt

Unicode Character Set

HP-UX 11i provides system level support for the Unicode 2.1/ISO-10646 character set. Hewlett-Packard's support for Unicode provides a basis of enabling heterogeneous interoperability for all locales.

ISO-10646 is an industry standard for defining a single encoding which uniquely encodes all the world's characters. Unicode 2.1 is the companion specification to ISO-10646, Unicode support conforms with existing X/Open (OpenGroup), POSIX, ISO C and other relevant UNIX-based standards.

HP-UX 11i supports Unicode/ISO-10646 by utilizing the UTF-8 (Universal Transformation Format-8) representation for persistent storage. UTF-8 is an industry recognized 8-bit multibyte format representation for Unicode. This representation allows for successful data transmission over 8-bit networking protocols as well as for safe storage and retrieval within a historically byte-oriented operating system such as HP-UX.

For internal processing, HP-UX utilizes the four-octet (32-bit) canonical form specified in ISO-10646. This support allows parity with HP-UX's current `wchar_t` implementation which has been based on a 32-bit representation.

Full systems level support is provided for all locales provided in this release.

For more information on the Unicode features of Asian System Environment, see `/usr/share/doc/ASX-UTF8`.

A select subset of locale binaries have been provided for 32-bit application processing:

Table 16-2 Base

C.utf8	C UTF-8
univ.utf8	universal

Table 16-3 European

fr_CA.utf8	French Canadian
fr_FR.utf8	French
de_DE.utf8	German
it_IT.utf8	Italian
es_ES.utf8	Spanish
sv_SE.utf	Swedish

Table 16-4 Asian

ja_JP.utf8	Japanese
ko_KR.utf8	Korean
zh_CN.utf8	Simplified Chinese

Table 16-4 Asian (Continued)

zh_HK.utf8	Traditional Chinese (Hong Kong)
zh_TW.utf8	Traditional Chinese

To enable Unicode support in applications, set the environment variable to a desired `utf8` locale.

Locales are installed based on the current language file sets already installed on the target system. For example, if the system uses the International.German the German Unicode locale (`de_DE.utf8`) is installed.

Source files for ALL supported locales (34 total) have also been supplied for 64- or 32-bit applications.

To build Unicode locales use the `localedef` command. Refer to the *localedef* (1M) manpage. Systems must have the kernel parameters `MAXDSIZ`, `MAXTSIZ`, and `SHMMAX` set to at least 100 MB to ensure adequate swap space allowance for successful `localedef` compilation of these locales.

Unicode Euro Enhancement

HP-UX 11i provides expanded Unicode support to align the character repertoire with the ISO 8859-15 locales that are being provided for Euro support. This will ensure full interoperability with the newly added support for the ISO 8859-15 codeset.

Specific enhancements are provided to allow Euro display and input capabilities though Xlib and new fonts.

A subset of existing European (and French Canadian) locales have been modified:

Table 16-5 Modified European Locales

Locale	Country
fr_CA.utf8	French Canadian
fr_FR.utf8	French
de_DE.utf8	German
it_IT.utf8	Italian
es_ES.utf8	Spanish
sv_SE.utf8	Swedish

Source files for all supported European locales have also been modified. To build these locales, refer to the *localedef* (1M) manpage.

Size Requirement

Unicode support requires the following additional disk space requirements:

Base Unicode offering (installed on all systems): Approximately 10MB.

Table 16-6 Unicode European Locales and Localized Files

French & French Canadian	8.4 MB
German	4.2 MB
Italian	4.2 MB
Spanish	4.2 MB
Swedish	4.2 MB

Table 16-7 Unicode Asian Locales and Localized Files

Japanese	3.4 MB
Korean	2.4 MB
Simplified Chinese	2.5 MB
Hong Kong	1.7 MB
Traditional Chinese	4.2 MB

Performance Issues

Applications using Unicode support should see comparable performance as observed with other multibyte codesets. For those applications moving from a single-byte codeset to Unicode, some performance impact will be observed for some types of character-based operations.

Streams PTY Driver

UTF-8 is supported on the Streams PTY driver's line discipline (LDTERM) module. The user does not interact with the Streams PTY driver directly; it runs underneath the `dtterm` window. The Streams PTY driver is responsible for providing a UTF-8 communication channel while `dtterm` is responsible for processing the UTF-8 code and displaying the characters on the screen.

Refer to *ucset* (1), *ldterm* (7) and the *lp* (1) model script for details.

Corrected Character Mappings to iconv(1) and iconv(3C)

This release contains defect fixes for incorrect character mappings. The corrections concern the Simplified Chinese, Traditional Chinese, Japanese, and Korean characters of HP-UX.

Corrected character converter mappings allow for improved interoperability when sending or receiving converted character data to/from Unicode-aware systems.

Correction for Simplified Chinese

A patch corrects an incorrect character mapping that occurs when converting between hp15CN and Unicode (UCS2)/UTF-8 for Simplified Chinese.

Specifically, the Simplified Chinese character “Double Vertical Line” mapped incorrectly when converting between hp15CN and UCS2/UTF-8. This character was being mapped to the “Parallel To” character, which is a different character.

The following table summarizes the change applied to `iconv` tables:

Table 16-8 Change Applied to iconv Tables

hp15CN	incorrect UCS2	correct UCS2	Character Name
0xA1CE	-	0x2225	Parallel To
0xA1AC	0x2225	0x2016	Double Vertical Line

The `hp15CN=ucs2` and `ucs2=hp15CN` `iconv` converter tables are affected. These tables are shared by both UCS2 and UTF-8 conversions.

No compatibility problems are anticipated. However, if compatibility concerns arise with regard to persistent data stored either in Unicode (UCS2) or UTF-8 on an HP-UX system, it is possible to generate a simple conversion script to search for each occurrence of an incorrect value in either UCS2 or UTF-8 and convert it to the correct value, based on the following mapping:

Table 16-9 Mapping for Double Vertical Line

Old UCS2	UCS2	Old UTF-8	UTF-8	Char Name
0x2225	0x2016	0xe288a5	0xe28096	Double Vertical Line

Correction for Traditional Chinese

A patch corrects several incorrect character mappings that occur when converting between Big-5/EUC and Unicode (UCS2)/UTF-8 for Traditional Chinese.

In the case of Big-5 to/from UCS2/UTF-8, the “Ideographic Space” character was absent in the Unicode conversion table mapping:

Table 16-10 Mapping for Ideographic Space

big5	incorrect UCS2	correct UCS2	Char Name
0xA140	-	0x3000	Ideographic Space

The following table summarizes the changes applied for conversions between eucTW and UCS2:

Table 16-11 Changes Applied to eucTW—UCS2 Conversions

eucTW	incorrect UCS2	correct UCS2	Character Name
0xa1a6	0x30fb	0x2022	Bullet
0xa1b7	0x2014	0x2013	EN Dash
0xa1b9	0x2013	0x2014	EM Dash
0xa1b6	0xfe31	0xff5c	Full-width Vertical Line
0xa1b8	0xfe32	0xfe31	Presentation form Vertical EN Dash
0xa1ea	0x2032	0x2035	Reversed Prime
0xa1eb	0x2035	0x2032	Prime
0xa2b9	0x2264	0x2266	Less-than over equal to
0xa2ba	0x2265	0x2267	Greater-than over equal to
0xa2c2	0xfe66	0xfe65	Small Greater-Than
0xa2c3	0xfe65	0xfe66	Small Equals Sign
0xa2de	0xff5c	0x2223	Divides
0xa2e1	0xfe67	0xff0f	Full-width Solidus
0xa2e4	0xfe5	0x00a5	Yen Sign
0xa2e6	0xfe0	0x00a2	Cent Sign
0xa2e7	0xfe1	0x00a3	Pound Sign

iconv conversions between eucTW and UCS2 or UTF-8 may be affected.

Big-5 conversions with UCS2/UTF-8 are not directly impacted as only a missing table entry has been added.

eucTW=ucs2, ucs2=eucTW, big5=ucs2 and ucs2=big5 iconv converter tables are affected. These tables are shared by both UCS2 and UTF-8 conversions.

No compatibility problems are anticipated. However, if compatibility concerns arise with regard to persistent data stored either in Unicode (UCS2) or UTF-8 on an HP-UX system, it is possible to generate a simple conversion script to search for each occurrence of an incorrect value in either UCS2 or UTF-8 and convert it to the correct value, based on the following mappings:

Table 16-12 Mapping for UCS2/UTF-8 Conversion

Old UCS2	UCS2	Old UTF-8	UTF-8	Char Name
0x30fb	0x2022	0xe383bb	0xe280a2	Bullet
0x2014	0x2013	0xe28094	0xe28093	EN Dash
0x2013	0x2014	0xe28093	0xe28094	EM Dash
0xfe31	0xff5c	0xf8b1	0xfbd9c	Fullwidth Vertical Line
0xfe32	0xfe31	0xf8b2	0xf8b1	Presentation form Vertical EN Dash
0x2032	0x2035	0xe280b2	0xe280b5	Reversed Prime
0x2035	0x2032	0xe280b5	0xe280b2	Prime
0x2264	0x2266	0xe289a4	0xe289a6	Less-than over equal to
0x2265	0x2267	0xe289a5	0xe289a7	Greater-than over equal to
0xfe66	0xfe65	0xf9a6	0xf9a5	Small Greater-Than
0xfe65	0xfe66	0xf9a5	0xf9a6	Small Equals Sign
0xff5c	0x2223	0xfbd9c	0xe288a3	Divides
0xfe67	0xff0f	0xf9a7	0xfbc8f	Full-width Solidus
0xfe5	0x00a5	0xfbfa5	0xc2a5	Yen Sign
0xfe0	0x00a2	0xfbfa0	0xc2a2	Cent Sign
0xfe1	0x00a3	0xfbfa1	0xc2a3	Pound Sign

Correction for Japanese

A patch corrects four incorrect Japanese character mappings that occur between Shift-JIS/EUC and Unicode (UCS2)/UTF-8.

The following table summarizes the changes applied:

Table 16-13 Changes Applied to Shift-JIS/EUC—WUCS2/UTF-8 Conversion

sjis	eucJP	incorrect UCS2	correct UCS2	Character Name
0x8150	0xA1B1	0xFFE3	0x203E	Overline
0x815C	0xA1BD	0x2015	0x2014	Em Dash

Table 16-13 Changes Applied to Shift-JIS/EUC—WUCS2/UTF-8 Conversion (Continued)

sjis	eucJP	incorrect UCS2	correct UCS2	Character Name
0x818F	0xA1EF	0xFFE5	0x00A5	Yen Sign
n/a	0x8FA2B7	0x02DC	0xFF5E	Full-width Tilde

Affected `iconv` conversions are conversions between `sjis` and UCS2 or UTF-8 as well as conversions between `eucJP` and UCS2 or UTF-8.

`sjis=ucs2`, `ucs2=sjis`, `eucJP=ucs2` and `ucs2=eucJP` are the affected `iconv` conversion tables. These tables are shared by both UCS2 and UTF-8 conversions.

No compatibility problems are anticipated. However, if compatibility concerns arise with regard to persistent data stored either in Unicode (UCS2) or UTF-8 on an HP-UX system, it is possible to generate a simple conversion script to search for each occurrence of an incorrect value in either UCS2 or UTF-8 and convert it to the correct value, based on the following mappings:

Table 16-14 Mapping for UCS2/UTF-8 Conversion

Old UCS2	UCS2	Old UTF-8	UTF-8	Char Name
0xFFE3	0x203E	0xefbfa3	0xe280be	Overline
0x2015	0x2014	0xe28095	0xe28094	Em Dash
0xFFE5	0x00A5	0xefbfa5	0xc2a5	Yen Sign
0x02DC	0xFF5E	0xcb9c	0xefbd9e	Full-width Tilde

Correction for Korean

A patch provides a defect fix to address standards non-conformance for Korean Unicode (UCS2)/UTF-8 character mappings.

The currently supplied Korean `iconv` converter tables do not conform to the Unicode 2.1 and ISO-10646 (with 1997 amendments) standards in addition to the Korean national standard, KSC-5700. The current mappings are considered obsolete by all noted standards organizations.

The enhancement provides a set of standards-conformant `iconv` converter tables for converting between `eucKR` and Unicode/UTF-8. Specifically, the obsolete region of 0x3d2e - 0x4dff has been re-mapped to the 0xac00 - 0xd7ff region specified in Unicode 2.1 for Hangul.

Without this modification, it is impossible to share data with any other system which is standards-conformant in adhering to the Unicode 2.1/ISO-10646/KSC-5700 standards.

Affected `iconv` conversions are any conversions between `eucKR` and UCS2 or UTF-8.

The `iconv` conversion tables affected by this modification are `eucKR=ucs2` and `ucs2=eucKR`. These tables are shared by both UCS2 and UTF-8 conversions.

No compatibility problems are anticipated. However, if compatibility concerns arise with regard to persistent data stored either in Unicode (UCS2) or UTF-8 on an HP-UX system, it is recommended that the previously installed ucs2=eucKR table be saved and renamed prior to installation of this fix. Persistent data can then be converted back to eucKR using this old table and then reconverted to the correct Unicode/UTF-8 representation.

EURO (ISO 8859-15 Locales)

Euro support is provided via locale support for the ISO 8859-15 character set. ISO 8859-15 is a newly ratified character set that differs from ISO 8859-1 in that it supports eight new characters. Specific enhancements are provided to allow Euro display, input, and processing capabilities.

Fourteen new locales have been created based on ISO 8859-15:

Table 16-15 **New Locales**

Locale	Language (Country)
C.iso885915	“C”
da_DK.iso885915@euro	Danish (Denmark)
de_DE.iso885915@euro	German (Germany)
en_GB.iso885915@euro	English (Great Britain)
es_ES.iso885915@euro	Spanish (Spain)
fi_FI.iso885915@euro	Finnish (Finland)
fr_CA.iso885915@euro	French (Canada)
fr_FR.iso885915@euro	French (France)
fr_IS.iso885915@euro	Icelandic (Iceland)
it_IT.iso885915@euro	Italian (Italy)
nl_NL.iso885915@euro	Dutch (The Netherlands)
no_NO.iso885915@euro	Norwegian (Norway)
pt_PT.iso885915@euro	Portuguese (Portugal)
sv_SE.iso885915@euro	Swedish (Sweden)

Source files for supported European locales are also being supplied.

Applications must elect to enable ISO 8859-15 support, by setting the LANG environment variable to the desired locale.

ISO 8859-15 support is part of HP-UX and is available to all platforms. ISO 8859-15 support is not automatically turned on for any application. No special configuration is required and there are no compatibility issues involved with the addition of this new feature.

Locales are installed, based on which current language file sets are already installed on a target system.

The LC_MONETARY environment variable will be set to the euro for all locales listed above except C.iso885915 and fr_CA.iso885915. Standard euro formatting rules will apply to ALL locales where this environment variable is set to the euro. As a result, users may

encounter a change to the decimal and thousands separators for the currency, whereas decimal and thousands separators outside the monetary area stay the same as in previous locales.

For example, in the French locale, the thousands separator is a space and the decimal point is a comma. However, the international standard for the thousands separator for the euro currency is a period. So, a user that has the LC_MONETARY locale category set to “fr_FR.iso885915@euro” will see the following behavior:

- The number one thousand five hundred and fifty and a half, outside the monetary area will be displayed as 1 550,50
- One thousand five hundred and fifty euro and 50 cents will be displayed as EUR 1.550,50.

The LC_MONETARY value can be changed by users to their national currency unit.

ISO 8859-15 support is not automatically provided in any application. Applications which use the Euro symbol must elect to enable ISO 8859-15 support, by way of setting the LANG environment variable to the desired locale. Users enable ISO 8859-15 automatically in some locales when logging in through the CDE.

For more information, please see:

<http://software.hp.com/products/EURO/index.html>

CDE Support

New functionality was introduced in the CDE product to support input and display of the Euro symbol. (These changes are for both the workstation and the server.)

X Window Support

New functionality was added to Xlib to support input and display of the Euro symbol. This was done by adding internal support for the ISO8859-15 character set (as well as support of UTF8 on 11i). When an Xlib application is started, Xlib internals determine if the locale is set to an ISO8859-15 character set. If it is, Xlib will perform character lookups using the eight new symbols present in the ISO8859-15 character set. Currently, only applications linked with X11R6 (X Window version X11 Release 6) will support the ISO8859-15 character set. Older X11 versions are not currently supported.

Libraries

The libc and xlib libraries support the Euro symbol.

Codeset Converters

New iconv tables exist to support conversion from/to ISO 8859-15 and ISO 8859-1, ucs2, and utf8. The additional disk space in HP-UX 11i is 6.42MB. No additional memory is required.

LaserJet Printers

An important aspect of the euro support is printing the new symbol on LaserJet printers using existing standard lp(1) model files.

The ISO8859-15 font set is resident on the HP 4500 Color LaserJet Printer, which contains the Euro symbol at position A4 (hexadecimal). Your data file must contain this code to print the Euro symbol.

A new utility will be provided to download the fonts to the printer RAM. These fonts will then reside in the printer's RAM until the next power cycle.

Use the `lp` option `-ocs9N` (or `-oscs9N`) to select the ISO 8859-15 character set as the primary (or secondary) character set. For example:

```
lp -dprinter_name -ocs9N -oother_options print_filename
```

NOTE

The case is significant. Be sure to use an upper case "N".

Euro - ISO 10646/Unicode Support

**new at 11i
original release**

HP-UX 11i provides system level support for the Unicode 2.1/ISO-10646 character set. Hewlett-Packard's support for Unicode provides a basis of enabling heterogeneous interoperability for all geographic areas.

ISO-10646 is an industry standard for defining a single encoding which uniquely encodes all the characters of the modern world. Unicode 2.1 is the companion specification to ISO-10646. Unicode specification at revision 2.1 includes the Euro symbol at 0X20AC code point.

Euro support to input, store, retrieve, display and print the Euro symbol has been added for this release. In addition to the base functionalities, HP-UX 11i is providing the following new functionalities:

- Dual currency support using @euro modifier.
- UTF-8 (Universal Transformation Format - 8 Bit) performance tuning.
- Euro display and processing capabilities for Asian UTF-8 locales.
- Additional converter tables.

Specific enhancements are provided to locales, localedef, libc, Xlib and iconv converter tables to achieve those new functionalities.

A subset of existing European locales has been modified to support dual currency to meet euro standard monetary formatting.

The following table gives the list of euro locales being supplied which support dual currency:

Table 16-16 Euro Locales with Dual Currency

Locale	Language/Country
de_DE.utf8	German (Germany)
es_ES.utf8	Spanish (Spain)
fr_FR.utf8	French (France)
it_IT.utf8	Italian (Italy)
sv_SE.utf8	Swedish (Sweden)

The following table gives the list of locale sources being supplied which include dual currency support:

Table 16-17 Locales with Dual Currency

Locale	Language/Country
da_DK.utf8	Danish (Denmark)
de_DE.utf8	German (Germany)
el_GR.utf8	Greek (Greece)

Table 16-17 **Locales with Dual Currency (Continued)**

Locale	Language/Country
en_GB.utf8	English (Great Britain)
es_ES.utf8	Spanish (Spain)
i_FI.utf8	Finnish (Finland)
fr_FR.utf8	French (France)
is_IS.utf8	Icelandic (Iceland)
it_IT.utf8	Italian (Italy)
nl_NL.utf8	Dutch (The Netherlands)
no_NO.utf8	Norwegian (Norway)
pt_PT.utf8	Portuguese (Portugal)
sv_SE.utf8	Swedish (Sweden)

When the LANG and/or LC_* environment variables are set to a euro-supported locale, the national monetary formatting rules are used. The LC_MONETARY environment variable should be set to the euro-supported locale name with @euro modifier to use/access euro monetary formatting rules.

For example, to specify the Euro as the currency for French, the following should be set:

```
LANG =3D fr_FR.utf8  
LC_MONETARY =3D fr_FR.utf8@euro
```

Similarly, to specify French francs the following should be set:

```
LANG=3Dfr_FR.utf8
```

To access the monetary unit and the related monetary formatting rules programmatically, the programmer needs to toggle between the alternate monetary units via *setlocale* (3C) calls:

```
/* Handle euro in strfmon(), ... */  
setlocale(LC_MONETARY, "fr_FR.utf8@euro");  
  
...  
/* Handle French francs in strfmon(), ... */  
setlocale(LC_MONETARY, "fr_FR.utf8");
```

When the LC_MONETARY environment variable is set to euro, the formatting in monetary category will use euro standard formatting rules whereas other categories will still use local conventions in formatting. As a result, users may encounter a change to the decimal and thousandths separators for the currency, whereas decimal and thousandths separators outside the monetary area, like in numeric numbers, remain as per local conventions.

For example, in the French locale the thousandths separator is a space and the decimal point is a comma. However, the international standard for the thousandths separator for the euro currency is a period. So, a user that has the LC_MONETARY locale category set to "fr_FR.utf8@euro" will see the following behavior:

- The number “One thousand five hundred and fifty and a half” outside the monetary area will be displayed as 1 550,50.
- The monetary number “One thousand five hundred and fifty euro and 50 cents” will be displayed as EUR 1.550,50

Commands

The *localedef* (1M) command has been enhanced to handle @euro modifier in order to build dual currency locale(s).

The *lp* (1) model scripts for the dual currency locales have been enhanced to print euro character.

libc

Standard libc supports @euro dual currency.

Codeset Converters

New *iconv* converter tables are available to support conversion from utf8, ucs2, and iso885915 to IBM's euro enabled code pages and PC code pages:

Table 16-18 utf8 and IBM's code pages (EBCDIC)

utf8 <-> cp1140	utf8 <-> cp1141	utf8 <-> cp1142	utf8 <-> cp1143
utf8 <-> cp1144	utf8 <-> cp1145	utf8 <-> cp1146	utf8 <-> cp1147
utf8 <-> cp1148	utf8 <-> cp1149		

Table 16-19 ucs2 and IBM's code pages (EBCDIC)

ucs2 <-> cp1140	ucs2 <-> cp1141	ucs2 <-> cp1142	ucs2 <-> cp1143
ucs2 <-> cp1144	ucs2 <-> cp1145	ucs2 <-> cp1146	ucs2 <-> cp1147
ucs2 <-> cp1148	ucs2 <-> cp1149		

Table 16-20 iso885915 and IBM's code pages (EBCDIC)

iso885915 <-> cp1140	iso885915 <-> cp1141	iso885915 <-> cp1142	iso885915 <-> cp1143
iso885915 <-> cp1144	iso885915 <-> cp1145	iso885915 <-> cp1146	iso885915 <-> cp1147
iso885915 <-> cp1148	iso885915 <-> cp1149		

Table 16-21 utf8 and PC code pages (EBCDIC)

utf8 <-> cp437	utf8 <-> cp737	utf8 <-> cp775	utf8 <-> cp850
utf8 <-> cp852	utf8 <-> cp855	utf8 <-> cp857	utf8 <-> cp1860

Table 16-21 utf8 and PC code pages (EBCDIC) (Continued)

utf8 <-> cp861	utf8 <-> cp862	utf8 <-> cp863	utf8 <-> cp864
utf8 <-> cp865	utf8 <-> cp866	utf8 <-> cp869	utf8 <-> cp874
utf8 <-> cp1250	utf8 <-> cp1251	utf8 <-> cp1252	utf8 <-> cp1253
utf8 <-> cp1254	utf8 <-> cp1255	utf8 <-> cp1256	utf8 <-> cp1257
utf8 <-> cp1258			

Table 16-22 ucs2 and PC code pages (EBCDIC)

ucs2 <-> cp437	ucs2 <-> cp737	ucs2 <-> cp775	ucs2 <-> cp850
ucs2 <-> cp852	ucs2 <-> cp855	ucs2 <-> cp857	ucs2 <-> cp1860
ucs2 <-> cp861	ucs2 <-> cp862	ucs2 <-> cp863	ucs2 <-> cp864
ucs2 <-> cp865	ucs2 <-> cp866	ucs2 <-> cp869	ucs2 <-> cp874
ucs2 <-> cp1250	ucs2 <-> cp1251	ucs2 <-> cp1252	ucs2 <-> cp1253
ucs2 <-> cp1254	ucs2 <-> cp1255	ucs2 <-> cp1256	ucs2 <-> cp1257
ucs2 <-> cp1258			

Impact

To use euro monetary formatting rules, the `LC_MONETARY` environment variable must be set to the euro supported locale name with the `@euro` modifier appended to it.

The size requirement for locale sources and binaries is 20.1 MB, while the converter tables size requirement is 191 KB.

There are no compatibility issues involved with the addition of these features.

Applications using UTF-8 locales should see improved collation performance as compared with UTF-8 locales delivered in the previous releases.

Asian System Environment (ASE)

**new at 11i
original release**

HP-UX provides Asian systems for the Asian countries of the Far East, consisting of the following products:

JSE	Japanese System Environment
KSE	Korean System Environment
SSE	Simplified-Chinese System Environment
TSE	Traditional-Chinese System Environment

HP-UX provides several Asian enhancements as server features, including some new Asian codesets, UDC (User Defined Characters, or Gaiji), printing, and codeset conversions with mainframe codesets.

The new, changed, deleted features as well as some troubleshooting information is described below. For further information, see the following documentation:

- JSE
 - *Japanese System Environment User's Guide* (B3782-90873)
 - *HP XJIM Japanese Input Method Guide* (B3782-90869)
 - *ATOK8 Japanese Input Method Guide* (B3782-90870)
 - *EGBridge Japanese Input Method Guide* (B3782-90871)
 - *VJE-gamma Japanese Input Method Guide* (B3782-90872)
- *KSE - Korean System Environment User's Guide* (5969-4454)
- *SSE - Simplified Chinese System Environment User's Guide* (5969-4455)
- *TSE - Traditional Chinese System Environment User's Guide* (5969-4453)

To get release information on earlier versions of ASE, see the following files:

- JSE: /usr/share/doc/ASX-JPN
- KSE: /usr/share/doc/ASX-KOR
- SSE: /usr/share/doc/ASX-SCH
- TSE: /usr/share/doc/ASX-TCH

New Features

- ASE Common

- New printer model

New printer models are supported on both the LP Spooler and HPDPS. You can print plain text file on the following printers by configuring the printer using the PCL5.nloo(PCL5.asian) model file on the LP Spooler or PCL5.asx(2BPCL5.asx) printer model on HPDPS:

HP LaserJet 4000(N)
HP LaserJet 4050(N)
HP LaserJet 4500(N)
HP LaserJet 5000(N)
HP LaserJet 8000(N)
HP LaserJet 8100N

NOTE

By installing optional Font DIMM on these printers, you can print text with TrueType fonts. To use TrueType fonts, you have to configure a printer with PCL5.asian model file for the LP Spooler, or with 2BPCL5.asx printer model for HPDPS.

❑ HPDPS common printer model directory

For HPDPS, the common printer model directories PCL5.asx, 2BPCL5.asx and ESCP.asx are provided for future new printer support. The user can copy these sample printer model directories to a directory under `/var/opt/pd/lib/model` with an appropriate name and customize it to be suited for the printer being configured.

• JSE

❑ ATOK X for HP-UX Preview Edition

The new version of ATOK is now supported. As a Kana-Kanji conversion feature, the ATOK12 engine is incorporated enabling you to achieve a comfortable and effective Japanese input environment. As this release of ATOK X is a Preview Edition, some of the customization tools are not yet available. In the next release, a full featured ATOK X for HP-UX will be provided.

❑ Unicode

Japanese UTF-8 locale `ja_JP.utf8` is supported. Using this locale, you can input, display and print UTF-8 characters. It supports characters defined in standards JIS X 0201 (1976), JIS X 0208 (1990), and JIS X 0212 (1990). UDC (User Defined Characters or GAIJI) and VDC (Vender Defined Characters) are not supported.

For details, see the document `/usr/share/doc/ASX-UTF8`.

❑ USB (Universal Serial Bus) Japanese 109 Keyboard support

This allows for inputting Japanese characters by Japanese input methods.

❑ NEC VDC symbols for display on X Window System

NEC special characters are included in Japanese fonts. NEC VDC has 83 characters which occupy following code areas:

JIS[Kuten]: 13/01 - 13/92

Shift-JIS: 0x8740 - 0x879C

Those characters can be shown on X Window System.

❑ New Ricoh TrueType font package

The new Ricoh TrueType font package “TrueTypeWorld ValueFontD2” is supported. The supported fonts are Windows 3.1 version of WABUN (Japanese) fonts.

❑ New printer model

New printer models are supported on both the LP Spooler and HPDPS. You can print Japanese plain text file on the following printers by configuring the printer using the specified model file on the LP Spooler or printer model on HPDPS:

Table 16-23 New Printer Models for JSE

Printer	LP Spooler Model File	HPDPS Printer Model File
HP LaserJet 5si ^a	PCL5.nloo (PCL5.asian)	PCL5.asx (2BPCL5.asx)
HP HITPCPDA	ESCP	ESCP.asx
HP HITHTS4A	ESCP	ESCP.asx
HP HITKD20A	ESCP	ESCP.asx
HP HITKD45A	ESCP	ESCP.asx
Canon LBP-850	LIPS4	LIPS4.asx
Canon LBP-930EX	LIPS4	LIPS4.asx
Canon LBP-2030	LIPS4	LIPS4.asx
Canon LBP-2040	LIPS4	LIPS4.asx
Canon LBP-2160	LIPS4	LIPS4.asx
OKI Microline 9XXPSII ^b	PS2.nlio	PS2.asx
OKI Microline 9XXPSIII ^b	PS2.nlio	PS2.asx
OKI Microline 703N(3) ^b	PS2.nlio	PS2.asx
EPSON VP-1800	ESCP	ESCP.asx
OKI 533OS	ESCP	ESCP.asx
OKI 835OS	ESCP	ESCP.asx
OKI 858OS	ESCP	ESCP.asx
NEC LL-15 (NPDL2)	NPDLII	NPDLII
NEC LL-30 (NPDL2)	NPDLII	NPDLII
NEC LL-15 (ESC/P) ^c	ESCP	ESCP.asx
NEC LL-30 (ESC/P) (*3)	ESCP	ESCP.asx

- a. By installing optional Japanese Font DIMM on these printers, you can print Japanese text with TrueType fonts. To use Japanese TrueType fonts, you have to configure a printer with PCL5.asian model file for the LP Spooler, or with 2BPCL5.asx printer model for HPDPS. To see whether your printer has Japanese TrueType Font installed, follow these steps:

Press **Menu** on the control panel of the printer until “INFORMATION MENU” appears.

Press **Item** until “PRINT PCL FONT LIST” appears.

Press **Select** to print the font list.

If your printer has Japanese TrueType font, you will see “MS Mincho” and “MS Gothic” in the printed list.

- b. Printing text files on expanded A3 (called “A3-Nobi” in Japan) paper is not supported.
- c. There are restrictions of page length setting on ESC/P mode. For detail, see manual of the printer and online document `/usr/share/doc/PRINTER-JPN-S[E]`.

❑ HPDPS common printer model directory

For HPDPS, the common printer model directories `LIPS3.asx`, `LIPS4.asx` and `PS.asx` are provided for future new printer support. The user can copy these sample printer model directories to a directory under `/var/opt/pd/lib/model` with an appropriate name and customize it to be suited for the printer being configured.

❑ Mainframe code set conversion

The Mainframe code set conversions are provided to convert code sets between Mainframe code sets Hitachi KEIS, NEC JIPS, Fujitsu JEF, and IBM EBCDIC with existing code sets SJIS, eucJP, and ucs2. These code conversions are used from `iconv (1)` and `iconv (3C)`.

The following code sets are supported:

— Hitachi KEIS

- `keis7k`: KEIS78 (Hitachi MF code set based on JIS C6226-1978) + EBCDIK
- `keis8k`: KEIS83 (Hitachi MF code set based on JIS X0208-1983) + EBCDIK
- `keis7c`: KEIS78 (Hitachi MF code set based on JIS C6226-1978) + EBCDIC
- `keis8c`: KEIS83 (Hitachi MF code set based on JIS X0208-1983) + EBCDIC

— NEC JIPS

- `jipsj`: JIPS (NEC Mainframe code set) JIS
- `jipsec`: JIPS (NEC Mainframe code set) EBCDIC
- `jipsek`: JIPS (NEC Mainframe code set) EBCDIK

— Fujitsu JEF

- jefc: JEF (Fujitsu Mainframe code set) + EBCDIC (lower alphabet)
- jefk: JEF (Fujitsu Mainframe code set) + EBCDIK (katakana)
- jefc9p: JEF + EBCDIC designating 9 point size in printing
- jefk9p: JEF + EBCDIK designating 9 point size in printing

The code set conversions are provided between the above Mainframe code sets and the following existing code sets:

SJIS

eucJP

ucs2

❑ New UDC feature

A new UDC environment is provided for client/server or distributed environments. You can share UDC font on a single server machine and print UDC from client machines. As a UDC font, TrueType font is supported. You can use UDC TrueType font created on X Window or provided by some vendors. Two typefaces are supported as UDC fonts. ESC/P and PCL printers are supported.

• KSE

❑ Unicode

The Korean UTF-8 locale `ko_KR.utf8` is supported. On this locale, you can input, display and print UTF-8 characters. There is support for characters defined in standards KSC 5636 (1989) and KSC 5601 (1987). UDC (User Defined Characters or GAIJI) and VDC (Vender Defined Characters) are not supported. For details, see the document `/usr/share/doc/ASX-UTF8`.

The full Hangul Syllables in KS X 1005-1 (old name is KS C 5700-1995) are supported on `ko_KR.utf8` locale. You can input full Hangul characters by XKIM and display on X Window System. With Korean font DIMM and PCL5.asian model file, you can print full Hangul characters.

❑ Euro and registered trademark ® symbols

The printing of the Euro symbol in the `ko_KR.eucKR` locale is supported. The registered trademark symbol ® is also supported. PCL printers are supported to print these symbols with PCL5.asian model file. Two typefaces, Dotum and Batang, are supported. You can print Euro and ® symbols without any printing options.

❑ USB (Universal Serial Bus) Korean 106 Keyboard

USB Korean 106 Keyboard is supported for inputting Korean characters by Korean input method XKIM.

❑ X Print Server

KSE supports printing via the X Print Server to PCL printers.

- SSE
 - ❑ Unicode

Simplified Chinese UTF-8 locale zh_CN.utf8 is supported. On this locale, you can input, display and print UTF-8 characters. There is support for characters defined in standards ISO10646 and GB 2312 (1980). UDC (User Defined Characters or GAIJI) and VDC (Vender Defined Characters) are not supported. For details, see the document /usr/share/doc/ASX-UTF8.
 - ❑ USB (Universal Serial Bus) Simplified Chinese 104 Keyboard

The USB Simplified Chinese 104 Keyboard is supported for inputting Simplified Chinese characters by the input method XSIM.
 - ❑ X Print Server

SSE supports printing via the X Print Server to PCL printers.
- TSE
 - ❑ Unicode

Traditional Chinese UTF-8 locales zh_TW.utf8 and zh_HK.utf8 are supported. On these locales, you can input, display and print UTF-8 characters. There is support for characters defined in standards ISO10646, CNS 11643 (1992) plane 1, 2, 3 and 4, except for some characters which are not supported by Unicode 2.1. UDC (User Defined Characters or GAIJI) and VDC (Vender Defined Characters) are not supported. For details, see the document /usr/share/doc/ASX-UTF8.
 - ❑ USB (Universal Serial Bus) Traditional Chinese 104 Keyboard

USB Traditional Chinese 104 Keyboard is supported for inputting Traditional Chinese characters by the input method XTIM.
 - ❑ X Print Server

TSE supports printing via the X Print Server to PCL printers.
 - ❑ HongKong big5 Support (new)

Locale support is provided with the big5 codeset for HongKong.

HP provides support for the HongKong big5 locale, zh_HK.big5. HongKong big5 locale is similar to Traditional Chinese big5 locale. The difference between these two locales are in monetary and date/time properties which reflect local cultural conventions.

CDE has been enhanced to support this new locale by providing the required app-defaults files to CDE applications.

Impact

Applications must elect to enable big5 support by setting the LANG and/or LC_* environment variables to the HongKong big5 locale.

The size requirement for locale source and binaries is 1.7 MB

Applications using HongKong big5 locales should see the same performance as of Traditional Chinese big5.

Changed Feature

- JSE
 - ❑ **EISUU** key mode change for 106/109 keyboard

In the previous version, the **EISUU** key, **Shift + EISUU** (Caps Lock mode) keys, and **Alt + EISUU** (KANJI BANGOU mode) keys all worked as **Caps Lock**. Now they work as original features of the key/keys.

Deleted Features

- ASE Common
 - ❑ Printing to LaserJet III series is now obsoleted. If you are currently using LaserJet III series printers, you should use newer printer models.
- KSE
 - ❑ XDevice is not included from this release.

NOTE

The Japanese input methods EGBridge and VJE-gamma will be obsoleted in an upcoming release.

Troubleshooting Information

- JSE
 - ❑ XJIM
 - On a low-resolution display, customize window is cut off by default. Specify 14-dot font with `-fn` option or `XJim*fontList` resource.
 - If you use 'KANJI' input (not 'ROMAJI' input) as the key input method at 'YOMI' input, and you input a 'KANJI' character and 'HANDAKUTEN' or 'DAKUTEN' successively, the input method server does not compose 'KANJI' with 'DAKUTEN' or 'HANDAKUTEN' as one character, but displays the 'KANJI' character and 'DAKUTEN' or 'HANDAKUTEN' symbol. In this case, you should make the composite character using 'ZENKAKU-HIRAGANA' conversion (press **Shift + F5** key), or 'ZENKAKU-KATAKANA' conversion (press **F6** key).
 - If you install XJIM after NIS configuration, you will find that you can not use XJIM Conversion Server. To resolve this problem, move the following line in the `/etc/services` file

```
nuekks          6897/tcp        # nuekks daemon
```

to the position above the line which begins with a "+" sign indicating the start of NIS mapping.

❑ EGBridge

Closing the EGBridge main window during Kana-Kanji conversion on hpterm may also close hpterm. You should finish conversion before closing the EGBridge main window.

❑ IMS common (XJIM/ATOK8/EGBridge/VJE-gamma)

- Window focus sometimes cannot be moved by **Meta(Alt)-Tab** key if applications use XIMStatusNothing and they overlap each other with KANJI-ON state. To avoid this problem, set `stackChange` resource to `False` as follows:

```
XJIM          XJim*stackChange: False
ATOK8         Atok8*stackChange: False
EGBridge      EGIm*stackChange: False
VJE           Vje*stackChange: False
```

See the “Resource” section in each Input Method manual for details.

- On Motif 1.2 and Motif 2.1 applications, the **F10** and **Shift-F10** keys cannot be used as the Japanese input function key because those keys are used to switch focus to the menu bar. To assign these keys to certain functions for IMS, set the following:

```
— for DIN keyboard: $ xmodmap -e "keycode 25 = F10"
— for ITF keyboard: $ xmodmap -e "keycode 38 = F10"
```

- Japanese IMS is not available with X11R4 (including Motif 1.1) applications using PS2-DIN-JIS keyboard if `$LANG` is “`ja_JP.SJIS`” or “`ja_JP.eucJP`”. To avoid this problem, set `$LANG` “`japanese`” or “`japanese.euc`” when invoking X11R4 (Motif 1.1) applications.
- Even if you merge UDC in X font after running the input method server, the server cannot display UDC in the pre-edit and the candidate. You should merge UDC in X font server before running the input method server. Re-login makes sure that the input method server displays UDC on CDE.

❑ JIS keyboard

- Do not set the `KBD_LANG` shell variable or Motif 1.1 applications will not work with a JIS keyboard.
- The **Yen** key on JIS keyboard with X terminal does not work correctly. To use the **Yen** key, execute the command.

```
$ xmodmap -e "keysym yen = backslash bar prolongedsound"
```

❑ 106/109 Keyboard

- You cannot turn off EGBridge (although you can turn on). The solution is to change the key map file `$HOME/.egb/EGBMap` (for personal use) or `/etc/opt/egb/config/EGBMap` (for system use). You open the key map file with an editor and change the following entry:

```
old: LKONOFF = XK_Henkan XK_Meta_L  
new: LKONOFF = XK_Henkan XK_Meta_L XK_Alt_L
```

Then save the updated key map file and restart EGBridge. You can turn EGBridge on/off with the left “**Alt**” key.

udcload

- When UDCs are not arranged in the code order in the UDC file, udcload cannot load UDC. Therefore, you should arrange UDCs in the code order. UDCs generated by xudced have no problem because xudced generates UDSs arranged in code order.

• KSE

xk0input

Xkim is not available with X11R4 (including Motif 1.1) applications using PS2-DIN keyboard if LANG is ko_KR.eucKR. To avoid this problem, set LANG to korean when invoking X11R4 (Motif 1.1) applications.

• ASE Common

xudced (UDC editor)

When you select “Search...” in the main menu “Edit”, you cannot specify the character directly. Only the Index number can be specified to search a character.

Enhanced Print Capabilities in the Asian System Environment

HP-UX 11i contains enhancements to the printer capabilities of four Asian-country system environments (JSE, KSE, SSE, TSE), as itemized below.

Changes Common to All ASEs

- LP Model File: Supports new printers: The PCL5.nl00 model file supports Asian text printing on following printers.
 - HP LaserJet 4000
 - LaserJet 5000
 - LaserJet 8000

- HPDPS: Provides common printer model directories: Provides new printer model directories, PCL4.asx, PCL5.asx and ESCP.asx for future printer support. Users can use these model directories as *model* or *sample* implementation of a printer-model. Users can copy these sample printer model directories to a directory under `/var/opt/pd/lib/model` with an appropriate name and customize it for the printer being configured.

Supports new printers: Users can print Asian text on the following printers through HPDPS by configuring the printer with PCL5.asx printer-model.

- HP LaserJet 4000
- LaserJet 5000
- LaserJet 8000

For more information, see the following files in `/usr/share/doc/`:

ASX-JPN, ASX-JPN-S, ASX-JPN-E, ASX-KOR, ASX-SCH, ASX-TCH

Japanese System Environment (JSE)

- LP Model File: Supports new printers. The PS.nli0 model file supports Japanese text printing on these printers:
 - OKI ML703N
 - ML600PSII

The ESCP model file supports Japanese text printing on these printers:

- OKI 5330S
- 8350S
- 8580S
- EPSON VP-1800

The PCL5.asian model file supports Japanese text printing on:

- HP LaserJet 5Si with 2Byte Font SIMM
- LaserJet 4000 with 2Byte Font DIMM
- LaserJet 5000 with 2Byte Font DIMM
- LaserJet 8000 with 2Byte Font DIMM

- **HPDPS: Provides common printer model directories:** Provides new printer model directories, `LIPS3.asx`, `LIPS4.asx`, `PS.asx` and `2BPCL5.asx` for future printer support. Users can use these model directories as *model* or *sample* implementation of a printer-model. Users may copy these sample printer model directories to a directory under `/var/opt/pd/lib/model` with an appropriate name and customize it to suit the printer being configured.

Supports new printers: Users can print Japanese text on the following printers through HPDPS, by configuring the printer with the `2BPCL5.asx` printer-model:

- HP LaserJet 5Si with 2Byte Font SIMM
- LaserJet 4000 with 2Byte Font DIMM
- LaserJet 5000 with 2Byte Font DIMM
- LaserJet 8000 with 2Byte Font DIMM

Users can print Japanese text on following printers through HPDPS by configuring the printer with the `PS.asx` printer-model:

- OKI ML703N
- ML600PSII

Users can print Japanese text on following printers through HPDPS by configuring the printer with the `ESCP.asx` printer-model:

- OKI 5330S
- 8350S
- 8580S
- EPSON VP-1800

For more information, see the following files in `usr/share/doc/`: `ASX-JPN`, `ASX-JPN-S`, `ASX-JPN-E`, `PRINTER-JPN-S`, `PRINTER-JPN-E`

Korean System Environment (KSE)

- **X Print Server:** KSE supports printing via X Print Server to PCL printers.
- **LP and HPDPS:** Supports new print options. Supports new printers.
- **HPDPS:** Provides a common template model directory for each print language.

For more information, see the file: `/usr/share/doc/ASX-KOR`.

Simplified-Chinese System Environment (SSE)

- **X Print Server:** SSE supports printing via X Print Server to PCL printers
- **LP and HPDPS:** Supports new print options. Support new printers.
- **HPDPS:** Provides common template model directory for each print language.

For more information, see the file: `/usr/share/doc/ASX-SCH`.

Traditional-Chinese System Environment (TSE)

- X Print Server: TSE supports printing via X Print Server to PCL printers
- LP and HPDPS: Supports new print options. Supports new printers.
- HPDPS: Provides common template model directory for each print language.

For more information, see the file: `/usr/share/doc/ASX-TCH`.

Multibyte Support Extension and Unix98 Support

**new at 11i
original release**

A new set of multibyte APIs have been added to `libc` following the C99 specification (ISO/IEC 9899:1999), and the Unix98 specification.

These APIs extend the already existing multibyte and wide character APIs in order to be able to:

- perform input and output of wide character, or multibyte character, or both
- perform general wide string manipulation
- provide extended capabilities for conversion between multibyte and wide character sequences

Several new design concepts have been introduced:

- Stream orientation
- Restartable APIs and the conversion state

Stream Orientation

A stream can be either wide-character or byte-oriented. The orientation of a stream is a concept based on an input/output model that assumes that characters are handled as wide characters within an application and stored as multibyte characters in files, and that all the wide-character input/output functions begin executing with the stream positioned at the boundary between two multibyte characters.

After a stream is associated with a file, but before any operations are performed on the stream, the stream is without orientation. If a wide-character input or output function is applied to a stream without orientation, the stream becomes wide-oriented implicitly. Likewise, if a byte input or output operation is applied to a stream without orientation, the stream becomes byte-oriented implicitly. Once the stream becomes oriented, the orientation is fixed and cannot be changed until the stream is closed.

Restartable APIs and the Conversion State

A new set of APIs have been introduced to facilitate the conversion between multibyte character representations to wide character representations. These APIs use a new object type, `mbstate_t`, that can hold the conversion state information necessary to convert between sequences of multibyte characters and wide characters. The conversion state determines the behavior of a conversion between multibyte and wide-character encoding. For conversion from multibyte characters to wide characters, the conversion state stores information, such as the position, within the current multibyte character (as a sequence of characters or a wide character accumulator). For conversions in either direction, the conversion state stores the current shift state, if any, and possibly, the encoding rule.

As these APIs store the partial character information, a multibyte sequence can be processed one byte at a time, and the processing can be interrupted and continued (i.e., restarted) at some other point in time, so the new multibyte/wide-conversion utilities are thus made restartable by using the information in the `mbstate_t` object.

How to Get MSE/Unix98 Behavior

In order to get MSE/Unix98 behavior, the programs have to be compiled with the `-D_XOPEN_SOURCE=500` macro definition and the variable has to be defined in the environment.

Under the Korn, Bourne, and POSIX shells, this is done with:

```
UNIX_STD=98
export UNIX_STD
```

Under the C shell this is done using

```
setenv UNIX_STD 98
```

A `cc` compiler equal to HP92453-01 A.11.01.20 HP C Compiler or newer is required to get this functionality.

Below is a summary list of new and modified APIs. For further details, please refer to the corresponding manpages.

New Interfaces

The following APIs are newly added to `libc` and will not affect existing code:

btowc()

`btowc()` returns the wide-character representation of a given single-byte character.

fwide()

`fwide()` sets the stream orientation.

fwprintf(), swprintf(), wprintf()

These APIs print formatted wide-character output.

fwscanf(), swscanf(), wscanf()

These APIs process formatted wide-character input.

mbrlen()

`mbrlen()` returns the number of bytes in a wide character. Note that the behavior of this function is affected by the `LC_CTYPE` category of the current locale.

mbrtowc()

`mbrtowc()` converts a stream of bytes to a wide-character code. Note that the behavior of this function is affected by the `LC_CTYPE` category of the current locale.

mbsinit()

`mbsinit()` determines whether the object pointed to by the first argument, which contains shift state information, describes an initial conversion state.

mbsrtowcs ()

`mbsrtowcs ()` converts a character string to a wide-character string. Note that the behavior of this function is affected by the `LC_CTYPE` category of the current locale.

towctrans ()

`towctrans ()` is provided for character transliteration. The current setting of the `LC_CTYPE` category should be the same as during the call to `wctrans ()`.

vwprintf (), vswprintf (), vfwprintf ()

These APIs are provided for printing wide-character formatted output of a `stdarg` argument. They are similar to `fwprintf (3C)` except that instead of being called with a variable number of arguments, they are called with an argument list as defined by `<stdarg.h>`.

wcrtomb ()

`wcrtomb ()` converts a wide-character to a multibyte character. It determines the number of bytes needed to represent the character corresponding to the wide-character code whose value is specified by the second argument.

wcsrtombs ()

`wcsrtombs ()` converts a wide-character string to a character string. Note that the behavior of this function is affected by the `LC_CTYPE` category of the current locale.

wcsstr ()

`wcsstr ()` finds a substring in a wide-character string. Note that the behavior of this function is affected by the `LC_CTYPE` category of the current locale.

wctob ()

`wctob ()` converts wide-character to single-byte.

wctrans

`wctrans ()` defines character mapping in the current locale. Note that the values returned by `wctrans ()` are valid until a call to `setlocale ()` that modifies the category `LC_CTYPE`.

wmemchr (), wmemcmp (), wmemcpy (), wmemmove (), wmemset ()

These APIs operate with wide-character in memory areas:

- `wmemchr ()` finds a wide-character in a memory array.
- `wmemcmp ()` compares wide-characters in memory.
- `wmemcpy ()` copies wide-character in memory.
- `wmemmove ()` copies wide-characters in memory with overlapping areas.
- `wmemset ()` sets wide-characters in memory.

Modified Interfaces

The following APIs may have a change in behavior or a parameter type change that could affect existing HP-UX code when the Unix98 support is selected:

fprintf(), **printf()**, **snprintf()**, **sprintf()**, **fscanf()**, **scanf()**, **sscanf()**

printf(3S), *scanf*(3S) and related functions support the new qualifier `l` (the letter) to select wide character conversion in a given format string and set `errno` to `[EILSEQ]` if the data obtained from the input stream does not form a valid wide character.

fputwc(), **putwc()**, **putwchar()**

The type of first argument is changed from `wint_t` to `wchar_t`.

freopen()

Regardless of the mode of underlying stream, after a successful call to the `freopen()` function, the orienting of the stream is cleared and the associated `mbstate_t` object is set to describe an initial conversion state.

wcschr(), **wcsrchr()**

The type of second argument is changed from `wint_t` to `wchar_t`.

Future Change for LicensePower/iFOR

HP plans to remove LicensePower/iFOR from the Core HP-UX software in a future release. This licensing product can be obtained directly from Isogon Corporation, the owner of the product.

To download LicensePower/iFOR, go to Isogon's Web site:

<http://www.isogon.com/downloads.htm>

Impending LSSERV Software Obsolescence

**new at 11i original
release**

HP-UX 11i is the last release that will contain the LSSERV licensing product as a bundled part of the operating system.

You can obtain this product directly from its owner, the Isogon Corporation. You can also visit the Isogon Corporation web site for further information about LSSERV support at <http://www.isogon.com>.