HP-UX 9.x/10.x Interoperability Guide

HP 9000 Computers

HP Part No. 5964-1370
Printed in USA November 1995

E1195

Notices

Corporate Offices:

Hewlett-Packard Company
3000 Hanover St.
Palo Alto, CA 94304

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Printing History

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February 1995 ... Edition 1 (5962-7396).
     May 1995 ... Edition 2 (5963-8920) updated for HP-UX 10.01.
November 1995 ... Edition 3 (5964-1370) updated for HP-UX 10.10.
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This guide replaces earlier versions supplied with HP-UX 9.10 (Series 300/400) and HP-UX 10.01.

The printing date and part number indicate the current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The edition and part number changes when extensive technical changes are incorporated.

Printed by:

Worldwide Customer Support Operations
Hewlett-Packard Company
3404 East Harmony Road
Fort Collins, CO 80525

About This Guide

The introduction of HP-UX 10.x on HP 9000 Series 700/800 computers provided significant new functionality beyond HP-UX 9.x. 10.0 enhanced interoperability between HP-UX and other UNIX vendors' platforms, improved the portability of software applications, and added management capabilities and fault-resilient functionality.

Since HP-UX for Series 300/400 workstations has stabilized with HP-UX 9.10 (Series 300/400), the introduction of HP-UX 10.x for Series 700/800 computers created challenges for environments with Series 300/400 workstations running 9.x and Series 700/800 computers running 10.x. Also, many customers may have requirements to keep some Series 700/800 computers on 9.x. The ability to exchange data, share resources and services, and share common systems management activities between different systems is known as **interoperability**.

Reporting Problems

This guide will help you maintain existing HP 9000 computers running HP-UX 9.x in networks including Series 700/800 computers running 10.x.

Audience

This guide is organized for system administrators, end users and programmers. System administrators may wish to perform the end-user tasks described here on behalf of their end users.

This guide assumes:

- You are a system administrator familiar with HP-UX 9.x and are planning to either **install** or **upgrade** some Series 700/800 computers to 10.x, while maintaining some servers or workstations on 9.x.
- You want to inter-operate some Series 300/400 workstations or Series 700/800 computers with HP-UX 10.x systems.
- Your Series 300/400 workstations are all on HP-UX 9.0, 9.03, or 9.10 and your Series 700/800 computers are all on 9.x. If not, some of the functionality discussed here will not be available to you. For details on upgrading to these latest releases, see your HP Sales Representative.

Typeface Conventions

These typeface conventions are used in this guide:

Boldface	Marks the first appearance of a word or phrase explained further in the Glossary.
`Computer output`	Text output from a computer, HP-UX commands and utilities.
Italics	Book titles, emphasized words, parameters in HP-UX commands, and references to entries in the *HP-UX Reference*.
Return	Keyboard keys.
`Softkey`	The label of a function key appearing at the bottom of your window.
"Double Quotes"	Titles of chapters and sections.

Contents

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Interoperability Overview

This guide will help you interoperate HP 9000 computers running both HP-UX 9.x and 10.x. Whether you plan to upgrade some or all Series 700/800 computers to 10.x or continue to operate some systems on HP-UX 9.x, you will find helpful planning information here.

This chapter introduces you to the products available to help you interoperate computers running HP-UX 9.x with those running 10.x.

Current Operating Systems

This guide refers to these HP-UX operating systems:

- **HP-UX 9.10:** The latest version for Series 300/400 workstations.
- **HP-UX 10.0:** The current version being supplied with new Series 700/800 computers. This release is also called HP-UX 10.0 version B.10.00.
- **HP-UX 10.01:** An upgrade to HP-UX 10.0. Series 700/800 computers running 9.x should be upgraded to HP-UX 10.01, not 10.0. New versions of the installing and updating manual, the *HP-UX System Administration Tasks* manual, and release notes are provided. Changes from HP-UX 10.0 to 10.01 are explained in the 10.01 release notes.
- **HP-UX 10.10:** An upgrade to 10.01, adding large file-system support, large physical memory, Shared Logical Volume Manager, 3D graphics, support for UNIX95, and other features. For details, see the *Release Notes for HP-UX 10.0 version B.10.10*.

References to "HP-UX 10.x" in this guide refer to HP-UX release 10.0: 10.0 (B.10.00), 10.01 (B.10.01) and 10.10 (B.10.10).

HP-UX 9.x and 10.x Interoperability Products

These products will to help you interoperate HP-UX 9.x with 10.x:

HP 9000 Series 300/400/700/800 Interoperability Products

Product	Description and References
Common User Login Files	Improve interoperability of user home environments. See the release notes for HP-UX 9.10 (Series 300/400) and 10.01.
Interoperability Links	Makes 9.x file systems look like 10.x. See the release notes for HP-UX 9.10 (Series 300/400) and 10.01.
Transition Links	Makes 10.x file system look like 9.x file system. See the HP-UX 10.x documentation.
Software Distributor (SD)	Distribute software across OS revisions: ■ HP-UX 9.x: See the *Updating to HP-UX 9.10* (Series 300/400) and *Installing and Updating HP-UX 9.0* manuals. ■ HP-UX 10.x: See the *HP-UX System Administration Tasks* manual and *Managing HP-UX Software with SD-UX* manual.
Xterminal for S300/400	Configure Series 300/400 workstations as Xterminals on a network served by Series 700/800 on 10.x. See the *Updating to HP-UX 9.10* (Series 300/400) manual.
HP-UX 10.0 Analysis and Conversion Tools	Find interoperability issues in your HP-UX 9.x environment. See *Moving HP-UX 9.x Code and Scripts to 10.x: Using the Analysis and Conversion Tools.*
HP-UX 10.01 Upgrade Preparation Media	The 10.0 tools (above), plus tools to help you upgrade to HP-UX 10.x. See *Upgrading from HP-UX 9.x to 10.x.*
Restricted `update` for HP-UX 10.x.	Install `fpkg` (`netdist`) format software onto systems running HP-UX 10.x. See Chapter 4.

Contact your HP Sales Representative for details on ordering HP-UX 10.0.

Related Documentation and Training

If you are not familiar with installing and maintaining HP-UX, you should attend an HP-UX system administration course. Ask your HP Sales Representative for details.

Be sure to have these manuals handy, either printed or on HP LaserROM/UX, while planning:

- Release Notes (look under `/etc/newconfig` on HP-UX 9.x and `/usr/share/doc` on 10.x).
- *Installing HP-UX 10.10 and Updating from HP-UX 10.0x to 10.10*.
- *Upgrading from HP-UX 9.x to 10.x*.
- *Updating to HP-UX 9.10* (Series 300/400).
- *Updating to HP-UX 9.03* (Series 300/400).
- *HP-UX System Administration Tasks* manual.
- *How HP-UX Works* (9.x only).
- *Managing Clusters of HP 9000 Computers* (DUX) manual.
- *Managing HP-UX Software with SD-UX* manual (10.x only).
- *HP-UX Reference*.

More references are listed at the back of Chapter 2.

Above all, you should completely review the *Release Notes for HP-UX 10.0 version B.10.10* and *Upgrading from HP-UX 9.x to 10.x* (both supplied with 10.10) while planning for interoperability.

Interoperability Planning Checklist

Environments which use these HP-UX 9.x subsystems will have interoperability issues:

- **Native Language Support:** HP-proprietary NLS (Native Language Support) routines are no longer supported as of 10.0. See Chapter 7 for more details.
- **DUX Diskless:** HP-UX DUX clusters are no longer supported as of 10.0. HP-UX 10.01 adds support for NFS Diskless clusters. See Chapter 5 for more details. If you have scripts or applications that invoke HP-UX DUX commands or system calls, you will need to modify them before moving them to a 10.x system; see Chapter 7 for more details.
- **Software Disk Striping (SDS):** This product is no longer available as of 10.0, but support for disk striping has been added to LVM and existing *single* SDS striped disks will continue to be supported by means of a compatibility driver. See Chapter 3 for more details.
- **NetIPC:** NetIPC routines are no longer supported as of 10.0. See Chapter 3 for more details.
- **Netdist Servers and Software Management:** HP-UX software distribution has been completely revised with 10.0. HP OpenView Software Distributor 2.0 (SD) is used to install, update, remove, and package HP-UX software. SD media cannot be read by installation tools from previous HP-UX releases, nor can you use previous installation tools with HP-UX 10.x software. See Chapter 4 for more details.
- **Backup/Recovery:** The file system layout changes dramatically for 10.x, so you need to be particularly careful about moving files from a 9.x system to 10.x. You may want to review your backup policies. See Chapter 3 for more details.
- **Unsupported Hardware:** All Series 300/400 workstations and some early Series 800 computers are not supported on 10.x. See page 2-2 and Chapter 5 for more details.

Planning References

Interoperability Planning References

Topic	References
Supported Workstations	Chapter 2.
Disk/RAM Requirements	*Release Notes for HP-UX 10.0 version B.10.10.* `snoop` man page.
Networking Software	Chapter 3. *NETIPC to BSD Sockets and DSCOPY to FTP Migration Guide.* *Release Notes for HP-UX 10.0 version B.10.10.* *System Administration Tasks.*
Diskless	Chapter 5. *Release Notes for HP-UX 10.0 version B.10.10.* *Upgrading from HP-UX 9.x to 10.x.* *NFS Diskless Concepts and Administration.* *System Administration Tasks* for 10.x. *Managing Clusters of HP 9000 Computers* (DUX) manual. *Upgrading from HP-UX 9.x to 10.x.* *Updating to HP-UX 9.10* (Series 300/400).
File System Changes	Chapters 3 and 5. *Release Notes for HP-UX 10.0 version B.10.10.* *HP-UX 10.0 File System Layout.* *Updating to HP-UX 9.10* (Series 300/400). HP-UX 10.0 Analysis and Conv. Tools manpages. *HP-UX 10.0 System Administration Tasks.* *HP-UX 9.10 Release Notes* (Series 300/400). *File Sharing and Other Helpful Facts for HP-UX 10.0 Software Developers.*

Interoperability Planning References (continued)

Topic	References
User Environment	Chapters 3, 6, and 7.
Prog. Environment	Chapter 7. *Moving HP-UX 9.x Code and Scripts to 10.x*. HP-UX 10.0 Analysis and Conv. Tools manpages. *HP-UX 9.10 Release Notes* (Series 300/400). *Release Notes for HP-UX 10.0 version B.10.10*. *Upgrading from HP-UX 9.x to 10.x*. HP-UX 9.x and 10.x compile tools manpages.
Software Management	Chapters 3 and 4. *Upgrading from HP-UX 9.x to 10.x*. *Managing HP-UX Software with SD-UX* manual. *Updating to HP-UX 9.10* (Series 300/400). *File Sharing and Other Helpful Facts for HP-UX 10.0 Software Developers*.
System Administration	Chapter 3. *Updating to HP-UX 9.10* (Series 300/400). *Release Notes for HP-UX 10.0 version B.10.10*. *Updating to HP-UX 9.10* (Series 300/400). *HP-UX 10.0 Software Patches* (supplied with upgrade media). *HP-UX 10.0 System Administration Tasks*. *File Sharing and Other Helpful Facts for HP-UX 10.0 Software Developers*.
Finding Interop. Issues	Chapters 2 and 7. *Release Notes for HP-UX 10.0 version B.10.10*. *Moving HP-UX 9.x Code and Scripts to 10.x*. *Upgrading from HP-UX 9.x to 10.x*. HP-UX 10.0 Analysis and Conv. Tools manpages. HP-UX 10.01 Upgrade Preparation Media.

2

Interoperability Planning Guide

This chapter offers an overview of the differences between HP-UX 9.x and 10.x, highlighting the differences that affect interoperability of your HP-UX 9.x systems with systems running HP-UX 10.x. Each topic includes references to more detailed information that you can use if the issue pertains to your environment. There is also information about tools available to help find interoperability issues and information about available training and support.

The major changes in HP-UX 10.x are:

- A new directory layout based on the industry standard, Novell USL, often called simply "V.4 file system". HP-UX 10.x is not a full implementation of the V.4 operating system, just its file system layout.

  The upgrade process from HP-UX 9.x to 10.x re-arranges file systems to the new directory layout. No disk reformatting is required, and only operating system disks will be affected.

  See the *hier*(5) manpage on HP-UX 9.x and 10.x for more information.

- A new diskless solution based on industry standard components, **NFS Diskless**, is available with HP-UX 10.10. This replaces HP-UX 9.x **DUX Diskless** and is a substantial enhancement in system administration and resource sharing over the base NFS Diskless technology. Neither NFS Diskless nor DUX is supported with the initial HP-UX 10.0 release.

- Convergence between Series 700/800 computers:

  - I/O subsystem.
  - Kernel configuration.
  - Logical Volume Manager (LVM) used for disk management by default.

- A new tool for installing and updating software, HP Software Distributor.

- Minimum memory configuration is 16 MB.

Hardware Planning

Supported Workstations

New HP 9000 computers supported by HP-UX 10.0 include:

- Series 800 Model K
- Series 700 Model J

HP-UX 10.10 also supports these new systems:

- T520 (Model 892), 1-12 CPUs, 120MHz.
- C110, 120 MHz.

HP-UX 10.0 supports all Series 700/800 computers running HP-UX 9.x *except*:

- Series 600/800: Model 635SV, 645SV, 808, 815, 822S, 825S, 832S, 835S, 835SE, 840S, 842S, 845S, 850S, 852S, 855S, 860S, 865S, 870S/100, 870S/200/300/400.
- Any Series 800 with an 8 MB memory card in the first slot.

For a list of supported NFS Diskless configurations, see chapter 2 of the *Release Notes for HP-UX 10.0 version B.10.10*.

Since HP-UX 10.x does not support Series 300/400 workstations, HP-UX 9.10 provides many interoperability enhancements, as explained throughout this guide.

Ask your HP Sales Representative about available upgrade programs when considering purchasing new workstations.

Disk Space/RAM Requirements

The following table lists the disk space requirements for the HP-UX 9.x and 10.x interoperability products.

Interoperability Product Disk Space Requirements

Product	Disk Space Required
Common User Login Files	Negligible
Interoperability Links	93 Kbytes on 9.x systems
Transition Links	100 Kbytes on 10.x systems
SD on HP-UX 9.10 (Series 300/400) for S300/400	10 Mbytes
Xterminal for S300/400	6 Mbytes on Series 700/800 server
HP-UX 10.0 Analysis and Conversion Tools	7.5 Mbytes on 9.x systems
HP-UX 10.01 Upgrade Preparation Media	36 Mbytes

For information on HP-UX 10.x disk space requirements, see the *Release Notes for HP-UX 10.0 version B.10.10*, the `snoop` manpage, and *Upgrading from HP-UX 9.x to 10.x*.

Software Planning

Software Bases for Interoperability and Upgrading

The information in this guide assumes that you are running at least HP-UX 9.0 on each system. Many features and interoperability considerations explained here are not supported on earlier versions.

Network and Communications Software

The following networking products have interoperability issues. See Chapter 3 for more details.

- NetIPC.
- NFS.
- NIS.
- NS Services.
- SLIP/CSLIP.
- lanconfig.
- Network Tracing and Logging.
- Internet (ARPA) Services.
- ftp.
- nslookup.

File System Changes

The HP-UX file system layout changed with 10.0 to follow the USL and OSF/1 paradigms. This provides for client/server file sharing and alignment with an industry accepted file system layout.

Two main areas in the file system have changed: file/directory locations and system startup/shutdown control. This section is a summary of those changes. For more details, see Chapters 3 and 5, the *Release Notes for HP-UX 10.0 version B.10.10*, and the *HP-UX 10.0 File System Layout* white paper provided with 10.0.

Source files, shell scripts, binaries, build and test environments, documentation, and environment variables that have embedded pathnames may be impacted by file and directory location changes.

The startup and shutdown model in HP-UX 10.x separates system information from information users can customize. This prevents users from re-merging their customizations with each OS upgrade. The HP-UX 10.x model requires users to modify configuration variables that are separate from the execution scripts. Users that have modified rc scripts in the past to include customized functionality must move the script information to comply with the new startup/shutdown model. See the *HP-UX 10.0 File System Layout* white paper available with HP-UX 10.0 for detailed information.

File and Directory Changes

The HP-UX 10.x file system layout is modeled after the USL and OSF/1 file systems and is implemented on Series 700/800 computers:

- The file system layout is logical. Files are organized into categories such as static versus dynamic, executable versus configuration files, and so forth.
- To support a client/server file-sharing model, operating system software and application software are in different directories. In HP-UX 9.x, applications are co-resident with the OS, typically under the `/usr` directory. In HP-UX 10.x, most applications are in a separate directory, `/opt`.
- Files that are meant to be shared by different hosts and host-specific files are in different directories.

Transition and Interoperability Links

To ease updating to HP-UX 10.x, HP provides **transition links** (essentially symbolic links) on 10.x that provide binary compatibility by allowing applications to reference 9.x pathnames. These allow 9.x applications or scripts to operate while being ported to 10.x. See "File System Layout" in Chapter 3.

To ease the interoperability of applications and scripts in a **mixed environment**, HP also provides **interoperability links** that allow applications and scripts executing on HP-UX 9.x to reference 10.x pathnames. These links are described in Chapter 3 and the *HP-UX 9.10 Release Notes* (Series 300/400).

Changes to Startup and Shutdown Control

The system startup and shutdown control mechanism is also completely new for 10.x. With 9.x, `/etc` contained large rc scripts that were executed during system boot. With 10.x, however, execution scripts and script variables are

in different locations. You can set and modify the behavior of the system by changing script variables. The execution scripts, which read the variables and start/stop subsystems, are not user-modifiable. All control is supplied through the script variables. Applications developers may control the run-level at which these subsystem functions are initiated. See "File System Layout" in Chapter 3 and the *HP-UX 10.0 File System Layout* white paper for more information.

Other File System Changes

These and other HP-UX 10.x file system changes from HP-UX 9.x are explained in your *Release Notes for HP-UX 10.0 version B.10.10*:

- File system swap changes.
- The file system table `/etc/checklist` is now `/etc/fstab`.
- A V.4-like file system command interface is used to specify the file system type to some file system commands. This change is to handle the growing number of file system types on HP-UX.

Diskless

With HP-UX 10.01, diskless clients access files from servers via NFS Diskless instead of the previous Diskless HP-UX (DUX). HP-UX 9.x DUX features such as Context Dependent Files are not supported on HP-UX 10.x. With NFS Diskless, shared files are kept in separate directories from private files (this is facilitated by the V.4 file system layout). Each client has a private root directory. Only shared directories are NFS-mounted to all clients.

With NFS Diskless, Series 700 workstations may act as diskless clients or servers. Series 800 computers may act as diskless servers only. Clients must have a built-in LAN connection and may have as little as 16 MB RAM.

NFS Diskless is different from HP-UX 9.x DUX in several areas.

- DUX presented a cluster-wide single-root file system. NFS Diskless allows for private and shared roots, plus private and cluster-wide (via SAM) file systems.
- NFS Diskless does not require and does not support CDFs.
- NFS Diskless supports Series 800 computers as diskless servers. DUX did not support use of Series 800 computers in clusters.

- DUX provided a Posix-compliant file system for clients. Because it uses NFS, NFS Diskless is not Posix compliant for clients. This principally affects advisory vs. mandatory file locking.
- DUX allowed either local device swap or remote device swap to the root server or an alternate client's swap disk. NFS Diskless supports either local device or file system swap or remote file system swap to a swap server. NFS Diskless is very general: A client's swap server can be any HP-UX NFS machine, although there are some automatic system administration limitations.
- DUX supported distributed named pipes throughout a cluster. NFS Diskless does not support this functionality.
- DUX supported global process identifiers (**PIDs**) and a single shared /tmp. NFS Diskless uses private tmp directories for clients by default and doesn't support global PIDs.
- DUX provided kernel level transparent time synchronization. NFS transport does not provide this, the industry standard Network Time Protocol (NTP) is provided.
- DUX used single shared `/etc/passwd` and `/etc/group` files. With NFS Diskless, this is optionally provided via SAM.
- DUX supported cluster-wide ACL manipulation. NFS Diskless doesn't support HP-UX ACL manipulation from diskless clients.
- DUX used LAN break detection and clients failed if their server failed. NFS Diskless clients continue running until they need files from their server, then they wait for their server to become available again and continue operation.
- NFS Diskless allows CDROM file systems on client systems. DUX limited CDROM file system to server systems.
- No automatic cluster-wide NFS mounts. SAM provides the ability to make NFS mounts cluster-wide for NFS Diskless.
- DUX clusters were limited to a single LAN segment. NFS Diskless supports a richer set of topologies, independent of the physical files system and physical network logic.

For more details on each of the above items, see the *Release Notes for HP-UX 10.0 version B.10.10*.

Typeface Conventions

Planning for NFS Diskless

If you have Series 300/400 workstations configured in one or more diskless clusters and plan to share files with a server running HP-UX 10.x, you have these options:

- Maintain your Series 300/400 workstations in cluster(s) with HP-UX 9.x server(s). Although you cannot boot Series 300/400 workstations from a server running HP-UX 10.x, they can still exchange or share files via normal LAN services: rcp, ftp, NFS mounts, etc. See Chapter 3 for more information.
- Convert your DUX clusters to NFS Diskless. Upgrade all Series 700 workstations to HP-UX 10.10 and use NFS Diskless. Convert your Series 300/400 workstations into Xterminals using a 10.x Series 700/800 computer as the server. See Chapter 5 for details.
- Upgrade your Series 300/400 workstations to Series 700/800 computers and use NFS Diskless. Refer to *Upgrading from HP-UX 9.x to 10.x* for details.

For more details on NFS Diskless, see Chapter 5.

User Environment

Command and file pathnames differ between HP-UX 9.x and 10.x. The default location for users' home directories is also different (`/users` for 9.x and `/home` for 10.x). Several things can be done to help end-users function more seamlessly in a mixed environment:

- Modify users' login files (`~/.profile`, `~/.login`, etc.) to improve interoperability for end-users sharing their home environments between HP-UX 9.x and 10.x workstations. Details on setting up user environments for interoperability can be found in Chapters 4 and 6.
- Modify user scripts to use common commands and options or differentiate between HP-UX 9.x and 10.x and execute the appropriate version of certain commands. See Chapter 7 for more details on script interoperability issues.
- Be sure user scripts which invoke pathnames that differ between HP-UX 9.x and 10.x rely on interoperability or transition links to interoperate. More detail on the use of interoperability and transition links are in Chapter 3.

Programmer Environment

There are programmatic differences between HP-UX 9.x and 10.x. Programmers will need to know how to write or modify tools and code for a mixed environment. Here are some rules for writing scripts and code that will run on both HP-UX 9.x and 10.x:

- Avoid hard-coded pathnames.
- Use interoperability links to resolve hard-coded pathnames that differ between HP-UX 9.x and 10.x.
- Don't use new HP-UX 10.x commands and options if you want scripts and programs to work on 9.x systems.
- Don't use obsolete HP-UX 9.x commands and options if you want scripts and programs to work on 10.x systems.
- Don't use new HP-UX 10.x libc routines in programs you want to work on 9.x systems.
- Don't use obsolete HP-UX 9.x libc routines in programs you want to work on 10.x systems.
- Don't use the parts of the new standards HP-UX 10.x conforms to which 9.x does not implement.
- Don't use programmatic interfaces for new HP-UX 10.x features in programs that must work on 9.x systems.

The `prepare` and `analyzer` tools which are part of the HP-UX 10.0 Analysis and Conversion Tools can be used to identify interoperability problems in your code, scripts, and build environments. See the "Finding Interoperability Issues in Your Environment" section later in this chapter for more information.

See Chapter 7 for details about which commands, options, and routines to avoid. For commands and topics primarily of interest to system administrators, see Chapter 3.

For STREAMS programmers, STREAMS is bundled with HP-UX 10.x, but must be ordered as a separate product for HP-UX 9.x.

For threads programmers, the DCE POSIX threads (pthreads) library is bundled with 10.x, but must be ordered as a separate product for HP-UX 9.x.

Typeface Conventions

Other issues for programmers doing application development on both HP-UX 9.x and 10.x include setting up common makefiles and compiling your applications correctly. See Chapter 7 for details about handling these issues.

HP-UX 9.x and 10.x Standards Compliance

HP-UX 9.x and 10.x conform to most significant industry standards. Key standards that 9.x conforms to are:

- X/Open Portability Guide Base Profile (XPG4) and International Extension of XPG3 Base.
- Novell USL definition (aka: SVID2).
- UC Berkeley Software Distribution 4.3 (BSD).
- Federal Information Processing Specification (FIPS) 151-1.
- IEEE POSIX 1003.1.
- IEEE POSIX 1003.2.
- OSF1/AES.
- X11R5.
- Motif 1.2.
- PHIGS.
- PEXlib/PEX.
- ANSI C.
- Functional compliance with DoD C2 and B1 Trusted System Requirements. (Ask your HP Sales Representative for ordering information.)

HP-UX 10.x adds compliance to these industry and de facto standards:

- SVID3 Base System and Kernel Extension, Volume 1, Chapters 3-6 and 8-12.
- POSIX 1003.1b (partial implementation for real time including synchronous I/O, Timers, Priority Scheduling).
- POSIX 1003.1c (Draft 4).
- 4 Byte EUC (Asian language support).
- System V.4 File System Layout

While HP-UX 9.x is not fully compliant with the above standards that HP-UX 10.x has added compliance for, it supports large portions of the these standards. See "HP-UX 9.x and 10.x Standards Compliance" in Chapter 7 for more details.

Software Management

To use a common on-site software management package for HP-UX 9.x and 10.x workstations, all workstations should use HP Software Distributor 2.0/2.1, also known as SD. SD is the software management tool set for HP-UX 10.x. For more information about SD, see *Upgrading from HP-UX 9.x to 10.x* and *Managing HP-UX Software with SD-UX* manual. A subset of SD is available for Series 300/400 workstations in HP-UX 9.10 (Series 300/400) and for Series 700/800 computers in HP-UX 10.01 Upgrade Preparation Media. SD on HP-UX 9.x for Series 700/800 computers is also available as a separate product. Ask your HP Sales Representative about HP J2326AA OpenView Software Distributor.

For more details on this strategy for interoperability, and details on converting your update packages to the SD format, see Chapter 3.

A "restricted" `update` is available for HP-UX 10.x for those customers who need to continue distribution of `fpkg` (`netdist`) format software packages in a mixed environment for a transitional period. For more information, see page

System Administration

HP-UX 10.0 features which will cause interoperability issues for system administrators include:

- Converged I/O subsystem between Series 700/800 computers.
- Logical Volume Manager (LVM).
- V.4 file system layout.
- V.4 startup/shutdown control.

See Chapter 3 for more details on how these new features will affect administering mixed environments.

Series 300/400s Interoperability with HP-UX 10.x

The HP-UX 9.10 (Series 300/400) release for contains these optional features to improve interoperability with 10.x:

- Common user login files to mask path differences between HP-UX 9.x and 10.x systems.
- Interoperability Links to make 9.x file systems look like 10.x.

- Software Distributor (SD) to allow distributing software across OS revisions.
- Xterminal to configure Series 300/400 workstations as Xterminals on a network served by Series 700/800 computers.

To maximize the interoperability between your 9.x Series 300/400 workstations and your 10.x Series 700/800 computers, you should upgrade to HP-UX 9.10 (Series 300/400) and install at least the first two products. If you distribute your own internal software, consider installing the SD software. And if you have a mixed diskless cluster, consider using the Xterminal product to continue operation of your Series 300/400 workstations. For more information on these products, see the *HP-UX 9.10 Release Notes* (Series 300/400) and *Updating to HP-UX 9.10* (Series 300/400).

Series 700/800s Interoperability with HP-UX 10.x

For Series 700/800 computers that need to remain on HP-UX 9.x, these optional features are provided to improve interoperability with 10.x:

- Common user login files to mask path differences between HP-UX 9.x and 10.x systems. These are included in HP-UX 10.01.
- Interoperability Links to make 9.x file systems look like 10.x. These are available via patches to 9.x.

For more information on these products, see Chapters 4 and 6.

Finding Interoperability Issues in Your Environment

The first step in creating a seamless mixed environment with computers running both HP-UX 9.x and 10.x is to find out what interoperability issues pertain to your environment. The particular interoperability issues you will encounter will depend on the type of workstations in your environment, which subsystems of HP-UX you use, what your file system layout looks like, and what particular commands, tools, and library calls your software packages use.

Environments which use the HP-UX 9.x subsystems listed in "Interoperability Planning Checklist" in Chapter 1 will have interoperability issues.

Using 10.0 Analysis and Upgrade Tools

The HP-UX 10.0 Analysis and Conversion Tools and HP-UX 10.01 Upgrade Preparation Media contain tools to help you prepare your HP-UX 9.x system for upgrade to HP-UX 10.x. These tools can also be used to find interoperability issues in your environment.

Analysis Tools. These are in the HP-UX 10.0 Analysis and Conversion Tools and the HP-UX 10.01 Upgrade Preparation Media:

- `prepare` locates and analyzes large numbers of HP-UX 9.x files at a time. It is a "front-end" to the `analyzer` tool, identifying filenames that are likely to require analysis by the `analyzer` tool.
- `analyzer` is invoked by `prepare` to statically analyze compatibility differences between HP-UX 9.x and 10.x versions of shell scripts, makefiles, source files, and text files. On a per-file basis, it evaluates pathnames in ASCII files, commands and command options in shell scripts and makefiles, and system calls and library routines in source files.
- `fnlookup` is a filename-lookup utility that maps HP-UX 9.x directories and file locations to HP-UX 10.x locations and vice versa.

Upgrade Tools. The tools planned for HP-UX 10.01 will include the HP-UX 10.0 Analysis and Conversion Tools plus upgrade tools such as `snoop`, which can be useful for finding interoperability issues. `snoop` analyzes your Series 700/800 9.x systems and reports conditions that may prevent you from successfully upgrading your HP-UX 9.x system to 10.x. Examples of such conditions include insufficient disk space and the presence of Series 300/400 workstations. See the manual supplied with the HP-UX 10.0 Analysis and Conversion Tools for details.

See your HP Sales Representative to order the HP-UX 10.0 Analysis and Conversion Tools and HP-UX 10.01 Upgrade Preparation Media. Chapter 7 has more information on using these tools to find interoperability issues and on changing code to interoperate on HP-UX 9.x and 10.x.

Release Notes. The *Release Notes for HP-UX 10.0 version B.10.10* describe the major features of the HP-UX 10.x releases and how they will affect your system.

White papers. Available white papers are listed at the end of this chapter.

Planning for Training and Support

Training Services

HP offers a wide selection of courses on HP-UX system administration, network administration, and software development. These constantly changing courses are listed in the latest *HP Education Catalog*. To order a free copy or register for available courses, call:

- U.S.A.: 1-800-472-5277
- Canada: (416) 678-9430

Or see your HP Sales Representative.

Consulting Services

HP Professional Service Organization offers consulting services to help you plan an inter-operating strategy between HP-UX 9.x and 10.x. See your HP Sales Representative for more details.

Documentation

Have these manuals handy while planning your interoperability strategy:

HP-UX 9.x Manuals:

Installing and Updating HP-UX 9.0, B1864-90019.
Updating to HP-UX 9.03 (Series 300/400), B1864-90100.
Updating to HP-UX 9.10 (Series 300/400), B1864-90101.
HP-UX System Administration Tasks manual, B2355-90040.
Managing Clusters of HP 9000 Computers (DUX) manual, B1864-90015.
HP-UX Reference, B2355-90033.
Configuring HP-UX for Peripherals, B2355-90041.
How HP-UX Works, B2355-90029.
Using Your HP-UX Workstation (Series 700), A2615-90001.
Master Index, B1864-90013.

HP-UX 10.0 Manuals:

Installing HP-UX 10.0, B2355-90050.
Release Notes for HP-UX 10.0, B3782-90033 (also in `/usr/share/doc/10RelNotes` on 10.x) and `/etc/newconfig/10RelNotes` on 9.x when the HP-UX 10.01 Upgrade Preparation Media are installed).
Configuring HP-UX for Peripherals, B2355-90053.
HP-UX System Administration Tasks manual, B2355-90051.
Managing HP-UX Software with SD-UX manual, B2355-90054.
HP-UX Reference, B2355-90033.
HP Graphics Porting Guide for 10.0 (if applicable).
Using Your HP-UX Workstation (Series 700), A2615-90003.
Using HP-UX (Series 800), A1700-90014.

Additional HP-UX 10.10 Manuals:

Upgrading from HP-UX 9.x to 10.x, B3782-90073.
Installing HP-UX 10.10 and Updating from HP-UX 10.0x to 10.10, B2355-90078.
HP-UX System Administration Tasks manual, B2355-90079.
Managing HP-UX Software with SD-UX manual, B2355-90080.
Release Notes for HP-UX 10.0 version B.10.10, (look in `/usr/share/doc/10.10RelNotes`).
HP-UX Reference, B2355-90052.

Other Books and Planned Manuals:

Moving HP-UX 9.x Code and Scripts to 10.x: Using the Analysis and Conversion Tools (supplied with 10.0 upgrade media), B3782-90034.
Developing and Localizing International Software, ISBN #: 0-13-300674-3.

The HP-UX 10.0 manuals are supplied with new HP-UX computers. You can also order individual manuals from HP Direct; call 1-800-637-7740.

Typeface Conventions

Other Resources

Sharing Knowledge

Many HP-UX system administrators share their knowledge and experience with other "admins" and users. Some useful channels are:

- Usenet newsgroups:
  - `comp.sys.hp.hpux`
  - `comp.unix.admin`
- *Interworkings*, a quarterly publication of the InterWorks users group.
- Interex conferences.
- InterWorks conferences. To join InterWorks, contact:

  Carol Relph,
  c/o Hewlett-Packard Company
  300 Apollo Drive, MS IWORKS
  Chelmsford, MA 01824-3623

White Papers

These articles supporting new functionality are installed with HP-UX 10.0 in `/usr/share/doc`:

HP-UX 10.0 File System Layout (`filesys.ps, filesys.txt`).
HP-UX 10.0 Memory Management (`mem_mgt.txt`).
HP-UX 10.0 Process Management (`proc_mgt.txt`).
HP-UX 10.0 Documentation Map (`doc_map.ps, doc_map.txt`).
HP-UX 10.0 Software Patches, supplied with upgrade preparation media (`sw_patches.txt`).

These additional articles are installed with HP-UX 10.01 in `/usr/share/doc`:

File Sharing and Other Helpful Facts for HP-UX 10.0 Software Developers (`DevApps.ps`).
NFS Client/Server Configuration, Topology, Tuning and Performance (`NFSD_Client_Server.ps`).
NFS Diskless Concepts and Administration (`NFSD_Concepts_Admin.ps`).

3

System Administration Tasks

This chapter lists the major changes from HP-UX 9.x to HP-UX 10.x that system administrators will encounter, and describes tasks to improve the interoperability environment for "admins" and end users.

Patches

Many 9.x defect fixes and patches are included in the HP-UX 10.x release. For an up-to-date list, look in the *HP-UX 10.0 Software Patches* document in: `/usr/share/doc/sw_patches.txt` supplied with upgrade media.

Access to HP-UX patches is available free via the World Wide Web, CompuServe, Internet, and dial-up modem in the U.S. and Canada. For details on accessing HP SupportLine, see the *Read Me Before Installing HP-UX 10.01* document supplied with your system.

What's New for System Administrators

The major changes in HP-UX 10.x that will affect system administrators managing a mixed environment are the V.4 file system layout, the Software Distributor (SD), converged I/O, and NFS Diskless. Each of these is described briefly next.

File System Layout

The HP-UX file system layout for HP-UX 10.x follows the Novell USL and OSF/1 paradigms. It provides for client/server file sharing and alignment with an industry accepted file system layout. Two main areas in the file system have changed: file and directory locations and system startup and shutdown control.

Source files, shell scripts, binaries, build and test environments, documentation, and environment variables that have embedded pathnames may be impacted by file and directory location changes. There are products to help with interoperability problems due to the change: the HP-UX 10.0 Analysis and Conversion Tools, interoperability and transition links, and common user login file templates. Details about installing and using these products are given in the following sections.

The pathname locator tool, `fnlookup`, can be helpful to system administrators working in a mixed environment. Some file location changes that this tool doesn't cover are included in the following sections.

The 10.x startup and shutdown model requires users to modify configuration variables in a separate location from the execution scripts. Users that have modified rc scripts in the past to include customized functionality must move their modifications to comply with the new startup/shutdown model. System administrators modifying startup and shutdown control in mixed environments must do so in different locations. See the following "File System Layout" section for details.

Software Distributor (SD)

HP-UX Software Distributor 2.1 (SD-UX or SD) is the software management tool set for HP-UX 10.x. For more information on SD and its impact on system administrators, see Chapter 4.

Device Files and File Systems

The HP-UX I/O subsystem has been revised in HP-UX 10.x to provide a consistent set of I/O interfaces for Series 700/800 computers.

The device file naming convention and the minor numbers are different from HP-UX 9.x.

The file system layouts for disk media was converged. This affects disk interchange between HP-UX 9.x and 10.x systems. Software Disk Striping (SDS) for the Series 700 and hard partitions for the Series 800 are obsolete in HP-UX 10.x. However, some SDS and most hard-partitioned disks built under HP-UX 9.x may be accessed on HP-UX 10.x via a compatibility pseudo-driver.

For more details on the impact of converged I/O on system administrators, see the "Devices and Device Files" and "Disk and File System Management" sections below.

NFS Diskless

See Chapter 5 for more details about NFS Diskless system administration issues.

File System Layout

There are several tools and products to help system administrators deal with the differences in file system layout in their mixed environments, and for system administrators to use to help make end users feel more comfortable in a mixed environment.

Pathname Locator

Many system administration commands and configuration files changed locations between HP-UX 9.x and 10.x, and a few changed names.

The `fnlookup` tool is contained in the HP-UX 10.0 Analysis and Conversion Tools, the HP-UX 10.01 Upgrade Preparation Media, and HP-UX 10.01. It is useful for system administrators managing a mixed environment. `fnlookup` gives you the HP-UX 10.x equivalent of an HP-UX 9.x path or vice versa. If you are performing a task on both HP-UX 9.x and 10.x workstations, `fnlookup` can help find the proper location on each release, so you don't need to remember both locations.

For a complete description of `fnlookup`, its options, and its output, refer to the *fnlookup*(1) manpage included in the HP-UX 10.0 Analysis and Conversion Tools.

`fnlookup` does not contain the translations for a few of the more complex location changes. Those are listed in the following tables.

System Administration Configuration File Mapping

Not all of these entries are direct mappings, but they are at least similar functionality. See the appropriate HP-UX 9.x and 10.x reference pages for more information.

```
9.x Path ..............  10.x Path
-----------------------------------------------------------------
/etc/clusterconf ......  /etc/bootptab, /etc/clients.dc
/etc/conf/dfile .......  /stand/system
/etc/master ...........  /usr/conf/master.d/*
/etc/conf/gen/S800 ....  /stand/system
/etc/filesets/* .......  /var/adm/sw/products/*/*/INFO
/etc/shutdown.d .......  /sbin/init.d  (partial)
/.secure/etc/passwd ...  /tcb/files/auth/*
/etc/disktab ..........  /etc/disktab (Obsolete)
/usr/lib/uucp/* .......  /etc/uucp/*, /usr/lbin/uucp/*
/usr/spool/uucp/* .....  /var/uucp, /var/spool/uucp
/usr/spool/lp/* .......  /etc/lp/*, /var/spool/lp/*,
                         /usr/lib/lp/*, /var/adm/lp/*
```

System Administration Command Path Mapping

```
9.x File ...................  10.x File
-----------------------------------------------------------------
/etc/mkrs ..................  Obsolete -> COPYUTIL (ODE utility)
/usr/contrib/bin/monitor ...  Obsolete -> HP Glance
/system/TOOL/FreeDisk ......  /usr/sbin/freedisk, /usr/sbin/sam
/etc/regen .................  /usr/sbin/config
/etc/uxgen .................  /usr/sbin/config
```

System Startup and Shutdown

The system startup and shutdown paradigms are different on HP-UX 9.x and 10.x. See the *Release Notes for HP-UX 10.0 version B.10.10* for more information about this change. This table can help you find functionality that changed locations between releases.

```
9.x File ............ 10.x File
-----------------------------------------------------------------
/etc/rc ............. /etc/rc.config.d/*, /sbin/init.d/*, /sbin/rc
/etc/netnfsrc ....... /sbin/init.d/nfs.core, /etc/rc.config.d/nfsconf
/etc/netnfsrc2 ...... /sbin/init.d/nfs.client, /sbin/init.d/nfs.server,
                      /sbin/init.d/nis.client, /sbin/init.d/nis.server
/etc/audiorc ........ /etc/rc.config.d/audio, /sbin/init.d/audio
/etc/auditrc ........ /etc/rc.config.d/auditing, /sbin/init.d/auditing
/etc/netbsdsrc ...... /etc/rc.config.d/netconf, /sbin/init.d/gated,
                      /etc/rc.config.d/namesvrs, /sbin/init.d/named,
                      /etc/rc.config.d/netdaemons, /sbin/init.d/rwhod,
                      /etc/rc.config.d/mailservs, /sbin/init.d/sendmail,
                      /sbin/init.d/ddfa
/etc/netlinkrc ...... /etc/rc.config.d/netconf, /sbin/init.d/net,
                      /etc/rc.config.d/nettl, /sbin/init.d/nettl,
                      /etc/rc.config.d/x25, /sbin/init.d/x25,
                      /sbin/init.d/inetd
/etc/netncsrc ....... /etc/rc.config.d/ncs, /sbin/init.d/ncs
/etc/netnssrc ....... (Obsolete)
/etc/netlsrc ........ /etc/rc.config.d/netls, /sbin/init.d/netls
/etc/netnmrc ........ /etc/rc.config.d/agent_run, /sbin/init.d/agent_run
/etc/subnetconfig ... (Obsolete)
```

Compatibility Links

There are two sets of compatibility links provided to ease interoperability in a mixed environment for system administrators, end users, and programmers.

HP provides transition links on HP-UX 10.x (essentially symbolic links) that allow applications and scripts to reference HP-UX 9.x pathnames. These allow 9.x applications or scripts to operate while being ported to 10.x. These links are described in the *HP-UX System Administration Tasks* manual for HP-UX 10.x. To install these links, look for the `UPG-TLINK` fileset under the `Upgrade` product on the HP-UX 10.x media.

HP also provides interoperability links on HP-UX 9.10 (Series 300/400) and HP-UX 10.0 Analysis and Conversion Tools that allow applications and scripts executing on HP-UX 9.x to reference HP-UX 10.x pathnames. These links are described in the *HP-UX 9.10 Release Notes* (Series 300/400) and *Release Notes for HP-UX 10.0 version B.10.10*.

The interoperability links can be installed on Series 300/400 workstations running HP-UX 9.1. On the HP-UX 9.10 (Series 300/400) media, look for the `TLINKS` fileset under the `INTEROP` partition. To install the links after loading the `TLINKS` fileset, use `/usr/tlinks/bin/tlinstall`.

The interoperability links are also available for Series 700/800 computers running HP-UX 9.x as patches. For more information, contact for HP Service Representative or check HP SupportLine.

HP recommends that you modify your applications and scripts to work correctly on HP-UX 10.x and use the interoperability links provided on HP-UX 9.x so that your modified applications will function correctly on your 9.x workstations. The transition links provided on HP-UX 10.x should be viewed as a short-term solution for use while moving your applications to HP-UX 10.x.

The interoperability links on Series 700/800 computers running HP-UX 9.x should be removed using `tlremove` before performing the upgrade to HP-UX 10.01 or 10.10.

Common User Login Files

HP provides a set of login files (such as `/etc/profile`) that can be used to improve interoperability for end users sharing their home environments between HP-UX 9.x and 10.x workstations.

These files include:

```
/etc/profile  /etc/d.profile  /etc/d.cshrc
/etc/d.exrc  /etc/d.login
```

The `/etc/d.*` files provide default login files in users' home directories when new accounts are added. If further customization is done for each user, see Chapter 6 for information on making these customizations work on both HP-UX 9.x and 10.x.

These files are included with HP-UX 9.10 (Series 300/400) for Series 300/400 workstations. For Series 700/800 computers, they are included with HP-UX 10.x and 9.04/9.05. The solution provided by these files in HP-UX 9.10 (Series 300/400) differs from that provided by HP-UX 10.x and 9.04/9.05, but both solutions provide interoperability.

Devices and Device Files

The following revisions to the HP-UX I/O subsystem have some impact on scripts that need to interoperate.

Any use of the `mknod` command in code, scripts, or tests for creating device files needs to be release dependent and use the correct major and minor numbers for HP-UX 9.x vs. 10.x. It is recommended that you use `mksf` on HP-UX 10.x instead of `mknod`.

References to system device file names in code, scripts, or tests need to be made release-dependent. Alternatively, if you manipulate or access device files directly, it will be more convenient to choose whichever naming convention you like (9.x, 10.0, or pre-9.0) and create symbolic links from the real device files to consistent names of your choice on all of the workstations in your environment. The interoperability and transition links do not create links for device files.

Any scripts that use the `-l` option of `ioscan` will have to be changed, it was replaced by the `-I` option. Also, any scripts that parse the output of `ioscan` may need to be modified.

Any use of `mkboot` in code, scripts, or tests may need to be release dependent. If the HP-UX 9.x invocation of mkboot includes the `-s` option, it should be removed when executed on HP-UX 10.x. If the Whole Disk layout is desired on HP-UX 10.x, the invocation of `mkboot` for Series 700 should explicitly specify `-W` on the command line. On HP-UX 10.x, the default file system layout for `mkboot` is LVM (`-l` option) for disks without file systems on both Series 700 and 800.

The default device file for the `mt` command in 9.x was `/dev/rmt/0mn`. As of 10.0, the default is `/dev/rmt/0mnb`. Scripts that use `mt` may need to be modified.

For more information on these topics and other HP-UX 10.x changes to device handling due to converging of the Series 700/800 computers I/O subsystems, see the *Release Notes for HP-UX 10.0 version B.10.10*.

Disk and File System Management

There are several new file system types in HP-UX 10.x. These cause interoperability issues for mixed environments of HP-UX 9.x and 10.x workstations. For details on the new file system types, see the *Release Notes for HP-UX 10.0 version B.10.10* and the *HP-UX System Administration Tasks* manual.

LVM

Logical Volume Manager (LVM) is offered on HP-UX 10.x. LVM is new for Series 700 workstations only. For details on LVM, see the *Release Notes for HP-UX 10.0 version B.10.10* and the *HP-UX System Administration Tasks* manual. LVM disks can be NFS mounted to HP-UX 9.x systems. LVM disks can be hard mounted to 9.x Series 800 computers, but not to 9.x Series 300/400/700 workstations.

JFS

The Journaled File System (JFS) will be provided with the HP-UX 10.01. For details on JFS, see the *Release Notes for HP-UX 10.0 version B.10.10* and the *HP-UX System Administration Tasks* manual. JFS disks can be NFS mounted on HP-UX 9.x systems, but cannot be hard mounted.

Other 10.x File System Changes

Software Disk Striping (SDS) offered on Series 700 HP-UX 9.x workstations is obsolete on 10.x. Existing *single* SDS striped disks can be hard mounted on 10.x by means of a compatibility driver. Other SDS disks on 9.x cannot be hard mounted on 10.x workstations. They can be converted to LVM disks and used on 10.x, but then they cannot be used interchangeably on HP-UX 9.x and 10.x.

On Series 300/400/700 HP-UX 9.x and on Series 700/800 10.x, there is a kernel tunable parameter, `create_fastlinks`, that causes HFS symbolic link creation to generate one less disk block access for each symbolic link in a pathname lookup. This involves a slight change in the HFS disk format, which makes these disks unusable on pre-10.0 Series 800 systems and pre-9.0 Series 300/400/700 workstations. All HP-UX 10.x kernels and all Series 300/400/700 9.x kernels understand both disk formats.

Cross-release File Transfers

Because the file system layout is dramatically different between HP-UX 9.x and 10.x, be particularly careful about moving files between HP-UX 9.x and 10.x systems. "Moving files" means:

- Recovering backups.
- Transferring files over a network via NFS or `ftp`
- Mounting file systems from a remote system.
- Mounting file systems from a disk that you have moved from one system to another.

Review Your Backup Policies

At 10.0, many system files and commands moved to new locations and some of these files and commands behave differently from previous HP-UX releases. This means you cannot recover 9.x system files onto a 10.x system and expect them to work, and you must guard against such a recovery happening accidentally.

You should review your backup policies for your HP-UX 9.x systems according to the following recommendations:

1. Back up "data" files (user and application directories) separately from "structural" files (HP system directories), so that a given tape or archive volume contains only system files or user files. "System" files are HP-supplied files in:

   `/usr` `/etc` `/bin` `/lib` `/dev` `/system`

   Most 9.x files in these directories will not work on 10.x. Once you are running 10.x, *you should never recover them to their original (9.x) pathnames.*

2. Backup your systems using relative pathnames. For instance, back up `usr`, not `/usr`.

   If you must subsequently recover a file from one of these directories onto 10.x, you can then recover the file to a different pathname. For example, to recover the 9.05 version of `/etc/inittab`, you might create the directory `/9.05` on your 10.x system and recover the file to `/9.05/etc/inittab`.

3. If your system stores context-dependent files (CDFs) in directories other than the HP "system" directories listed above (for example, if you have created CDFs yourself, or if you have applications that use CDFs), you also should begin backing up these directories separately.

   On 10.x the CDFs will be treated as ordinary directories. For example, the CDF element `/myapp1/outputfile+/node1` will become an ordinary file (`node1`) in the ordinary directory `/myapp1/outputfile+`. For NFS Diskless, node-specific files should be stored in the 10.0 *private directories* created for each node. (In this example, the proper 10.0 path would be something like `/export/private_roots/node1/var/myapp1/outputfile`).

To retrieve non-HP CDFs from a 9.x tape onto a 10.0 system, you will need to recover them on a node-by-node basis (for example, `*+/`*nodename*) into the appropriate private directory.

Note Avoid recovering HP-created CDFs onto 10.x; they will not work on 10.x. To retrieve information from them, follow the guidelines for "structural" files above. For example, to retrieve the 9.05 version of `/etc/inittab+/node1`, create a directory such as `/9.05` and recover `/etc/inittab+/node1` into a file named `/9.05/etc/inittab.node1`.

Recovering, Moving or Mounting Files Between Systems

Follow these guidelines when recovering files from backups, transferring files over a network via NFS or `ftp`, or mounting file systems from a remote system or from a disk that you have moved from one system to another.

- Unless you're sure of what's on the tape (or disk, etc.), don't do a blanket recover (mount, etc.) onto a system.

  Make sure you recover or mount only "user", as opposed to "structural", files and directories. ("Structural" files and directories are those that form part of HP-UX, such as `./bin` and `./usr` on HP-UX 9.x systems, and `./usr` and `./etc` on HP-UX 10.x systems.) The previous section suggests ways of recovering HP-UX 9.x "structural" information so that it does not interfere with the HP-UX 10.x system. Follow a similar strategy for recovering HP-UX 10.x "structural" information onto HP-UX 9.x systems.

- Be careful about recovering *any* files or directories from HP-UX 9.x backups onto HP-UX 10.x systems or vice versa, or about moving or mounting them from an HP-UX 9.x system onto an HP-UX 10.x system or vice versa.

  If you follow file system layout guidelines in the HP-UX 10.x *HP-UX System Administration Tasks* manual and the *Moving HP-UX 9.x Code and Scripts to 10.x: Using the Analysis and Conversion Tools* manual, even your "user" files are likely to be in different directories on the HP-UX 10.x system from where they were on 9.x. Recovering these files blindly may create a redundant set of directories. The next run of your application may not find the data you recovered and produce erroneous results.

If in doubt, always recover 9.x files to a temporary directory, not to absolute pathnames. Then either copy the files you need to their correct 10.x locations, or (if these are system files) extract the information you need and merge it into the corresponding 10.x files. Follow the same strategy for recovering 10.x files onto 9.x files.

SAM

In HP-UX 10.x, SAM adds support for administration of Commercial Security, LVM, SCSI Cascade disks, JFS, Converged I/O subsystem, and NFS non-superuser access to SAM Functionality and the ability to interactively add custom utilities to SAM.

For administrators accustomed to viewing or manipulating the SAM log file, there are some differences. The SAM log file is `/usr/sam/log/samlog` on HP-UX 9.x and `/var/sam/log/samlog` on HP-UX 10.x. In HP-UX 10.x, support was added for the SAM log file viewer, accessible through the SAM options menu or by executing `/usr/sam/bin/samlog_viewer`. The entries in the SAM log file contain extra data that is useful to the viewer but makes no sense if the log file is viewed directly (such as with *vi*(1)). The log file is still a text file, however, and can be viewed directly if necessary. The effect of the SAM logging environment variables is also different between HP-UX 9.x and 10.x.

For more information on HP-UX 10.x changes in SAM, see the "What's new in SAM" pull-down window on the SAM actions menu or the *HP-UX System Administration Tasks* manual.

Remote Administration in a Mixed Environment

The *Remote Administration* feature of SAM can be used between HP-UX 9.x and 10.x workstations. To use this feature on Series 300/400 workstations, you need HP-UX 9.10 (Series 300/400) on your workstations or you need to install patch PHCO_5194 for 9.0 or 9.03. To use this feature on Series 700/800 computers, you need HP-UX 10.x or a SAM patch (`PHCO_4792` or `PHCO_4793`) for HP-UX 9.x. Contact your HP Response Center for patch information.

Sharing User Account Information (passwd)

One of the effects of the new V.4 file system layout is that the default location for user home directories moved from `/users` to `/home`. The login shells also changed locations. The `/etc/passwd` file can still be shared between HP-UX 9.x and 10.x systems.

The systems in your mixed environment must be set up to allow the home directories and login shells to be the same for both HP-UX 9.x and 10.x. This can be accomplished for login shells by installing the interoperability links on your 9.x systems. You also need to include the shells with both their 9.x and their 10.x paths in `/etc/shells`, as follows:

```
/usr/bin/sh     /usr/bin/rsh     /usr/bin/ksh     /usr/bin/rksh
/usr/bin/csh    /sbin/sh         /bin/ksh         /bin/csh
/bin/sh         /bin/rsh         /bin/rksh
```

Other Interoperability Issues

These are some other potential interoperability issues in system administration usage and scripts. For information on issues with section 1 commands and section 3 routines, see Chapter 7.

- Checksum values produced by `cksum` and `sum` on HP-UX 10.x are generated according to a new algorithm for conformance with the latest POSIX.2 specification. Thus, checksum values will be different from HP-UX 9.x checksum values. Putting `/usr/old/usr/bin/` in your `$PATH` before `/usr/bin` on your HP-UX 10.x workstations will give checksum values calculated using the HP-UX 9.x algorithm.
- The HP-UX 9.x `-b` option to `df` is the `-B` option on HP-UX 10.x. Any use of this option in scripts must be made release-dependent. Alternatively, putting `/usr/old/bin/` in your `$PATH` before `/usr/bin` on your HP-UX 10.x workstations will give HP-UX 9.x behavior.
- Scripts using the `fuser` command that explicitly tie stdout and stderr to the same file will be affected by HP-UX 10.x changes. See the *Release Notes for HP-UX 10.0 version B.10.10* and the *fuser*(1M) manpage for more details.

- These section 1M command options were changed:
  - The `-F` option to `fsck` on HP-UX 9.x is the `-f` option on HP-UX 10.x.
  - The HP-UX 9.x `-F` option to `mkfs` is the HP-UX 10.x `-d` option.
  - `ncheck` invocations with the `-i` option need to be modified on HP-UX 10.x to use the new syntax for the list of inode numbers.
  - The HP-UX 9.x `-F` option to `newfs` is the HP-UX 10.x `-d` option. The disk_type parameter is required on HP-UX 9.x, it is optionally specified via the `-O` option for HP-UX 10.x. The `-n` option to `newfs` is not allowed on HP-UX 10.x.

  Any use of these commands and options in scripts must be made release-dependent. Alternatively, putting `/usr/old/etc/` in your `$PATH` before `/usr/sbin/` or `/sbin` on your HP-UX 10.x workstations will give HP-UX 9.x behavior.
- HP-UX 9.x diagnostics will *not* run on HP-UX 10.x, so users must not attempt to run any HP-UX 9.x diagnostics on their system after the HP-UX 10.x upgrade.
- The `CONNECT1` and `CONNECT2` arguments to the `runacct` command have been replaced by `CONNECT`. The `CONNECT` entry point is identical to the old `CONNECT1` entry point.
- These section 1M commands do not exist on HP-UX 10.x:

```
buildlang(1M)   ccck(1M)        cfuser(1M)      cluster(1M)
clustersh       csp(1M)         makecdf(1M)     mk_cnode_kern
mk_client_8MB   mkpdf(1M)       mkrs(1M)        monitor(1M)
nftserver(1M)   nftdaemon(1M)   pdfck(1M)       pdfdiff(1M)
rfadaemon       rfaserver       recoversl(1M)   sysdiag(1M)
telinit(1M)     uncluster       uxgen(1M)
```

- These DUX-specific options to section 1M commands do not exist on HP-UX 10.x:

```
reboot -l -b    bdf -L          df -L           mount -L
umount -L       sync -l         syncer -l       fbackup -H
```

- These new section 1M commands were added to HP-UX 10.x:

```
dcnodes(1M)     fstyp(1M)        groupadd(1M)    groupdel(1M)
groupmod(1M)    listusers(1M)    mk_kernel(1M)   mountall(1M)
pwconv(1M)      setuname(1M)     setup(1M)       sysadm(1M)
umountall(1M)   useradd(1M)      userdel(1M)     usermod(1M)
```

- These new accounting commands should not be needed by end users under normal usage:

```
closewtmp       utmp2wtmp        acctcon         acctprc
```

- These new options were added to commands in HP-UX 10.x:

```
fbackup -E -l      frecover -E      mount -Q
swapon -t
```

See the *Release Notes for HP-UX 10.0 version B.10.10* and the HP-UX 9.x and 10.x manpages for more details on these changes.

Sharing File and Execution Servers in a Mixed Environment

There are several categories of files commonly NFS mounted from a file/execution server to individual workstations in a networked, distributed environment. In a mixed environment of HP-UX 9.x and 10.x workstations and servers, there are two basic strategies for sharing these common files. You can have separate HP-UX 9.x and 10.x servers and NFS mount the separate, release-specific versions of files to the appropriate individual workstations, or you can have a single server with release-independent files and NFS mount those to all individual workstations.

Recommended NFS Mounts in a Mixed Environment

Each of the categories of commonly NFS mounted files suggest different distribution strategies, as discussed below.

Mailboxes

The location of users' mailboxes moved from `/usr/mail` on 9.x to `/var/mail` on 10.x. If you use NFS mounts to individual workstations for users' mailboxes, make sure to use the correct location on workstations running HP-UX 9.x and 10.x.

Manpages

For standard HP-UX manpages, this is `/usr/man` on 9.x and `/usr/share/man` on 10.x. Since the two revisions of the manpages have significant differences, it is not recommended that you NFS mount only one version. You should either provide both revisions on separate servers and mount the appropriate revision to individual workstations, or mount both revisions and provide a wrapper to `man` that allows users to specify which revision they wish to view and retrieves the correct version.

Users' Home Directories

If you follow the guidelines for setting up a common user environment given in Chapter 6, users' home directories can be shared between for each of the OS revisions, you would NFS mount users' home directories to `/users` on 9.x individual workstations and to `/home` on 10.x workstations, although these are just suggestions and home directories can be mounted anywhere you choose.

Shared Applications

How you handle NFS mounts for shared applications depends on which strategy from Chapter 7 you chose for building executables for each release. If you have shared executables that can run on either OS revision, you can mount shared applications from a single server onto individual workstations. To adhere to the directory layout guidelines, applications should be NFS mounted under `/usr` on 9.x and under `/opt` on 10.x, or under `/usr/local/bin` on either release. On the other hand, if you have release-dependent executables, then you

will need two servers and should NFS mount the applications to individual workstations of the same OS revision.

/usr/local

Files under `/usr/local` will follow a strategy similar to that for shared applications, depending on whether the executables are release-dependent.

Other Networking Considerations

NetIPC

`NetIPC` will be obsoleted in HP-UX 10.x. This obsolescence includes all of the `NetIPC` system calls, the `sockreg` daemon, `rlb` daemon, `nodename` command, `proxy` command and `PROBE` proxy services. HP-UX 10.x will not use `PROBE` to resolve name-to-address mapping and will not respond to `PROBE` name requests from other systems (HP 3000s, HP 1000s, PCs, and pre-10.x HP 9000s).

These NetIPC system calls are removed from HP-UX 10.x:

`ipccreate`	`ipcconnect`	`ipcdest`	`ipccontrol`
`ipcname`	`ipcnamerase`	`ipclookup`	`ipcrecv`
`ipcrecvcn`	`ipcselect`	`ipcsend`	`ipcshutdown`
`ipcsetnodename`	`ipcgetnodename`	`ipcerrstring`	`ipcerrmsg`
`initopt`	`addopt`	`readopt`	`optoverhead`

All applications and services that use NetIPC will interoperate if they are migrated to BSD Sockets. For more details, see the *NetIPC to BSD Sockets and DSCOPY to FTP Migration Guide*, HP part number 98194-90045.

NFS

For NFS interoperability between HP-UX 9.x and 10.x, it is recommended that you install the following patches on your 9.x Series 700/800 computers: The NFS Kernel Mega Patch for Series 700, PHKL_5175, and the NIS/NFS Mega Patch for Series 700/800, PHNE_4879.

The Loopback File System (LOFS) is supported on HP-UX 10.x and provides better performance than NFS loopback. For details on LOFS, see the *Release Notes for HP-UX 10.0 version B.10.10* and the *HP-UX System Administration Tasks* manual. A Loopback File System created on an HP-UX 10.x workstation cannot be NFS mounted or hard mounted to a 9.x workstation.

NIS

In HP-UX 10.x, NIS has been upgraded to NIS version 4.2. This version includes two new pieces of functionality: hostname fallback and sendmail aliases database support. This functionality is also available in patches for 9.x Series 700/800 computers. The Sendmail alias patch is PHNE_4936. The patch for hostname fallback is included in the NIS/NFS "Mega Patch" for Series 700/800, PHNE_4879. For more details about this new NIS functionality, see the *Release Notes for HP-UX 10.0 version B.10.10*.

In HP-UX 10.x, the default location for users' home directories changed from `/users` to `/home`. If you follow this recommended change, be sure to modify `/etc/passwd` and your NIS user-account information database accordingly.

If NIS is used to manage both HP-UX 9.x and 10.x hosts, the users' shell should be specified using the 10.x pathname and interoperability links should be used on your 9.x computers. Also, you must create an `/etc/shells` file [see *getusershell*(3)] and include old paths as well as new. See "Sharing User Account Information (passwd)" for details on creating an `/etc/shells` file.

NS Services

`dscopy`(nft) is not supported on HP-UX 10.x. If it is being used between HP 9000s, migrate to using `ftp` to provide HP-UX 9.x and 10.x interoperability. Other NS systems in the network may need to be updated to maintain `vt3k` communications with systems running HP-UX 10.x. For MPE systems, get the latest patch from your HP Sales Representative.

For more details, see Chapter 5 of the *NetIPC to BSD Sockets and DSCOPY to FTP Migration Guide*, HP part number 98194-90045.

SLIP

If you are communicating between HP-UX 9.x and 10.x workstations using SLIP, you must not upgrade to using CSLIP on your HP-UX 10.x workstations. CSLIP use is not compatible with SLIP use. You should not use CSLIP unless you are sure that the other side supports it; otherwise no communication is possible.

lanconfig

The `lanconfig` command in HP-UX 10.x allows TCP/IP users over the HP-UX Token Ring/9000 products to selectively disable or enable the Source Routing feature for 802.5. For disabling of Source Routing to work, a similar patch/upgrade must be installed on all HP workstations on the 802.5 network. Either update to 9.0 Dart 9 or later 802.5 bits, or install PHNE_1869 or PHNE_1870 for any 8.02 or 8.07 systems with Token Ring.

Network Tracing and Logging

User scripts that depend on `netfmt` formatter output may be impacted. Formatter output has changed in several ways, most significantly with the addition of the heading for each trace and log message.

`$HOME/.netlogrc` and `$HOME/.nettrc` are no longer used as default filter files. Use `$HOME/.netfmtrc` instead.

Internet (ARPA) Services

If the `domain` keyword is used in the `resolv.conf` file then partially qualified host names won't work with most networking commands as they did in prior releases. To generate the same behavior in 10.0, you need to replace the `domain` keyword in the `resolv.conf` file [see *resolver*(4)] with the `search` keyword like this:

```
domain  mkt.aone.com   ==>   search  mkt.aone.com  aone.com
```

This `search` construct will generate the same behavior on HP-UX 9.x and 10.x.

ftp

The `ftp` server on an HP-UX 10.x host may deny access to a user if the `/etc/passwd` file on the server has been copied or retained from a pre-10.0 system. The `/etc/passwd` file may need to be modified for HP-UX 10.x, specifically, the shells must be updated to their new paths (such as `/bin/sh` to `/usr/bin/sh`). You cannot use old path names for shells in the password file and rely on symbolic links, the library call `getusershell` does not by default contain the old path names. Instead, you can create an `/etc/shells` file [see *getusershell*(3)] and include old paths as well as new for correct operation of `ftp` with 9.x path names in the `/etc/passwd` file. See "Sharing User Account Information (passwd)" for details on creating an `/etc/shells` file.

nslookup

There are some minor changes in the output of `nslookup` in the default condition. These output changes may affect administrative scripts using `nslookup`. See the HP-UX 9.x and 10.x manpages for details.

4

Software Management

The update tool set in HP-UX 9.x is obsolete in 10.x. These utilities do not exist on 10.x:

`netdistd(1M)` `rmfn(1M)` `update(1M)` `updist(1M)` `fpkg(1M)`

These have been replaced in HP-UX 10.x by HP Software Distributor 2.0/2.1, also known as SD-UX or SD. SD provided with HP-UX 10.x is a subset of the full HP OpenView Software Distributor 2.0/2.1 product. SD-UX manages software on the local host only, but can use remote software depots (much like netdist servers). To install and manage software simultaneously on multiple remote hosts (including PCs) from a central controller, you must purchase the HP OpenView Software Distributor 2.0/2.1. At this time, the OpenView product is supported on HP-UX 9.x Series 700/800 computers.

For detailed information about SD, see the *Upgrading from HP-UX 9.x to 10.x* and the *Managing HP-UX Software with SD-UX* manual.

Managing Environments with Existing netdist Servers

If your current environment contains netdist servers providing access to software for client computers, you must decide how to maintain support for accessing that software in a mixed environment:

- Maintain your netdist servers on HP-UX 9.x. HP-UX 9.x system software for all workstations will continue to be available only in `update` format. If you make HP-UX 9.x system software (the OS) available from a netdist server, netdist services must be provided from a computer running HP-UX 9.x.
- Maintain your netdist area on HP-UX 10.x server and have 9.x system NFS mount the netdist area.

- Alternatively, you can migrate your software packages in `update` format to SD format and provide access to these packages from an SD depot on a computer running HP-UX 10.x. This solution will require SD software on your HP-UX 9.x computers. See the following section for details about this strategy and for availability of SD software on the various platforms. Remember, this strategy will not work for HP-UX 9.x system software, you will need a 9.x server for those packages.

For customers with application software in `fpkg` (`netdist`) format, a restricted version of `update` called `rupdate` is available via a patch through your HP Sales Representative. It can be used to load software onto systems running HP-UX 10.x from a HP-UX 9.x `netdist` server. This restricted `update` does not support:

- Installation from CD-ROM.
- Installation of Series 300/400 filesets.
- Kernel reconfiguration or modification.
- Removal of software after installation (`rmfn`).
- "Match what I have" update.

With the exception of the missing features noted above, the manpage for `update` on any HP-UX 9.x workstation also covers `rupdate`.

Using Software Distributor for Interoperability

HP-UX 9.x system software for all workstations will continue to be available only in `update` format, and HP-UX 10.x system software will only be available in SD format. If you develop and distribute your own in-house software or use software from other vendors who provide 9.x versions in SD format, you can use SD for managing that software on all your HP-UX platforms.

SD-300/400 is available in HP-UX 9.10 (Series 300/400) for Series 300/400 workstations. SD-UX for HP-UX 9.x servers is available on the HP-UX 10.01 Upgrade Preparation Media. In addition, the HP OpenView Software Distributor 2.0/2.1 product may be purchased for HP-UX 9.x Series 700/800 SD clients (order HP B1996AA). Using these products in conjunction with SD-UX on HP-UX 10.x can provide an effective interoperability strategy for software management of your applications.

For more information about SD-300/400 in HP-UX 9.10 (Series 300/400), see the *HP-UX 9.10 Release Notes* (Series 300/400).

If you plan to use SD as your interoperability strategy for software management and plan to install SD software packages onto HP-UX 9.x Series 700/800 computers, plan to purchase HP OpenView Software Distributor 2.0/2.1 for these workstations.

Refer to the following table for details about the different versions of SD available.

HP 9000 Software Distributor Products

Product Identification		Version		Availability
Name	Acronym(s)	HP-UX	SD	
Series 700/800:				
HP OpenView Software Distributor 2.0	SD-OV A.00.00 or SD-OV	9.x	SD 2.0	HP J23266AA
HP OpenView Software Distributor 2.1	SD-OV A.01.00 or SD-OV or SD-PC	9.x	SD 2.1	HP B19966AA
HP-UX Software Distributor 2.1	SD-UX	10.x	SD 2.1 + extensions	Bundled with 10.x
Series 300/400:				
HP Software Distributor 2.0	SD-300/400	9.1	SD 2.0	Bundled with 9.1
HP-UX Software Distributor 2.1	SD-UX	9.x	SD 2.1 + extensions	Part of HP-UX 10.01 Upgrade Preparation Media

fpkg-to-SD Format Converter

If you have existing software packages for HP-UX 9.x in `fpkg` (update) format that you wish to use in a mixed environment with SD, these must be converted to SD format.

There is a utility shipped with HP-UX 10.x and with HP OpenView Software Distributor 2.0/2.1 for Series 700/800 called `fpkg2swpkg` that translates `fpkg` format Product Specification Files (PSFs) and `fpkg` format network media into `swpackage` PSFs. See the *fpkg2swpkg* manpage on HP-UX 10.x for details about the use of this utility.

This gets you a valid software package for your HP-UX 9.x workstations that you can install using SD.

Caution The `fpkg2swpkg` converter does not translate pathnames and packages that modify `/etc/rc` or that require a kernel build and system reboot. These types of packages will require further manual modification. See the *Managing HP-UX Software with SD-UX* manual for more information.

Building Software Packages for HP-UX 9.x and 10.x

Different versions of SD products can be defined for different platforms and operating systems, as well as different revisions (releases) of the product itself. Different versions can be included on one distribution media or depot. However, you cannot mix Series 700 and 800 software on a single depot.

You can also specify in the PSF what computer(s) and operating system(s) the product supports by using the `uname` attributes of these system(s). These `uname` attributes are:

- *machine_type* — Machine hardware model name.
- *os_name* — Trademarked operating system name.
- *os_release* — Current operating system release number.
- *os_version* — Current operating system version number.

Using these SD features, you can create filesets with the same name for each of the different architectures and releases you need to support, wrap them into a single product on a depot or distribution media, and SD will select the correct one for each install target.

For more information on these SD features, see the *Managing HP-UX Software with SD-UX* manual.

Solving Pathname Difference Problems

If all of the workstations in your environment are using the interoperability or transition links, commands referenced in your control scripts by absolute paths should get executed correctly.

There are two approaches to resolving application location differences (**install point**s) between HP-UX 9.x and 10.x:

- Use separate PSF and control scripts for each OS revision to install files in the correct locations.
- Install files to a temporary location and determine the OS revision of the install target in your control scripts and move the files to their correct locations.

If you choose the first option, you can use the SD features described in the preceding section to create a single product with OS revision specific filesets.

If you use the second approach, you can have only one version of the product that will install to either OS revision, but this approach has some drawbacks. You will need to choose a temporary location for the application files. This can be complicated for large applications on computers with many LVM volumes. Also, SD's disk space analysis feature will check your temporary location's file system, but will not be able to guarantee sufficient disk space on the file system of your application's final destination.

For information on determining the OS revision of the install target from your control scripts, see "Customizing Login Files" in Chapter 6.

For more information on appropriate install points for applications, see the *Moving HP-UX 9.x Code and Scripts to 10.x: Using the Analysis and Conversion Tools* manual supplied with HP-UX 10.0.

SD 2.0 and SD 2.1 Interoperability Issues

As indicated in the previous table, there are several versions of SD, including SD 2.0, SD 2.1, and SD-UX 10.0 extensions to 2.1.

Typeface Conventions

Versions of SD based on SD 2.0 and SD 2.1 will interoperate in most cases. Specifically:

- All versions can communicate with each other, except 2.1 versions have some new RPCs that were not present in 2.0 (these are cleanly rejected by 2.0 targets). There are some new features in 2.1 that should be avoided when you want to allow 2.0 install targets.
- 2.1 versions can read 2.0 depots.
- 2.0 versions can read 2.1 depots, but generate warnings when they skip new keywords that they cannot recognize.

Use these attributes and keywords with caution when using SD-UX 10.0 to build a software package that will be installed on both HP-UX 9.x and 10.x systems, because they will be ignored by SD 2.0 install targets:

- `bundle` object class.
- `path`, `root_type`, and `description` root attributes.
- `category_title`, `install_date`, `install_source`, `install_type`, and `contents` product attributes.
- `software_spec` subproduct attribute.
- `install_date`, `install_source`, `is_packaged_in_place`, `ancestor`, and `software_spec` fileset attributes.

Software Management Task Cross-Reference

If you are accustomed to searching the files in the `/etc/filesets` directory to determine the fileset that contains a particular file when using `update`, this task can be performed on systems using SD with `grep`:

```
grep "^path  pathname" /var/adm/sw/products/*/*/INFO
```

5

Managing Diskless Clusters

This chapter discusses setting up an interoperability environment if your current environment includes DUX diskless clusters. This information is included here so you can begin your interoperability planning and implement the first steps of your diskless cluster reconfiguration.

HP's proprietary DUX diskless technology was replaced with NFS Diskless functionality at HP-UX 10.x. Rather than updating Series 700 DUX clusters to NFSD manually, plan on using HP-provided tools. Check with your HP representative for more details.

For general discussion of management of HP-UX 10.01 diskless clusters, see the *NFS Diskless Concepts and Administration* white paper and the *HP-UX System Administration Tasks* manual supplied with HP-UX 10.01. For a list of supported NFS Diskless configurations, see chapter 2 of the *Release Notes for HP-UX 10.0 version B.10.10*.

Moving Diskless Clusters

If you have Series 300/400 workstations configured in diskless clusters and plan to share files with an HP-UX 10.x server, you have these options:

- Convert your Series 300/400 workstations clients to standalone systems. If your clients have at least one disk, you can install HP-UX onto each client. NFS mount non-system directories from the servers. If you choose this option, you may need additional disks.
- Maintain your Series 300/400 workstations cluster(s) with HP-UX 9.x (Series 300/400/700) servers. If this is your current configuration and there is no need to upgrade any Series 700 servers to HP-UX 10.x, no reconfiguring

of your clusters is necessary. File sharing with HP-UX 10.x servers can be accomplished using NFS mounts.

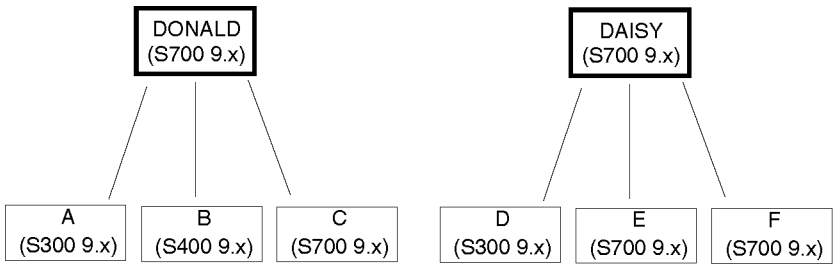
- Re-configure your DUX clusters: Use NFS Diskless for Series 700 workstations and leave Series 300/400 workstations in their own 9.x DUX cluster. Alternately, use NFS Diskless for Series 700/800 computers and use the Xterminal product to make Series 300/400 workstations "part" of a Series 700/800 NFS Diskless cluster.
- Upgrade your Series 300/400 workstations to Series 700/800 computers and use NFS Diskless.

If you have Series 700/800 computers that must remain on HP-UX 9.x, are configured in DUX clusters, and must share files with a HP-UX 10.01 server, you can reconfigure these clusters to use NFS Diskless for your HP-UX 10.01 computers and leave your HP-UX 9.x computers in their own 9.x DUX cluster.

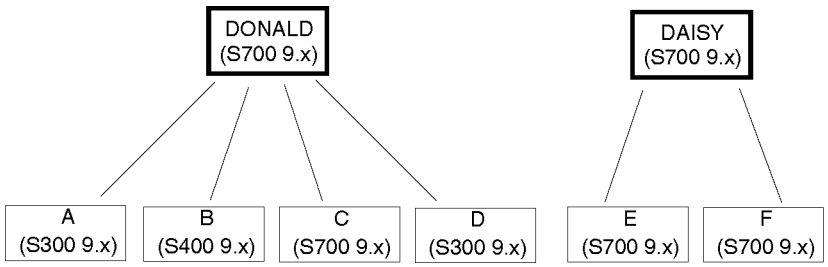
Planning to Reconfigure Your Clusters

If you have mixed clusters of Series 300/400 and Series 700 workstations, and you plan to upgrade at least some of the Series 700 workstations to HP-UX 10.x in your clusters, you will need to reconfigure your mixed clusters. These steps will need planning:

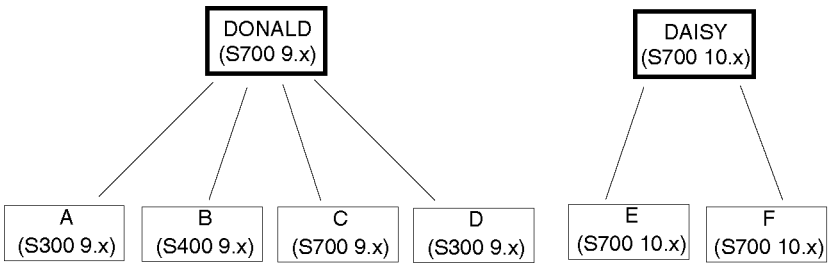
1. Create full backups of your current environment. See the *HP-UX System Administration Tasks* manual for details.
2. Determine which Series 700 DUX servers and clients you plan to upgrade to HP-UX 10.10. For example, say you have two clusters as shown next. You plan to upgrade client C from cluster DONALD and all of cluster DAISY:



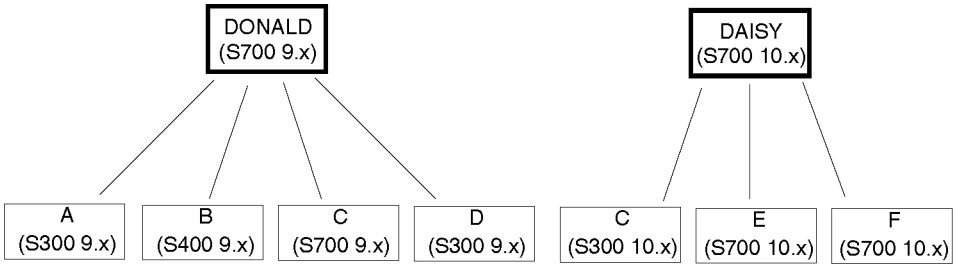
3. Select cluster server(s) to remain as 9.x DUX cluster(s) (Series 300, 400, or 700 workstations). A Series 300/400 cluster server requires at least 16 MB of memory and at least a 420 MB disk. See the *Managing Clusters of HP 9000 Computers* (DUX) manual for hardware requirements for Series 700 cluster servers. In our example, we will keep server DONALD at 9.x.
4. Select NFS Diskless server(s) to become HP-UX 10.x NFS Diskless clusters (Series 700/800). See the *NFS Diskless Concepts and Administration* white paper and the *HP-UX System Administration Tasks* manual for minimum RAM and disk space requirements for these servers. In our example, DAISY will be the 10.x NSFD server.
5. If you plan to upgrade any current DUX server(s) to HP-UX 10.x you will have to:
   a. Create new DUX server(s) for 9.x cluster(s). See the *Managing Clusters of HP 9000 Computers* (DUX) manual and the *HP-UX System Administration Tasks* manual.
   b. Add DUX clients to new DUX server(s) for workstations remaining in 9.x DUX cluster(s). See the 9.x *HP-UX System Administration Tasks* manual. In our example, we need to move client D to DONALD:



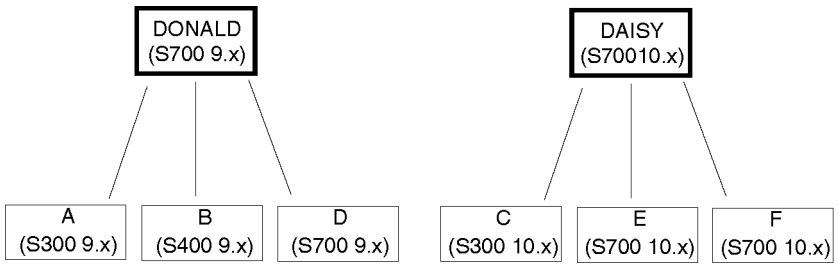
   c. Upgrade old DUX server(s) to HP-UX 10.10. If these servers have clients defined that are remaining on 9.x, these clients should be removed before you upgrade. If these servers will not be NFS Diskless servers in your new configuration, all clients should be removed before you upgrade. See *Upgrading from HP-UX 9.x to 10.x* for details. In our example, plan on upgrading DAISY to HP-UX 10.10 as shown next.



6. Upgrade NFS Diskless server(s) to HP-UX 10.10, if not already done in the preceding step. See *Upgrading from HP-UX 9.x to 10.x*.
7. Add clients to NFS diskless server(s) for those Series 700 workstations moving from 9.x to HP-UX 10.10. See the 10.x *HP-UX System Administration Tasks* manual. In our example, add a new client C to DAISY:



8. If the old DUX server(s) remain in your new configuration, remove clients that moved to 10.10 clusters from 9.x DUX server(s). See the 9.x *HP-UX System Administration Tasks* manual. In our example, remove client C from DONALD:



9. Set up any file sharing required between your 9.x DUX clusters and your HP-UX 10.10 NFS Diskless clusters using NFS mounts.

Using the Series 300/400 Xterminal Product

If you have mixed clusters of Series 300/400 and Series 700 workstations, and you plan to upgrade the Series 700 workstations to HP-UX 10.x, you may choose to convert your Series 300/400 workstations to Xterminals which boot from a Series 700/800 10.x server.

If you upgrade all Series 700/800 computers to HP-UX 10.x and convert all Series 300/400 workstations to Xterminal operation, you will eliminate HP-UX 9.x from your environment and have no other interoperability issues.

The XTERM300 product allows a Series 300/400 workstation to act as an Xterminal and connect to a Series 700/800 computer running HP-UX 10.x. A Series 300/400 workstation needs at least 8 MB RAM to run XTERM300. A local disk is not required. No local devices such as disks, tape drives, and printers will be available while the workstation is booted as an Xterminal.

To set up an Xterminal environment for your Series 300/400 workstations, you need to choose one or more Series 700/800 computers to be servers for your Series 300/400 Xterminals. There are two types of servers for the Xterminals: the **boot server** and the **Xterminal server**.

The boot server is the HP 9000 computer that the XTERM300 product is installed on. It services boot requests from the Xterminal and provides the essential files and commands that the Xterminal will use during the boot sequence. To serve as boot server, a computer must have 6 MB free disk space for the XTERM300 product and it must be on the same LAN segment

as the Xterminal. It must also be an NFS server, making the `/usr/xterm300` directory available to all Xterminals using it as a boot server.

The Xterminal server is the Series 700/800 computers that the Xterminal will connect to after booting. The Xterminal user will actually log into this computer after the Xterminal boots. This computer needs LAN connectivity to the Xterminal, but does not need to be on the same LAN segment as the Xterminal. This computer also needs sufficient resources to support an additional user.

The Xterminal server and the Boot Server may or may not be the same workstation.

For more information about XTERM300 installation and setup, see the *Updating to HP-UX 9.10* (Series 300/400) manual.

CDFs

CDFs are not supported on HP-UX 10.x. Be careful when NFS mounting an HP-UX 9.x disk containing CDFs onto an HP-UX 10.x system, the CDFs will appear to the system as directories with the SUID bit set and will carry no special meaning.

6

Common User Environments

In a mixed environment, end users will probably be sharing their home directory and user environment between HP-UX 9.x and 10.x workstations. There are several tasks that can be performed to make a mixed environment less visible to these end users.

These tasks include installing compatibility links to mask file path name differences, ensuring that users' executables have no release dependencies, and making their login files release independent.

Fixing Personal Executables

Users who have their own personal executables (shell scripts and programs) will need to insure that they work on both HP-UX 9.x and 10.x. To resolve pathname differences, have your system administrator install the interoperability and transition links on all HP-UX 9.x and 10.x workstations you will be using. For other potential interoperability problems in scripts and programs, see Chapter 7.

Customizing Login Files

The system provides default login files in users' home directories when new accounts are added with SAM. This section provides information on making user customizations to these files that will work on both HP-UX 9.x and 10.x.

These default files are provided, depending on what shell is used:

`/etc/d.profile` `/etc/d.cshrc` `/etc/d.exrc` `/etc/d.login`

In customized login files, pay particular attention to path variables, command invocations using full paths, and paths containing the user's home directory.

If `/etc/profile` has been set up to set the correct default `$PATH` value (if the common login files have been installed), then users can append their own paths in a release appropriate manner as follows:

For sh and ksh:

```
# For 9.x/10.x interoperability determine which major revision
# of the operating system we are running on.

    rev=‘uname -r | cut -d. -f2‘
    rev=‘expr $rev + 0‘
    if [ $rev -ge 10 ]
        then
                ## OS revisions 10.0 and beyond
                PATH=$PATH:/opt/myapp/bin
        else
                ## OS revisions prior to 10.0
                PATH=$PATH:/usr/myapp/bin
        fi
```

For csh:

```
# For 9.x/10.x interoperability determine which major revision
# of the operating system we are running on.

        set rev=‘uname -r | cut -d. -f2‘
        set rev=‘expr $rev + 0‘

        if ( $rev >= 10 ) then
                # OS revisions 10.0 and beyond
                set path=( $path /opt/myapp/bin )
        else
                # OS revisions prior to 10.0
                set path=( $path /usr/myapp/bin )
        endif
```

Use a similar strategy for invoking any commands via the correct complete pathname, for pathnames in .vueprofile and .Xdefaults, and other user customizations. The system files `/etc/profile` and `/etc/d.cshrc` on HP-UX 9.10 (Series 300/400) have templates that may be used to perform the above modifications to users' login files.

For paths that contain the complete path of the user's home directory, modify those instances to use ~ (tilde) in place of the home directory location.

Users who have anything particularly complex in their login files (if they invoke many system commands) may want to refer to Chapter 7 for information on changes to commands and their options between HP-UX 9.x and 10.x.

Miscellaneous Mixed Environment Issues

Other issues associated with user activities in a mixed environment are:

- The `more` command behaves differently between HP-UX 10.x and 9.x. Many new options were added to `more` to comply with XPG4 standards:
  - added the ability to scroll backwards while examining a file
  - added many new subcommands
  - has modified behaviors for some existing subcommands
  - has positioning commands that now use the third line of the screen as the current position, so the behavior of search commands has changed
  - does not exit immediately after writing the last line of file except when `stdout` is not a terminal device
  - has options `-f` and `-n` that now also imply the `-c` option.
  - has no special treatment for `^L` (form feed).

  If you want consistent behavior and appearance from `more`, you can move HP-UX 9.x `more` to `/usr/old/usr/bin` on your HP-UX 10.x workstations and put `/usr/old/usr/bin` in your `$PATH` before `/usr/bin`.
- HP provides transition links in HP-UX 10.x that allow references to HP-UX 9.x pathnames and interoperability links on HP-UX 9.x that allow references to HP-UX 10.x pathnames. These products can help users accustomed to typing complete command pathnames. Ask your system administrator to install these links on all HP-UX 9.x and 10.x workstations you will be using.
- For HP VUE users: If there are pathnames in your `~/.vueprofile`, they'll need to be made release-dependent or use transition links. If you've created your own VUE scripts, you'll have to make the same changes as stated above for user scripts. If you have any X resource files such as `~/.Xdefaults`, either check them for pathname incompatibilities or use transition links.
- When using `telnet` or `rlogin` in a mixed environment, there are some slight differences in the terminal types recognized on HP-UX 9.x and 10.x. As a workaround, put `eval 'ttytype -s'` in your `~/.profile` (for `ksh` users) or `~/.login` (for `csh` users).

7

Programming Environment

This chapter describes the programming differences between HP-UX 9.x and 10.x, including writing or modifying tools and code for a mixed environment.

The rules for writing scripts and code that will run on HP-UX 9.x and 10.x include:

- Don't use new HP-UX 10.x commands and options if you want scripts and programs to work on HP-UX 9.x systems.
- Don't use obsolete HP-UX 9.x commands and options if you want scripts and programs to work on HP-UX 10.x systems.
- Don't use new HP-UX 10.x libc routines in programs you want to work on HP-UX 9.x systems.
- Don't use obsolete HP-UX 9.x libc routines in programs you want to work on HP-UX 10.x systems.
- Don't use the parts of the new standards HP-UX 10.x conforms to which HP-UX 9.x does not implement.

The next sections describe the standards compliance of each release, the commands, options, and routines to avoid, and other interoperability issues for programmers. Commands and topics primarily of interest to system administrators are in Chapter 3.

File System Changes

The HP-UX file system layout changed with HP-UX 10.x to follow the Novell USL and OSF/1 paradigms. Directories are structured for static files which normally do not change during system operation (binaries, libraries, documentation and headers) and dynamic files which change size and content during system operation (logs, temporary files, configuration data).

A further division is made between the operating system and applications. The static portion of the OS and applications now reside under separate directories. In HP-UX 9.x, applications were co-resident with the OS, typically under the `/usr` directory. For HP-UX 10.x, applications have been moved to a separate directory, `/opt`.

Of particular interest to programmers:

- Graphics (Starbase, PHIGS, and PEX), including header files and libraries moved to `/opt/graphics`.
- C language tools moved to `/usr/ccs`, `/opt/ansic`, and `/opt/langtools`. (The compiler in /usr/ccs is for building kernels only. It is not for program development.)
- C++ language tools moved to `/opt/CC`.
- FORTRAN language tools moved to `/opt/fortran`.
- Pascal language tools moved to `/opt/pascal`.

In addition, some programming libraries moved to these directories:

```
/opt/graphics/PEX5/lib     /opt/dce/lib    /usr/ccs/lib    /opt/langtools
/opt/graphics/common/lib   /opt/graphics/phigs/lib
```

Those directories are not in the linker's default path. Libraries in these directories can be accessed by setting the `$LPATH` environment variable.

Other HP-UX 10.x file-system changes from 9.x are explained in Chapter 2.

Available Tools

To ease updating to HP-UX 10.x, HP provides transition links that allow applications and scripts to reference HP-UX 9.x pathnames. These allow applications or scripts to operate while being ported to 10.x. These links are described in the *HP-UX System Administration Tasks* manual.

A pathname locator utility, `fnlookup` is available which reports the old and renamed pathname. The pathname locator is useful when a user is searching for a specific file; the locator can be used to determine the file's old/new directory. `fnlookup` is provided with the HP-UX 10.0 Analysis and Conversion Tools. For more details, see *Upgrading from HP-UX 9.x to 10.x* and the `fnlookup` manpage.

To ease the interoperability of applications and scripts in a mixed environment, HP also provides interoperability links that allow applications and scripts executing on HP-UX 9.x to reference HP-UX 10.x pathnames. These links are described in the *HP-UX 9.10 Release Notes* (Series 300/400) and Chapter 3.

HP-UX 9.x and 10.x Standards Compliance

HP-UX 9.x conforms to most significant industry standards, as listed here:

- X/Open Portability Guide Base Profile (XPG4) and International Extension of XPG3 Base.
- Novell USL Definition (aka: SVID2).
- UC Berkeley Software Distribution 4.3 (BSD).
- Federal Information Processing Specification (FIPS) 151-1.
- IEEE POSIX 1003.1 and 1003.2.
- Functional compliance with the DoD C2 and B1 Trusted System Requirements. (Ask your HP Sales Representative for ordering information.)

HP-UX 10.x provides compliance with these additional standards:

- SVID3 Base System and Kernel Extension, Volume 1, Chapters 3-6 and 8-12.
- POSIX 1003.1b (partial implementation for real time including synchronous I/O, Timers, Priority Scheduling).
- POSIX 1003.1c (Draft 4).
- 4 Byte EUC (Asian language support).

Differences in Commands, Options and Routines

If you are writing or modifying scripts or code that will execute in a mixed environment of HP-UX 9.x and 10.x workstations, you should avoid the use of commands, options, and routines that differ between HP-UX 9.x and 10.x, and use only standards and portions of standards common to HP-UX 9.x and 10.x. If you must use the features that differ between HP-UX 9.x and 10.x, you must use release-dependent branches as described later in this chapter so you avoid referencing features that do not exist on a particular release.

See Chapter 3 for commands and topics primarily of interest to system administrators. See "Compiling Shared Applications" later in this chapter for compiler tools differences.

Changes to commands, options, and routines which were done for standards compliance are listed in the "Using only common parts of standards" section, all other changes are given in the "Obsolete commands, options, and routines" and "New commands, options, and routines" sections.

If your applications or scripts are written specifically for a diskless environment, see "Diskless Programming Differences" below.

The `analyzer` utility can help locate these references in your code. For more information on use of this tool, see the section "Developing Applications in a Mixed Environment" below.

Obsolete Commands, Options and Routines

The following commands, options, and routines found on HP-UX 9.x were removed in 10.x. For more details, see the *Release Notes for HP-UX 10.0 version B.10.10* and the HP-UX 9.x and 10.x manpages for the listed functionality.

Commands and Options

Don't use these obsolete HP-UX 9.x commands and options if you want scripts and programs to work on HP-UX 10.x systems.

Commands obsoleted in HP-UX 10.x include:

```
bifchgrp(1)    bifchmod(1)    bifchown(1)    bifcp(1)
biffind(1)     bifls(1)       bifmkdir(1)    bifrm(1)
```

```
bifrmdir(1)    bifdf(1M)       biffsck(1M)    biffsdb(1M)
bifmkfs(1M)    cdb(1)          chksnmpd(1)    fdb(1)
instlang(1)    nlsinfo(1)      pdb(1)         read_cct
rmchg(1)       vueconvert(1X)  vuefp2to3(1X)
```

These command options do not exist on HP-UX 10.x:

```
sort -l          cc -J +Obb +Os +OE +Om1
ioscan -l        join -a (without a number)
```

Routines

Applications designed to be run on both HP-UX 9.x and 10.x systems should not use library routines which are obsolete on HP-UX 10.x. These include:

- Internationalization:
  - HP proprietary NLS functions and macros:

```
ICONV          langinfo        nl_isalnum       nl_sprintf
ICONV1         langinit        nl_isalpha       nl_sscanf
ICONV2         langtoid        nl_iscntrl       nl_strcmp
_errlocale     ld_nl_ctype     nl_isdigit       nl_strncmp
catgetmsg      nl_asctime      nl_isgraph       nl_strtod
catread        nl_ascxtime     nl_islower       nl_tolower
currlangid     nl_atof         nl_isprint       nl_toupper
fprintmsg      nl_catopen      nl_ispunct       printmsg
getmsg         nl_ctime        nl_isspace       sprintmsg
iconvclose     nl_cxtime       nl_isupper       strcmp16
iconvlock      nl_fprintf      nl_isxdigit      strcmp8
iconvopen      nl_fscanf       nl_msg           strncmp16
iconvsize      nl_gcvt         nl_printf        strncmp8
idtolang       nl_init         nl_scanf         nlsinfo
```

    For applications linked shared that call these interfaces, forward object code compatibility is supported through versioning of `/usr/shlib/libc.sl`. Applications that are recompiled or re-linked on HP-UX 10.x cannot call these obsolete interfaces.

  - The `getlocale` `MODIFIER_STATUS` and `ERROR_STATUS` types are no longer supported in HP-UX 10.x. `LOCALE_STATUS` is supported, with

the exception of `LC_ALL_D` element in the `locale_data` structure. This element is obsoleted because `LC_ALL` does not exist any more as a separate category.

- HP-UX locales have been renamed in HP-UX 10.x to conform to ISO standards. The mapping between old HP-UX 9.x locale names and the standard ISO names can be found in `/usr/lib/nls/config`. Links can be created from directories containing local translations with the new HP-UX 10.x locale names to the old HP-UX 9.x locale names to ensure that products and scripts continue to operate.
- The `-d` flag of `localedef` will no longer be provided. If compatibility with the HP specific HP-UX 9.x locale is desired, the HP-UX 9.x `/usr/old/usr/bin/localedef` can be used to dump the HP-UX 9.x locale. These changes can then be applied to the sources of the HP-UX 10.x locales.

- These other libc functions have been obsoleted in HP-UX 10.x:

```
byte_status       c_colwidth       fgetspwent     firstof2
putspwent         secof2
```

New Commands, Options and Routines

The following commands, options, and routines were added in HP-UX 10.x. For section 1M functionality, see Chapter 3. For more details, see the *Release Notes for HP-UX 10.0 version B.10.10*, and the HP-UX 9.x and 10.x manpages for the listed functionality.

Commands and Options

Don't use these new HP-UX 10.x commands and options if you want scripts and programs to work on HP-UX 9.x systems.

- The `fuser` command was extended to NFS file systems for HP-UX 10.x.
- These new commands were added to HP-UX 10.x:

```
dcnodes(1M)       dmpxlt(1)          genxlt(1)
model(1)          sccs(1)
```

- These new options were added to commands in HP-UX 10.x:
  - `cat`: `-b`, `-n`, and `-r` options.
  - `/bin/cc`: `-V`, `-O4`, many `+O` options.
  - `chgrp`, `chgrp`: `-h` option.
  - `compress`: `-z` option.
  - `cp`, `cpio`, `ftio`, `ls`, `mv`, `tar`: `-e` option.
  - `gencat`: `-` option.
  - `mesg`: `-g` option.
  - `nfsstat`: `-m` option.
  - `nljust`: `-i` and `-d` options.
  - `nroff`: `-P` option.
  - `passwd`: `-m`, `-x`, `-w`, `-F`, options.
  - `pax`: `-k`, `-X`, `-pm`, `-po`, `-t`, and `-f archive` options.
  - `ps` (if HP PRM is configured): `-P` and `-R` options.
  - `rpcgen`: `-D`, `-I`, `-K`, `-L`, `-T`, and `-t` options.
  - `sar`: `-S` option.
  - `sort`: `-A` option.
  - `tput`: `-S` option.
- Changes in behavior for commands that may affect interoperability are:
  - `cat`: `-e` and `-t` options.
  - `echo`: Recognizes two additional special characters.
  - `help`: Name changed to `sccshelp`.
  - `iostat`: Changes in output format.
  - `locale`: `-a`, `-c`, and `-k` options.
  - `mm`: No longer supports compiled macro files.
  - `passwd`: `-f` option on HP-UX 9.x is the `-F` option on HP-UX 10.x. The HP-UX 9.x functionality can be accessed on HP-UX 10.x by adding `/usr/old/bin` to the `$PATH` environment variable `/bin`.
  - `rm`: `-f`, `-i`, `-r` and `-R` options.
  - `rmdir`: `-f` and `-i` options.
  - `sort`: `-f` and `-t` options.
  - `uniq`: `-s` option may produce different results on HP-UX 10.x than HP-UX 9.x.

Typeface Conventions

Routines

These new routines and new functionality in existing routines were added in HP-UX 10.x:

- New requests to `ptrace`:

```
PT_SET_EVENT_MASK       PT_GET_EVENT_MASK
PT_GET_PROCESS_STATE    PT_GET_PROCESS_PATHNAME
```

- `madvise` now recognizes the `MADV_RANDOM` and `MADV_SEQUENTIAL` options.
- Multi-threaded application support was added to `libc`.
- `openlog` and `closelog` have been changed to be COSE XPG4.2 (SPEC1170) compliant, and now return `void` rather than `int`.
- The decrypt capability of the `encrypt` function is now available.
- These new `libc` functions were added:

```
authdes_create    getfsgid      key_decryptsession  setspent
authdes_getucred  getfsgnam     key_encryptsession  sigsend
basename          getfsguser    key_gendes          sigsendset
clearenv          getnetname    key_setsecret       strfmon
clnt_create_vers  getspent      netname2host        strptime
dirname           getspnam      netname2user        tcgetsid
endfsgent         host2netname  putws               unlockpt
endspent          iconv         re_comp             user2netname
grantpt           iconv_close   re_exec             yp_update
getfsgdef         iconv_open    setfsgent
getfsgent         isastream     setfsgfil
serialize
```

- New formatting directives for `strftime`.
- `select` system call behavior more closely follows System V `select` behavior for STREAMS.

Using Only Common Parts of Standards

If your applications must work on both HP-UX 9.x and 10.x, don't use the parts of the new standards HP-UX 10.x conforms to but which HP-UX 9.x does not. Details about those items added to HP-UX 10.x for standards compliance are given in the following sections.

HP-UX 10.x Additions for SVID3

The following items were added to HP-UX 10.x for SVID3 compliance. For more details, see the *Release Notes for HP-UX 10.0 version B.10.10* and the appropriate HP-UX 10.x manpages.

- STREAMS-based pipes capability:

  `fattach(3c)  fdetach(3c)  detach(1M)  isastream(3c)`

- New `whodo` options `-h` and `-l`.
- New system calls, commands, and routines:

`addsev(3C)`	`fmtmsg(3C)`	`fstatvfs(2)`	`getsid(2)`
`gettxt(3C)`	`lchown(2)`	`listuser(1)`	`logins(1M)`
`mkmsgs(1)`	`pfmt(3c)`	`setcat(3C)`	`setlabel(3C)`
`sigsend(2)`	`sigsendset(2)`	`statvfs(2)`	`statvfsdev(2)`
`tcgetsid(2)`	`vpfmt(3C)`		

The following items were modified in HP-UX 10.x for SVID3 compliance. For more details, see the *Release Notes for HP-UX 10.0 version B.10.10* and the appropriate HP-UX 10.x manpages.

- `readlink` was changed to take an `int` for its third argument, not a `size_t`, and to return an `int`, not an `ssize_t`.
- `wait` and `waitpid` were enhanced to allow the options parameter to have the macro `WNOWAIT`.
- `getrlimit` and `setrlimit` were enhanced to support these new resources:

  `RLIMIT_DATA  RLIMIT_STACK  RLIMIT_NOFILE  RLIMIT_CORE  RLIMIT_FSIZE`

- In HP-UX 10.x, `getpgid` behaves as `getpgrp`. In HP-UX 9.x, it was undocumented and behaved as `getpgrp`.

- `mkfs`, `mount`, `umount`, and `ncheck` modifications.
- Changes to "TERMIO" interface:

  These `termio ioctl`s were added:

  ```
  TCGETS          TCSETS          TCSETSW         TCSETSF
  TIOCGSID        TIOCMBIS        TIOCMBIC        TIOCMGET
  TIOCMSET
  ```

  These special characters are now processed:

  ```
  WERASE          REPRINT         EOL2            DISCARD
  LNEXT
  ```

  These input and local mode features are supported:

  ```
  IMAXBEL         ECHOCTL         ECHOPRT         ECHOKE
  FLUSHO          PENDIN
  ```

  The `stty` command can report and activate the new special characters handling and the new input and local modes features. `stty` also allows for the system-wide setting of the special character defaults used when a port is opened.

HP-UX 10.x Additions for POSIX 1003.4

The following features were added to HP-UX 10.x for Posix 1003.4:

- A Real-time deterministic scheduler providing different execution scheduling policies. This scheduler co-exists with the existing HP-UX execution scheduling policies (`timeshare`, `rtprio`, and `fair-share`).
- A standard set of interfaces to the existing clocks in HP-UX, a standard set of interfaces for creating and manipulating interval timers based on those clocks, and a high-resolution "sleep" function independent of interval timers and signals.
- Two new flags for Synchronized I/O, `O_DSYNC` and `O_RSYNC`, were added to `open/fcntl`. The new system call `fdatasync` was also added.

HP-UX 10.x Additions for XPG4

XPG4 Base Profile Branding was also provided in the following prior releases: HP-UX 9.0 (XPG4 PCO), HP-UX 9.03, and HP-UX 9.04.

Only the XPG4 Internationalized System Interfaces and Headers component required any change to conform to the XPG4 Base Profile, as the other components conformed in prior releases.

The new features and significant bug fixes for HP-UX 10.x affect XPG4 Branding and Compliance are listed next. Affected header files were also changed.

Changes to libc:

catopen	New `NL_CAT_LOCALE` processing.
iconv*	New `iconv`, `iconv_open`, `iconv_close` functions.
nl_langinfo	New `ALT_DIGITS`, `ERA`, `ERA_D_T_FMT`, `ERA_T_FMT` processing.
printf	New grouping specifier functionality (') to `printf` family of functions.
strfmon	New `strfmon` function, and new header file `monetary.h`.
strftime	Modified some formatting directives.
strptime	New `strptime` function.

Changes to libM:

y0/y1/yn	Bug fix: `y0(0.0)`, `y1(0.0)`, `yn(3.0,0.0)` now return `HUGE_VAL`.
log/log10	Bug fix: `log(0.0)`, `log10(0.0)` now return `ERANGE`.

Changes to commands:

iconv	Enhancements.
localedef	Major redesign. Old implementation under `/usr/old/usr/bin` (it will only dump a locale).
make	Enhancements.
more	New options, new subcommands and some behaviors of existing subcommands changed.
patch	Created dummy command. Full functionality will be in next major HP-UX release.
rm	Now descends to arbitrary depths in a file hierarchy and will not fail due to path length limitations.
sccs	New front end utility for SCCS commands.
sh-posix	New commands/options: `hash`, `type` and `export`.
talk	Created dummy command. Full functionality will be in next major HP-UX release.
tar	Bug fix: handles 100 character link name properly.
tr	New usage syntax.
type	Added executable version of POSIX shell built-in command.

Corresponding changes were also made to affected header files.

Differences in Features (APIs)

The following features were added or obsoleted in HP-UX 10.x. Don't use these for applications that you wish to interoperate on HP-UX 9.x and 10.x. For more information, see the *Release Notes for HP-UX 10.0 version B.10.10*.

Obsolete Features

The following features were obsoleted in HP-UX 10.x. Don't use these for applications that you wish to interoperate on HP-UX 9.x and 10.x:

- Software Disk Striping (SDS).
- DataPair/UX, including `mirror` and `mirrorlog`.
- Fair-Share Scheduler: replaced by HP Process Resource Manager (HP PRM). The command line interfaces are different.

New Features

The following features were added in HP-UX 10.x. Don't use these for applications that you wish to interoperate on HP-UX 9.x and 10.x:

- STREAMS based pipes capability, the STREAMS Pty driver, and XTI interface.
- "Realtime Deterministic" scheduler and Commercial security (`pwconv`).
- `rdist` remote distribution service and `ntp` time service.
- The Loopback File System (LOFS) is supported and provides better performance than NFS loop-back. Some applications that walk file trees use `stat`'s `st_dev` to detect the crossing of mount points. This will not work with LOFS, since an LOFS file has the `st_dev` of its original location. Code that needs to identify a particular file system (in the sense of a particular mount) should use `f_fsid` from `statfs` or `statvfs`.
- Journaled File System (VxFS): Added in HP-UX 10.01; the only applications which will not work with VxFS are those that are aware of UFS specific information, such as UFS disk format, read/write UFS file systems using the raw or character device, etc. All applications which use portable interfaces specified by POSIX, X/Open, AES, SVID, etc., will work.

- Curses: To conform to XPG3, four routines were added: `def_shell_mode`, `def_prog_mode`, `reset_shell_mode`, `reset_prog_mode`. Curses-Color is a new COSE compliant curses package.
- The DCE client software (including the pthreads library) and STREAMS are bundled with HP-UX 10.x. There are available as separate products for HP-UX 9.x.
- Multiple file system support to file system related commands.

Diskless Programming Differences

If your applications or scripts are written specifically for a diskless environment, you should be aware of the following differences between HP-UX 9.x and 10.x.

NFS Diskless will be available with HP-UX 10.01 in second half of 1995. This discussion is included here so you can begin your interoperability planning and your diskless application modifications.

The file system semantics on an NFS Diskless client are not Posix compliant because NFS mounts are used for file system access. NFS-mounted file systems are not Posix compliant in several minor ways, primarily in regards to file locking issues (`fcntl` and `lockf`). See the *HP-UX Reference* pages under "NFS Dependencies" for details.

These DUX-specific commands do not exist on HP-UX 10.x:

```
cnodes(1)   cps(1)   getcontext(1)   makecdf(1M)   showcdf(1)
```

These DUX-specific options to commands do not exist on HP-UX 10.x:

```
chmod -H           find -hidden -type H         ls -H
find -nodevcid     find -devcid cname           last -c
pwd -H             users -c                     who -c
bdf -L             df -L                        sync -l
ftio -H            pax -H -m -o -p -t device    tar -H
```

These DUX-specific library routines (including context dependent files) are obsolete on HP-UX 10.x:

```
endccent          getcccid          getcdf            nftwh
fgetccent         getccent          gethcwd           setccent
```

`ftwh`	`getccnam`	`hidecdf`
`cnodeid`	`cnodes`	`getcontext`

These additional DUX features were obsoleted in HP-UX 10.x. Don't use these for diskless applications that you wish to interoperate on HP-UX 9.x and 10.x:

- Distributed named pipes across a cluster in diskless environments.
- The DUX concept of global PIDs across a cluster. Temporary name-space collision should be avoided by each diskless client having private `/tmp` areas.
- Using `/tmp` as a shared depository between diskless clients, such as an application using a lib routine to create unique tmp_file names.

Miscellaneous 9.x/10.x Differences

At HP-UX 10.x, the POSIX shell replaces the Bourne shell as the default shell. Most Bourne shell scripts will work unmodified with the POSIX shell, but for those rare cases where problems are encountered, either convert Bourne shell scripts to POSIX shell and have HP-UX 9.x and 10.x `$PATH`s point to `/bin/posix/sh` and `/usr/bin/sh` (the POSIX shell), respectively, or have 9.x and 10.x `$PATH`s point to `/bin/sh` and `/usr/old/bin/sh` (the Bourne shell), respectively. For more details about the differences between the Bourne shell and the POSIX shell see the *Release Notes for HP-UX 10.0 version B.10.10*.

Developing Applications For a Mixed Environment

If you are writing or modifying scripts or code that will execute in a mixed environment of HP-UX 9.x and 10.x workstations, this section describes additional issues you need to resolve. These include: using interoperability links to solve pathname differences, finding the use of commands, options, and routines that differ between HP-UX 9.x and 10.x and modifying your source code accordingly, setting up common makefiles, and compiling your applications correctly.

Using Analysis Tools to Solve Interoperability Problems

HP provides a set of analysis tools that can help the application developer write or modify code to interoperate on HP-UX 9.x and 10.x. These include the software tools in the HP-UX 10.0 Analysis and Conversion Tools and the interoperability and transition links provided with HP-UX 9.x and 10.x.

Using Interoperability and Transition Links

To ease the interoperability of applications and scripts in a mixed environment, HP provides interoperability and transition links that allow applications and scripts executing on HP-UX 9.x to reference HP-UX 10.x pathnames and vice versa. Using these compatibility links on workstations in a mixed environment can resolve many of the interoperability issues for the application developer. Chapter 3 describes these links in more detail and gives pointers for further information.

Applications which call any of the following functions directly or indirectly are extremely likely to require the use of transition links:

`confstr`	`ftw`	`getusershell`	`sysconf`
`devnm`	`getdate`	`msemlock`	`system`
`dial`	`getfsent`	`nftw`	`tempnam`
`endfsent`	`getfsfile`	`popen`	`undial`
`execlp`	`getfsspec`	`setfsent`	`wordexp`
`execvp`	`getfstype`		

You also *must* have interoperability and transition links installed to allow scripts using `#!/bin/ksh` or `#!/usr/bin/ksh` type constructs to work between releases.

HP recommends that you modify your applications and scripts to work correctly on HP-UX 10.x and use the interoperability links provided on HP-UX 9.x so that your modified applications will function correctly. The transition links provided on HP-UX 10.x should be viewed as a short term solution for use while moving your applications to HP-UX 10.x.

Please see the *HP-UX 9.10 Release Notes* (Series 300/400), the *Upgrading from HP-UX 9.x to 10.x* and the *Release Notes for HP-UX 10.0 version B.10.10* for more information.

Using prepare/analyzer

`prepare` and `analyzer`, two tools in the HP-UX 10.0 Analysis and Conversion Tools, are used to locate upgrade problems in your code and scripts while moving from HP-UX 9.x to 10.x. By taking slightly different action than what `analyzer` suggests, these tools can also be used to locate and fix interoperability problems.

`analyzer`'s output points out code that must be modified when moving code and scripts from HP-UX 9.x to 10.x. Rather than modifying these pieces of code as `analyzer` suggests, you can modify them to continue doing what they were doing if run on HP-UX 9.x and to do what `analyzer` suggests if run on 10.x, and they will run on both HP-UX 9.x and 10.x.

Please see the *Upgrading from HP-UX 9.x to 10.x* and the `prepare` and `analyzer` manpages for more information about the use of these tools.

Using snoop

`snoop` is a tool in the HP-UX 10.01 Upgrade Preparation Media to locate upgrade problems with your HP-UX 9.x workstations. It is of limited use in finding interoperability problems for your applications. It can be used to find any hooks your applications may have in system files, such as startup and shutdown scripts.

Please see *Upgrading from HP-UX 9.x to 10.x* and the `snoop` manpage for more information about the use of this tool.

Compile-time vs. Run-time Compatible Applications

Once you have used `prepare` and `analyzer` to locate interoperability problems in your source files, there are two basic ways of generating executables from your source that will function properly on both HP-UX 9.x and 10.x. You can add compile-time switches (`ifdefs`) in your source and generate a separate executable for each release, or you can add run-time switches (`if` statements) to your source and generate a single executable that will run on both releases.

Compile-time Source Modifications

Compile-time switches (`ifdefs`) can be added to your source code in the following manner to generate a separate executable for each release.

```
#ifdef HP-UX_10
  /* 10.0 specific code segment */
#else
  /* 9.x specific code segment */
#endif
```

Makefile changes required to build both versions are explained below.

Run-time Source Modifications

Run-time switches (`if` statements) can be added to your source code in the following manner to generate a single executable that will run on both releases.

For sh or ksh scripts:

```
# For 9.x 10.x interoperability determine which major revision
# of the operating system we are running on and only do OS revision
# dependent operations on the appropriate OS.
#
        rev=‘uname -r | cut -d. -f2‘
        rev=‘expr $rev + 0‘

        # OS revision dependent operations
        if [ $rev -ge 10 ]
        then
               # OS revisions 10.0 and beyond
               # put OS revision dependent code here
        else
               # OS revisions prior to 10.0
               # put OS revision dependent code here
        fi
```

For csh scripts:

```
# For 9.x 10.x interoperability determine which major revision
# of the operating system we are running on.

        set rev=`uname -r | cut -d. -f2`
        set rev=`expr $rev + 0`

        if ( $rev >= 10 ) then
                # OS revisions 10.0 and beyond
                # put OS revision dependent code here
        else
                # OS revisions prior to 10.0
                # put OS revision dependent code here
        endif
```

For C source code:

```
#include <sys/utsname.h>

struct utsname name;
int release;

/* For 9.x/10.x interoperability determine which major revision
   of the operating system we are running on. */

   uname(&name);
   strtok(name.release, ".");
   release = atoi(strtok(NULL, "."));

   /* OS revision dependent code */
   if (release < 10)
      /* OS revisions prior to 10.0 */
   else
      /* OS revisions 10.0 and beyond */
```

Makefile Issues

Application makefiles and build scripts may require changes to build two revisions of the application or to compensate for compile tool interface changes between HP-UX 9.x and 10.x. The following sections explain these makefile interoperability issues.

Building Two Executable Revisions

If you added compile-time switches to your source files to generate a separate executable for each release, you need to make some makefile changes to build both versions.

There are two approaches to using your current makefiles to generate two versions of your applications. One is to modify your makefiles to contain a separate target for each version:

```
myapp_9: myapp.h myapp.c
 cc -DHP-UX_9 myapp.c -o myapp.9

myapp_10: myapp.h myapp.c
 cc -DHP-UX_10 myapp.c -o myapp.10
```

Then, type:

```
make myapp_9      (generate the 9.x executable)
make myapp_10     (generate the 10.x executable)
```

Be sure to place the resulting executables in separate directories or filenames to avoid collision. They can then be moved or installed to their release-appropriate location on target machines.

The other approach is to use environment variables to select the appropriate compile options. You can generate a simple build wrapper to simplify this approach. The makefile entry looks like this:

```
myapp: myapp.h myapp.c
 cc $(CFLAGS) myapp.c -o myapp
```

From the command line or as a build script, you can then do something like shown next.

```
# This is my build script for myapp

# Build the 9.x version
CFLAGS = "-DHP-UX_9"
make myapp
mv myapp myapp.9

# Build the 10.x version
CFLAGS = "-DHP-UX_10"
make myapp
mv myapp myapp.10
```

You will also need to either build both versions of your application from an HP-UX 9.x workstation, or build the 9.x version from an HP-UX 9.x workstation and the 10.x version from an HP-UX 10.x workstation. (Binaries are forward compatible but not backward compatible.)

Absolute Paths in Makefiles

If your makefiles contain absolute pathnames for system commands, you need to make sure one of the following methods of handling those is used on your build machine. The first method is preferred.

- `$PATH` is set correctly for the machine the make is being run on, and the makefiles have been modified to use relative pathnames for commands.
- Interoperability links are installed. This should correct any pathname problems in your makefiles.

Other Makefile Issues

Some commands commonly used in application builds and makefiles have differences between HP-UX 9.x and 10.x. You should review your makefiles and build environments for any usage that may be incompatible between releases. See the *Release Notes for HP-UX 10.0 version B.10.10* and the HP-UX 9.x and 10.x manpages for more information about these differences.

These new HP-UX 10.x features to `make` may affect programming for interoperability:

- The search order of the `makefile` was extended to contain the SCCS directory.

Typeface Conventions

- Two new default macros were added, `SCCSFLAGS` and `SCCSGETFLAGS`.
- The environment variable `PROJECTDIR` was added to search for SCCS files not in the current directory.
- The `VPATH` special macro was added to enable make to search path list looking for dependents.
- Conditional macro definitions support was added.
- `-include` is now supported.

HP-UX 9.x and 10.x differences in the compilers, linkers, pre-preprocessors, and shared library behavior are explained next.

Compiling Shared Applications

This section discusses issues with compiling shared applications and describes compiler tool differences between HP-UX 9.x and 10.x.

You should either build shared applications from an HP-UX 9.x workstation, or build two separate executables on their corresponding releases. (Binaries are forward compatible but not backward compatible.)

Linking a mix of relocatable code modules, such as combining some modules compiled on release 9.x with other modules compiled on release 10.x, is not supported. All relocatable code modules should be compiled on versions of HP-UX with the same major release number.

Compiler Tools Differences

- HP-UX 10.x linker, `ld`, behavior that may affect programming for interoperability includes:
  - Linking `libc` archive with one or more shared libraries is not supported. Always link with the shared library version of `libc` whenever any other shared libraries are being used.
  - Do not use the `-lc` option with `ld`.
- STREAMS symbols that were in `libstr.a` in HP-UX 9.x are in `libc.a` in HP-UX 10.x.

- HP-UX 10.x compiler behavior that may affect programming for interoperability includes:
  - `/bin/cc` obsolete options:

Option:	Replaced by:
`-J`	`+Olibcalls`
`+Obb`	`+Onolimit -O`
`+Os`	`+Onopipeline -O`
`+OE`	`+Onomoveflops -O`
`+Om1`	`+Onoparmsoverlap -O`

  - New `/bin/cc` options: -V, -O4, many +O options (see manpage).
  - Misuse of the ALIGN rules is now diagnosed by: `fatal error`
  - The left operand of the right-shift operator is now promoted correctly, causing programs which relied on the incorrect behavior to fail.
  - The object file is left when compiling with `-S`; the 9.0 compiler removed the object file.
  - The HP-UX 10.x compilers behave differently than 9.x compilers with respect to `typedef`'s and the `HP_ALIGN` rules.
- Double-quotes are illegal characters in options to `cpp`. In HP-UX 10.x, you get a warning; on HP-UX 9.x, `cpp` accepts the first parameter from the double-quoted options and silently ignores the rest.
- Some routines in `libc` on HP-UX 9.x are in `libsec` on HP-UX 10.x:

`endspwent`	`endspwent_r`	`getspwaid`	`getspwaid_r`
`getspwent`	`getspwent_r`	`getspwnam`	`getspwnam_r`
`getspwuid`	`getspwuid_r`	`setspwent`	`setspwent_r`

- The format for the symbol table in archive (`.a`) files has been expanded to allow for long file names. Older archive files will still be handled correctly, but new archives that have long file names will not work on earlier systems.
- It is not recommended building internationalized applications archive, but if this is still desired on HP-UX 10.x there are build changes for *all* archive programs that use NLS. Any application that calls `setlocale` or `iconv` and is compiled archive on HP-UX 10.x will not be a complete archive and will now contain position independent code and data, which will be

loaded at runtime. It is best not to try sharing application executables for internationalized applications.

See the *Release Notes for HP-UX 10.0 version B.10.10* and HP-UX 9.x and 10.x manpages for more details on HP-UX 9.x and 10.x compile tools behavior.

Related Standards Documentation

- *POSIX.1* (aka ISO/IEC 9945-1 aka IEEE Std 1003.1) and *POSIX.2* (aka ISO/IEC 9945-2 aka IEEE Std 1003.2). Available from the IEEE:

```
IEEE
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
```

- *X/Open CAE Specification, Issue 4.* Available from X/Open:

```
U.S.A.:
 X/Open Company Ltd.          X/Open Company Ltd.
 1010 El Camino Real          3141 Fairview Park Drive
 Suite 380                    Suite 670
 Menlo Park, CA 94025         Falls Church, VA 22042-4501

 tel: +1 (415) 323 7992       tel: +1 (703) 876 0044 U.S.A.
 fax: +1 (415) 323 8204       fax: +1 (703) 876 0050

Europe:                      Japan:
 X/Open Company Ltd.          X/Open Company Ltd.
 Apex Plaza, Forbury Road     Karufuru-Kanda Bldg, 9F
 Reading                      1-2-1, Kanda Suda-cho
 Berkshire RG1 1AX            Chiyoda-Ku, Tokyo 101
 U.K.                         Japan

 tel: +44 734 508311          tel: +81 3 3251 8321
 fax: +44 734 500110          fax: +81 3 3251 8376
```

- *System V Interface Definition, Third Edition.* Available in your local bookstore.

A

File System Mapping

HP-UX 10.0	Pre-HP-UX 10.0	Description/Comments	Private/Shared
/dev	No change	Device files for local files	Private
/etc	No change	Workstation-specific configuration and administration databases; no executables invoked by users.	Private
/etc/opt/<application>	N/A	Application-specific configuration files	Private
/etc/rc.config.d	N/A	Startup configuration files	Private
/export	N/A	Default root of exported file systems	Server directory
/export/private_roots	N/A	For host-specific files	Server directory
/export/shared_roots	N/A	For shared OS and applications	Server directory
/home	/users	Default for user directories	Private
/home/<username>	/home/<username>	User home directory	Private dir. or local mountpoint
/lost+found	No change	Storage directory for fsck	Private
/mnt	No change	Mounting point for local file systems	Private
/net	No change	Mounting point for remote file systems	Private
/opt	N/A	Root for optional applications	Private
/opt/<application>	/opt/<application>	Application executables, libraries, and support files	Shared
/sbin	N/A	Essential system commands (those needed to boot system and mount file systems)	Shared

Typeface Conventions

HP-UX 10.0	Pre-HP-UX 10.0	Description/Comments	Private/Shared
/sbin/init.d	N/A	Startup and shutdown scripts	Shared
/sbin/rc#.d	N/A	Startup and shutdown link files for script sequencing	Shared
/stand	N/A	Standalone workstation-dependent binaries and kernel configs	Private
/tmp	No change	System-generated temporary files	Private
/usr	No change	Mount point for sharable user commands, libraries, and documentation	Shared
/usr/bin	/usr/bin and /bin	OS user commands	Shared
/usr/ccs	N/A	Unbundled development package	Shared
/usr/ccs/bin	N/A	Development binaries	Shared
/usr/ccs/lib	N/A	Development libraries	Shared
/usr/conf	/etc/conf	Kernel configuration	Shared
/usr/contrib	No change	Contributed software	Shared
/usr/include	No change	Header files	Shared
/usr/lbin	N/A	Back ends to other commands	Shared
/usr/lib	/usr/lib and /lib	Object code and object code libraries	Shared
/usr/local	No change	User contributed software	Shared
/usr/newconfig	/etc/newconfig	Default operating system configuration data files	Shared
/usr/old	N/A	Obsolete files	Shared
/usr/sbin	N/A	System administration commands	Shared
/usr/share	N/A	Architecture independent sharable files	Shared
/usr/share/dict	/usr/lib/spell	Dictionaries for spell and ispell	Shared
/usr/share/lib	N/A	Miscellaneous sharable files	Shared
/usr/share/man	/usr/man	Operating system manpages	Shared
/var	N/A	Holds files created at runtime such as log files and temporary files	Private
/var/adm	/usr/adm	Common administrative files and log files	Private
/var/adm/crash	/tmp	Kernel crash dumps	Private
/var/adm/cron	/usr/lib/cron	Cron queuing	Private
/var/adm/sw	N/A	SD directory	Private
/var/adm/syslog	N/A	Files generated by syslog	Private

A-2 File System Mapping

HP-UX 10.0	Pre-HP-UX 10.0	Description/Comments	Private/Shared
/var/mail	/usr/mail	Incoming mail	Private
/var/news	/usr/news	News	Private
/var/opt/ <application>	N/A	Application-specific temporary or data files	Private
/var/preserve	/usr/preserve	Preserved editor files	Private
/var/run	N/A	PID files	Private
/var/spool	/usr/spool	Spooled files	Private
/var/spool/cron	/usr/spool/cron	Crontabs and at jobs	Private
/var/spool/locks	/usr/spool/locks	UUCP Lock files	Private
/var/spool/lp	/usr/spool/lp	Printer spooling	Private
/var/spool/mqueue	/usr/spool/mqueue	Outgoing mail	Private
/var/spool/sw	N/A	Default location for SD depot	Private
/var/spool/uucp	/usr/spool/uucp	UUCP spool directory	Private
/var/spool/ uucppublic	/usr/spool/ uucppublic	Incoming UUCP files	Private
/var/tmp	/usr/tmp	Application generated temporary files	Private
/var/uucp	/usr/spool/uucp	UUCP administration files	Private

Glossary

boot server
An HP 9000 system that the XTERM300 product is installed on.

compatibility links
See **transition links** below.

DUX Diskless
The HP-UX client-server clustering scheme supported prior to 10.0. A cluster server acts as a file-system server for all clients (nodes), allowing the nodes to operate without a book disk.

GBR
The HP-UX 10.01 General Business Release is distributed and supported via HP-UX support services and replaces the previous major release. This GBR is also called "HP-UX 10.01 version B.10.01", and is an update to the HP-UX 10.0 New Business Release (NBR).

install
The initial placement of software, such as the operating system, onto the computer system.

install point
A directory into which software can be directly installed. All non-install points potentially are private directories and must be configured on a per-host basis by execution of SD configuration scripts.

interoperability
The ability to exchange data, share resources and services, and share common systems management activities between different systems.

interoperability links
Symbolic links to make HP-UX 9.x file systems look like 10.x.

mixed environment
A networked environment of workstations and servers running both HP-UX 9.x and 10.x OS revisions. The computers may include Series 300/400 workstations and Series 700/800 computers.

NFS
Network File System. An implementation of Remote Procedure Calls (RPCs) and remote mounting and access of file systems over a network.

NFS Diskless
The client-server scheme supported beginning with HP-UX 10.0.

PIDs
Files that contains the process ID of a running application or subsystem component.

private
Directories accessible only on one NFS Diskless client.

release notes
Files installed with new and updated software listing changes from the previous release. For HP-UX 9.x, look in `/etc/newconfig`. For HP-UX 10.x, look in `/usr/share/doc`.

SD
Software Distributor (SD or SD-UX) is an HP-UX 10.0 replacement for the HP-UX DUI update utility. The following terms apply to SD:

SD depot
A repository of software products and a catalog organized such that SD can use it as a source.

SD filesets
A collection of files. The software object upon which most SD operations are performed.

SD product
Collections of sub-products and filesets. The SD software object which directly relates to the software purchased by the user.

SD subproduct
An optional grouping of filesets used to partition a product which contains many filesets, or to offer the user different views of the filesets.

shared
Directories that can be accessed by multiple clients on an NFS Diskless system.

transition links
Symbolic links to make an HP-UX 10.x file system look like a 9.x file system. They are supported by the `tlinstall` and `tlremove` commands and manpages.

update
Overlaying currently installed software with a more-recent version. For example, updating from HP-UX 9.03 to 9.10. Also see **upgrade** and **install**.

upgrade
Moving your operating system to the next major revision level, such as from HP-UX 9.x to 10.x.

Xterminal Server
A Series 700/800 computers that the Xterminal will connect to after booting.

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