Software Product Description

PRODUCT NAME: **Compaq's DIGITAL UNIX® Operating System Version 4.0E** **SPD 41.61.21**

DESCRIPTION

Compaq's DIGITAL UNIX Operating System is a 64-bit advanced kernel architecture based on Carnegie-Mellon University's Mach V2.5 kernel design with components from Berkeley Software Distribution (BSD) 4.3 and 4.4, UNIX® System V, and other sources. DIGITAL UNIX is Compaq Corporation's implementation of the Open Software Foundation™ (OSF®) OSF/1 R1.0, R1.1, and R1.2 technology, and the Motif® graphical user interface and programming environment.

DIGITAL UNIX provides symmetric multiprocessing (SMP), real-time support, and numerous features to assist application programmers in developing applications that use shared libraries, multithread support, and memory mapped files. The full features of the X Window System™, Version 11, Release 6 (X11R6) from the X Consortium Inc. are fully supported. Selected features of Release 6.1 (X11R6.1) are also supported.

DIGITAL UNIX complies with numerous other standards and industry specifications, including X/Open™'s XPG4 and XTI, POSIX®, FIPS, and System V Interface Definition (SVID). By providing support for the SVID, DIGITAL UNIX supports System V applications. To ensure a high level of compatibility with DIGITAL's ULTRIX Operating System, DIGITAL UNIX Operating System is compatible with Berkeley 4.3 and System V programming interfaces. DIGITAL UNIX conforms to the OSF Application Environment Specification (AES) that specifies an interface for developing portable applications that will run on a variety of hardware platforms.

USER INTERFACES

The DIGITAL UNIX user interface environment consists of the following:

- Netscape Navigator Internet Client World-Wide-Web browser
- Common Desktop Environment (CDE) V1.0
- Motif programming libraries and headers
- X11R6 application programming libraries and headers
- DECwindows Motif User Environment
- Adobe Display PostScript System

Netscape Navigator

DIGITAL UNIX includes the Netscape Navigator Internet Client World-Wide-Web browser. The license for this software is included with the DIGITAL UNIX base license. Users of earlier versions of DIGITAL UNIX are licensed to use the Netscape Navigator Internet client software when they update to Version 4.0 or later, with an update license or with update services. The Netscape Navigator Internet client supports Latin, Japanese, Chinese, and Korean fonts.

Common Desktop Environment

CDE replaces the DECwindows Motif Environment as the default user interface for DIGITAL UNIX.

CDE V1.0 includes Motif and is dependent on the underlying X Consortium X Window System, Version 11, Release 6 (X11R6) as described in this document.

CDE V1.0 provides a common user interface that is now available across multiple vendor platforms. CDE includes a range of integrated desktop services including the following:

- The front panel
- Session management
- Window management

- File Manager
- Procedural and object-oriented application integration
- Online information
- Productivity and collaborative tools
- Data interchange
- Environment
- Visuals
- Network services

CDE requires a minimum configuration of 32MB of memory.

DIGITAL UNIX provides enhancements to CDE, including support for the ImageViewer and Multimedia Services.

Mail User Agents

The graphical mail user agent supplied with CDE, dtmail, provides Multipurpose Internet Mail Extensions (MIME).

DIGITAL UNIX also supplies mail and mailx for character cell systems. The mailx/Mail system is compatible with SVID 2, XPG4, and the Berkeley Enchanced mailer (/usr/bin/ucbmail).

For compatibility with previous DIGITAL UNIX releases, the MH 6.7.1 user agent and the dxmail graphical user agent to MH are provided. The MH mail agent was developed by the RAND Corporation, as an interface to the mail system.

Motif

DIGITAL UNIX includes the CDE V1.0/Motif V1.2 graphical user interface.

The Motif programming environment provides an extensive set of Window System libraries and tools for use by developers of new applications. Provided in both shareable and static versions, these libraries include:

- Motif Toolkit (Xm)
- Motif Resource Manager (Mrm)
- DIGITAL extensions to the OSF/Motif Toolkit (DXm)
- User Interface Language (UIL)
- User Interface Language Compiler (UIL)
- Widget Meta-Language Compiler (wml) and description files
- X Toolkit Intrinsics Library (Xt)
- X Library (Xlib)

DIGITAL UNIX provides OSF/Motif and X11 programming examples to illustrate various Motif and X11 programming techniques. Many of the examples are not fully implemented by the Open Software Foundation but do provide valuable programming information. A README file, included with each example, outlines the features and limitations of the particular application.

X Window System

X11R6

The X Window System, Version 11, Release 6 (X11R6) is fully supported in DIGITAL UNIX and UNIX supports the following X Consortium standards:

- X Image Extensions (V5)
- Inter-Client Communications Conventions Manual Update - DIGITAL UNIX supports Version 2.0 of the ICCCM.
- Inter-Client Exchange Protocol and Library
- X Session Management Protocol and Library
- Input Method Protocol
- X Logical Font Descriptions (update)
- SYNC extension
- XTEST extension
- BIG-REQUESTS extension
- XC-MISC extension

X11R6.1

DIGITAL UNIX supports selected Release 6.1 (X11R6.1) features, including the X Keyboard extension (XKB) (Version 0.65) and the double buffering extension (DBE).

DECwindows Motif User Environment

The DECwindows Motif Environment is an optional interface accessible through the CDE login manager or it can be configured to be the default environment. This environment consists of:

- Login Manager
- Session Manager
- Terminal Emulator

NOTE: DECwindows utilities and tools are scheduled for retirement. DIGITAL UNIX V4.0E will be the last version of DIGITAL UNIX to ship these components. See the DIGITAL UNIX Release Notes for more information.

Adobe Display PostScript System

DIGITAL UNIX supports the Adobe Display PostScript System X server extension and client library; the license is included with DIGITAL UNIX.

The Licensee agrees to execute Display PostScript only on those DIGITAL computer systems listed in the hardware tables in this Software Product Description (SPD), and that in any event licensee agrees not to make use of the Display PostScript software, directly or indirectly, to print bitmap images with print resolutions greater than 150 dots/per/inch (DPI), or to generate fonts or typefaces for use other than with the Compaq computer systems identified in this SPD. The foregoing limitation shall not be deemed to prohibit the printing of images of greater than 150 DPI resolution when such images are used solely for incidental or illustrative purposes.

NOTE: Adobe has announced their retirement of Display PostScript, including the client libraries and X Server extension. Compaq will retire the Adobe DPS libraries and X Server extension. DIGITAL UNIX V4.0E will be the last version of DIGITAL UNIX to ship these components. See the DIGITAL UNIX V4.0E Release Notes for more information.

STANDARDS

UNIX 95

Under The Open Group's UNIX branding program, Compaq has received the UNIX 95 brand for the DIGITAL UNIX Operating System, and is licensed to use the UNIX trademark in conjunction with the DIGITAL UNIX product.

UNIX 95 includes the following component brands: XPG4 Internationalized System Calls and Libraries Extended, XPG4 Commands and Utilities V2, XPG4 C Language, XPG4 Sockets, XPG4 Transport Interfaces (XTI), and XPG4 Internationalized Terminal Interfaces (XCurses). The UNIX 95 Conformance Statement Questionnaire for DIGITAL UNIX is provided in DIGITAL document order number AA-QAKPB-TE.

XPG4 UNIX

DIGITAL UNIX conforms to XPG4 UNIX, also known as the Single UNIX Specification, previously known as Spec1170. XPG4 UNIX covers the following specifications of the X/Open Common Application Environment (CAE): System Interface Definitions, Issue 4, Version 2; System Interfaces and Headers, Issue 4, Version 2; Commands and Utilities, Issue Version 4; Networking Services, Issue 4; and X/Open Curses, Issue 4.

XPG4 Common Desktop Environment (CDE)

DIGITAL UNIX conforms to the XPG4 Common Desktop Environment. Although the XPG4 Common Desktop Environment specifies only X11R5 components, DIGITAL UNIX fully implements X11R6, while maintaining compliance with the XPG4 CDE Standard.

DIGITAL UNIX has the XPG4 CDE Profile brand, which includes the XPG4 X Window System Application Interface V2 and the XPG4 X Window System Display Component brands.

The CDE Conformance Statement Questionnaire for DIGITAL UNIX has the DIGITAL document order number AA-QAKPB-TE.

Motif

DIGITAL UNIX provides the OSF/Motif Application Environment, which is based on CDE 1.0 (OSF/Motif R1.2.5) and conforms to the IEEE POSIX 1295 specification.

POSIX.1 and FIPS 151-2

DIGITAL UNIX conforms to the IEEE Std 1003.1- 1990, POSIX Part 1: System Application Program Interface (API) [C Language], also referred to internationally as ISO/IEC 9945-1:1990, and to the Federal Information Processing Standard, FIPS 151-2. DIGITAL UNIX is certified with the National Institute of Standards and Technology (NIST). The POSIX.1 conformance document for DIGITAL UNIX has DIGITAL document order number AA-PS35D-TE.

IEEE Std 1003.1b-1993

DIGITAL UNIX conforms to the IEEE Std 1003.1b 1993 (formally known as IEEE P1003.4), Part 1: System Application Program Interface (API) and Amendment 1: real-time Extension [C Language]. The POSIX.1b conformance document for DIGITAL UNIX has DIGITAL document order number AA-PS35D-TE.

IEEE Std 1003.1c-1995

DIGITAL UNIX conforms to the IEEE Std 1003.1c-1995, IEEE Standard for Information Technology-Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API)-Amendment 2: Threads Extension [C Language]. The POSIX.1c conformance document for DIGITAL UNIX has DIGITAL document order Number AA-QWY2A-TE.

IEEE Std 1003.2-1992

DIGITAL UNIX conforms to the IEEE Std 1003.2 1992 - Shell and Utilities, referred to internationally as ISO/IEC 9945-2, and provides the following implementation options:[POSIX2_C_BIND], [POSIX2_C_DEV], [POSIX2_CHAR_TERM], [POSIX2_LOCALEDEF], [POSIX2_SW_DEV], and POSIX2_UPE]. The POSIX.2

conformance document for DIGITAL UNIX has DIGITAL document order number AA-QWQQA-TE.

SVID

DIGITAL UNIX conforms to the base operating system section of the System V Interface Definition Issue 2 (SVID2) and to the base operating system and kernel Extension Sections of the SVID Issue 3 (SVID3). DIGITAL UNIX provides more than 400 commands and interfaces that comply with SVID3/SVR4.

System V Compatibility

DIGITAL UNIX enhances System V compatibility via a habitat mechanism. In the few cases where a given command or interface may behave differently under DIGITAL UNIX, SVID 2, or SVID 3, the habitat mechanism permits the user to specify the preferred behavior.

System V Release 3.2 (SVR3)

SVID, Issue 2:

DIGITAL UNIX was tested using the System V Verification Suite 3 (SVVS3) and conforms to the Base System as specified in Issue 2.

A license to use DIGITAL UNIX binaries includes the right to use the included System V Release 3.2 derivatives.

Additional commonly used SVID 2 base commands are made available via the SVID 2 habitat.

System V Release 4.0 (SVR4)

SVID, Issue 3:

A significant number of commands and interfaces compatible with SVID3 are included in DIGITAL UNIX.

The DIGITAL UNIX shared library scheme is patterned on and compatible with the SVR4 shared library scheme.

DIGITAL UNIX implements the SVR4 /proc file system, which provides the capability of accessing processes using file semantics.

DIGITAL UNIX supports SVR4 style terminal devices. This allows for increased numbers of terminal connections. Support for BSD tty names will be retired (removed from the DIGITAL UNIX distribution) in a future release, no sooner than June 1999.

DIGITAL UNIX includes STREAMS compatible with System V Release 4.0. Like sockets, STREAMS provides a framework for character I/O between user space and kernel networking protocols.

Real-time

DIGITAL UNIX provides a real-time user and programming environment. The real-time programming environment conforms to the POSIX 1003.1b-1993 standard for real-time, which allows portable real-time applications to be developed and to run in a POSIX environment.

The DIGITAL UNIX real-time programming environment provides a fully preemptive kernel (optionally enabled), and supports the following POSIX 1003.1b features:

- Real-time clocks and timers
- Real-time queued signals
- Fixed-priority scheduling policies
- Real-time scheduler priorities
- Counting semaphores
- Shared memory
- Process memory locking
- Asynchronous I/O
- Synchronized I/O
- Process communications facilities
- Message passing interfaces
- Thread safe implementation of real-time libraries

The compile-time constant (POSIX_4D11) previously provided to preserve compatibility with earlier drafts has been retired.

Threads

DIGITAL UNIX provides software developers the ability to write multithreaded programs using DECthreads. DECthreads provides a pthreads interface that complies with the POSIX 1003.1c semantics. In addition, for building libraries whose routines can be called in either a single-threaded or multi-threaded context, DECthreads provides a thread-independent services (tis) interface.

The DECthreads CMA interface is obsolete. The DECthreads DCE semantics interface will be retired in a future major release of DIGITAL UNIX, no sooner than June 1999.

Shared Libraries

DIGITAL UNIX provides a full complement of dynamic shared libraries, based on System V semantics, which increase system performance, reduce minimum hardware requirements, and ease system management. DIGITAL UNIX provides the following shared libraries:

libDXm	DIGITAL Motif Extensions library

libMrm	Motif Resource Manager library
libots	DIGITAL Compiled Code Support library
libX11	Xlib library
libXaw	X Athena Widgets run-time library
libXext	X Client-side Extension library
libXie	X imaging extension client side run-time library
libXm	Motif Widgets library
libXmu	X Miscellaneous utilities run-time library
libXt	X Intrinsics library
libXtrap	Client side run-time library for Xtrap
libXv	C Video extension client side run-time library
libaud	C2 security auditing library
libbkr	Motif help system library
libc	C library
libcdrom	Rock Ridge extensions to CDFS library
libcmalib	DECthreads library routines
libcurses	Curses screen control library
libdnet_stub	DECnet library
libdps	Adobe Display PostScript client-side run-time libraries
libdpstk	Adobe Display PostScript toolkit
libesnmp	Extensible SNMP library
libiconv	Codeset Conversion library
libm	DIGITAL Portable Math library
libmach	Mach library
libmxr	Library used by mxr, the ULTRIX binary interpreter for OSF/1
libpsres	Adobe Display PostScript resources utilities
libpthread	DECthreads library POSIX 1003.1c threaded interface
libpthreads	DECthreads library CMA and DCE threaded interfaces
librt	Real-time library (POSIX 1003.1b interface)
libsecurity	C2 security library
libsys5	System V Compatibility library
libdxterm	DECterm widget library
libtli	TLI library
libxti	XTI library
libICE	Inter-Client Exchange protocol library
libSM	Session Management protocol library
libUil	Callable UIL compiler
libXIE	X Imaging extension V5 client-side run-time library
libXi	X input extension
libXtst	X test extension

DIGITAL UNIX also provides static versions of most of these libraries.

INSTALLATION

DIGITAL UNIX is customer-installable. Installation Services are available for those customers who would like an experienced Compaq Software Specialist to install the software.

Systems with graphic adapters and a minimum of 32MB of memory have a MOTIF-compliant graphical interface for installation. Other system configurations present a simple text-based interface.

Update Installation

An update installation procedure will update the operating system from DIGITAL UNIX Version 4.0B, 4.0C, and 4.0D to DIGITAL UNIX Version 4.0E, while preserving appropriate system files and existing user-customized files.

Full Installation

A full installation procedure will install DIGITAL UNIX onto the system. Full installations may repartition the system drives, removing all existing information. Two options are available with a full installation:

- The default installation process configures the disk with the default UFS file system and loads the mandatory DIGITAL UNIX software subsets.
- The custom installation provides the ability to duplicate the file system layout and select optional software for installation. Mandatory and dependent subsets are automatically loaded.

System Cloning

DIGITAL UNIX includes the ability to duplicate the file system layout, file system type, and software subset selections from identical systems already installed. Performing a cloned installation alleviates the need to answer most questions during the installation procedure.

License Management Facility (LMF)

The License Management Facility (LMF) checks software licenses on line and enables easier software management. LMF supports two types of licenses, availability and activity. LMF is limited to single node capability.

SYSTEM MANAGEMENT

System Management (SysMan) consists of a suite of graphical applications for managing DIGITAL UNIX systems. SysMan applications are launched from the "checklist" application, the Application Manager icon on the CDE front panel, or executed from a command line interface for systems without a graphical monitor. SysMan is organized into Configuration, Daily Administration, Monitoring and Tuning, Storage Management, and Tools components.

Configuration

BIND Configuration – An application to configure the system as a BIND client or server. BIND configuration is used to initialize and maintain the BIND data files on the master nameservers, the BIND boot files, and the BIND resolver configuration files.

Disk Configuration – An application to display the disks attached to the system, display disk attributes including the partition information repartition the disk, and define a disk alias.

Latsetup – An application to administer Local Area Transport (LAT).

Mail Configuration – An application to set up the routing and delivery of mail. It configures Sendmail, and simplifies the configuration of the system as a Mail client or server.

Network Configuration – An application to configure network interfaces, routed or gated routing daemons, configure the system as an IP router, configure rwhod, configure static routing, and edit network configuration status.

NFS Configuration – An application to configure the system as an NFS client and/or server, start and stop the NFS daemons, configure automounter, mount and unmount, and export NFS file systems.

NIS Configuration – An application to configure and execute Network Information Service on the system.

Printer Configuration – An application to define and modify printer configurations for local and remote printers that are accessible to the system.

Daily Administration

Account Manager – An application to create, modify, and manage user and group accounts. The account manager operates under either base or enhanced security. It manages both local and NIS accounts.

Archiver – An application to manage archiving on the system. Supporting tar, cpio and pax format, this application stores and retrieves selected files from/to a locally attached output device including a tape drive or floppy disk drive.

Audit Manager – An application to set up the audit environment on the system.

DHCP server configuration – An application to configure and monitor the Dynamic Host Configuration Protocol on servers and clients.

Display Window – A generic application that provides an interface for executing and displaying the output of any UNIX command at user defined intervals.

File Sharing – An application to mount file systems accessible via NFS, and to export local file systems.

Host Manager – An application to display and manage user-specified remote hosts.

License Manager – An application to manage software product licenses. Software Product Authorization Keys (PAKs) can be listed, added, and deleted with this application.

Power Manager – An application to manage the power reduction features of a system monitor, disks, and CPU. This application is functional only on systems with power management features.

Shutdown – An application to facilitate the shutdown process of a system. This application provides an interface to determine the amount of time prior to system shutdown, to display messages, and to execute user shutdown scripts.

System Information – An application to display and monitor information about the system, including the operating system and version, the amount of RAM on the system, the number of CPUs, CPU activity, available free memory, available swap space, file system utilization, and locally attached disk and tape drive device names.

Monitoring and Tuning

Kernel Tuner – An application to display and change parameters of the kernel subsystem.

Class Scheduler – An application to allow the system manager to prioritize jobs and tasks.

Process Tuner – An application to display, monitor, and manage the system processes. A number of sort and filter options are provided to manage the way information is displayed.

Performance Manager - A real-time performance manager that provides tools for detecting and correcting performance problems. Running locally, this application can display data from every node in the DIGITAL UNIX network that runs the Performance Manager daemon, SNMP daemon, or cluster daemon.

Environmental Monitoring – This functionality is a means to monitor the thermal, fan, and redundant power supply state of AlphaServer systems 1000A, 4000, and 4100. If a condition reaches a dangerous level, the software alerts users of potential system shutdown and performs an orderly shutdown of the system if the condition persists. The functionality includes methods to set user-defined script, temperature levels, the collection rate and shutdown grace period, and to start or stop the environmental monitoring state.

SNMP Support

DIGITAL UNIX supports the DIGITAL Server Base System MIB and the DIGITAL Server Management MIB to provide methods for local and remote management of systems. Each MIB is registered with the SNMP daemon (master daemon) via its respective subagent. The DIGITAL Server Base System MIB subagent reports on the state of an Alpha Server System, including hardware components, firmware, and environmental information. The DIGITAL Server Management MIB subagent can monitor attributes of the system (thermal value, fan status, power supply status) and invoke actions if the attributes exceed their predefined thresholds. If specified, it can poll the attributes on restart of the subagent. The functionality delivers an enabler for any SNMP compliant software package, such as Netview for DIGITAL UNIX or ServerWORKS for Windows NT or Windows 95, so that such packages can manage server systems. The DIGITAL Server Base System MIB (svrSystem.mib) and the DIGITAL Server Management MIB (svrMgt.mib) definitions can be found in the /usr/share/sysman/mibs directory on a system with DIGITAL UNIX Version 4.0D or higher.

Storage Management

Bootable Tape – An application to create and recover a disk image from a system.

Supported tape devices are:

- TKZ9F
- TZK10, QIC tape, 320-525MB
- TZK11, QIC tape, 2.0GB
- TLZ06, 4mm, 2-4GB
- TLZ07, 4mm, 4-8GB
- TZ86, 5.25 inch cartridge
- Sony 8 mm AIT (DS-TZS20-VW)
- DS-TZ88/9N-VW (Exabyte 8mm)

Networker – An application that provides automated backup and recovery of files on a single local system. This is a subset of the optional NetWorker Save and Restore (NSR) layered product. This SingleServer version is licensed free of charge with the DIGITAL UNIX Operating System, and provides functionality similar to NSR, except that SingleServer supports only a single, local client.

Other Tools

DIGITAL UNIX provides graphical presentation of the iostat (I/O statistics), netstat (network statistics), systemmessages (system messages), vmstat (virtual memory statistics) and the who command.

DIGITAL UNIX supports DECevent, which provides error reporting and binary-to-text translation capabilities.

FILE SYSTEMS

The DIGITAL UNIX file system architecture is based on OSF/1 Virtual File System (VFS) which is based on the Berkeley 4.3 Reno Virtual File System. VFS provides an interface into files regardless of the file system in which the file resides.

DIGITAL UNIX supports the file system types described in this section.

File system limits are documented in the DIGITAL UNIX Release Notes.

Advanced File System (AdvFS)

The Advanced File System (AdvFS) is a journaled, local file system that provides higher availability and greater flexibility than traditional UNIX file systems. Using transaction journaling, AdvFS recovers file domains in seconds rather than hours after an unexpected restart, and provides increased file system integrity. The AdvFS defragment utility reduces file fragmentation that can impact I/O performance. AdvFS provides greater flexibility by allowing filesets (file systems) to share a single storage pool, and enabling hard and soft fileset quotas in addition to user and group quotas. The root/boot, /usr, and /var devices can be configured to use AdvFS during installation. The file descriptors have been extended, which allows for a greater number of SNA gateway connections. A salvage utility is available for retrieving lost files and file domains. The AdvFS on-disk-structure analysis tools now work with clones and striped files.

The right to use the Advanced File System is granted by DIGITAL UNIX Operating System license. Advanced File System Utilities is a separately licensed, optional layered product. Refer to the OPTIONAL SOFTWARE section of this SPD for more information.

UNIX File System (UFS)

UFS is compatible with the Berkeley 4.3 Tahoe release.

Network File System (NFS)

DIGITAL UNIX NFS V2 allows transparent file access over TCP/IP networks. The Network Information System (NIS), formerly Yellow Pages (YP), is provided for centralized system management of files. The automounter service automatically mounts and unmounts NFS file systems. The NFS locking service allows advisory and record locks to be used with remotely mounted files.

An NFS V3 server and client protocol implementation is provided in addition to V2. NFS V3 includes 64-bit support for file access, exclusive create semantics, negotiable transfer sizes, safe asynchronous writes, added support for access checking, and other changes designed to increase efficiency and performance. NFS file systems can use either the UDP or TCP transport protocols.

Network Lock Manager (NLM) V4 includes support for files larger than 2 GB. Support for additional over-the-wire error code is also provided. NLM V3 is supported for NFS V2 compatibility.

V2 PC-NFS server support is provided to enable connectivity from PC-NFS V5.1a, 5.1, 4.0, and 3.5 clients.

Memory File System (MFS)

The DIGITAL UNIX MFS is a memory-based UFS. The MFS has the same file system structure as the UFS, but resides in virtual memory. No permanent file structures or data are written to disk, so the contents of an MFS file system are lost on reboot, unmount, or power failure. An MFS is useful for temporary files or for read-only files that are loaded into it after it is created.

ISO 9660 Compact Disk File System (CDFS)

The DIGITAL UNIX implementation of CDFS is based on ISO 9660, a standard for a volume and file structure for the interchange of information using CD-ROM. DIGITAL UNIX CDFS is based on the following levels of ISO 9660:

- Level 2 of Interchange
- Level 1 of Implementation, which enables the user to:
- Mount single volume CD-ROMs which are formatted in compliance with ISO 9660, as a local file system
- List and examine files using standard UNIX utilities and programs
- Read files and directories using the standard POSIX system interface
- NFS export mounted ISO 9660 file systems
- Support the High Sierra Group extensions which provide compatibility with older format CD-ROMs

CDFS also supports CD-ROMs recorded using the Rock Ridge Interchange Protocol, Revision 1.09, August 1991. Rock Ridge specifies the use of the extension fields that are defined by ISO 9660:1988, and it uses those extensions to provide the following information:

- File owner, file group, file permissions
- Additional file types (symbolic links, device special files, named pipes)
- setuid, setgid, and sticky bits
- Hard link counts
- POSIX file names (mixed case names, unstructured names, and longer names than ISO-9660:1988 allows)
- Deep directory hierarchies (greater than 8 levels)
- File time stamps

X/OPEN Preliminary Specification (1991) CD-ROM Support Component (XCDR). XCDR extensions allow users to examine selected ISO 9660 attributes through defined utilities and shared libraries. A system administrator can substitute different file protections, owners, and file names for CD-ROM files.

The Compact Disk File System (CDFS) supports the organization of multiple sessions on one CD-ROM volume. Note that the contents of all sessions are available as one file system and are not separately available. See the Compact Disk File System Release Notes for more information.

File-on-File Mounting File System (FFM)

The File-on-File Mounting File System (FFM) allows regular, character, or block-special files to be mounted over regular files, and is primarily used by the SVR4-compatible system calls ’fattach’ and ’fdetach’ of a STREAMS-based pipe (or FIFO).

File-Based Pipes

A file-based pipe implementation replaces the socket-based pipes implementation for improved performance.

/proc File System

The SVR4-compatible /proc file system for DIGITAL UNIX allows running processes to be accessed and manipulated as files by ordinary system calls, open, close, read, write, seek and ioctl.

Logical Storage Manager (LSM)

DIGITAL UNIX Logical Storage Manager (LSM) is an integrated host-based solution to data storage management. Basic LSM functionality, including disk spanning and concatenation, is provided with the base operating system. Additional features, including disk striping, mirroring, and a graphical user interface, are available with a separate license. LSM is RAID Advisory Board (RAB) certified for RAID Levels 0 and 1. Refer to the OPTIONAL SOFTWARE section of this SPD and the LSM SPD for more information.

A migration utility allows LVM users to migrate their LVM volumes to LSM. This utility will be retired in a future release of the operating system.

The LSM Block Change Logging (BCL) feature will be retired and replaced in the next major release of the operating system. Refer to the LSM and DIGITAL UNIX Release Notes for more information.

NETWORKING

TCP/IP

DIGITAL UNIX allows for TCP/IP network communications over supported network devices. The TCP/IP protocol suite is implemented in the socket framework.

Sockets

DIGITAL UNIX provides sockets that are based on the Berkeley UNIX Operating System structure, which provides a framework for I/O over a network.

STREAMS

DIGITAL UNIX provides SVR4-compatible STREAMS. Like sockets, STREAMS provides a framework for character I/O to and from user space to kernel networking protocols.

X/Open Transport Interface (XTI)

X/Open Transport Interface (XTI) is an extension to the System V STREAMS user space interface called Transport Level Interface (TLI). This interface is thread-safe.

Data Link Bridge (DLB)

DIGITAL UNIX provides a DLPI-compatible interface into the non-STREAMS (BSD) driver environment. This interface does not support complete DLPI semantics. The DLB interface is the preferred interface for STREAMS modules to access the BSD-based datalink services.

Screend

When the system is operating as an IP router, screend provides flexible per-packet access controls for forwarded packets. This can be used as part of a comprehensive network security plan. DIGITAL UNIX also provides interface access filtering to reinforce the system security against IP spoofing attacks.

Packetfilter

The Packetfilter software interface allows an application to send and receive packets directly to or from a LAN (Ethernet or FDDI). The Packetfilter provides flexible filtering of incoming packets, so that many such applications can run simultaneously.

The DIGITAL UNIX Packetfilter supports two filtering models: the CMU/Stanford model supported in ULTRIX, and the BSD Packet Filter (BPF), which provides more flexible and efficient filtering. BPF was developed by the University of California, Lawrence Berkeley Laboratory.

Several public domain applications that use the Packetfilter are integrated in DIGITAL UNIX including rarpd, tcpdump, tcpslice, nfswatch, and nfslogsum.

Simple Network Management Protocol (SNMP)

The SNMP agent allows management of the Internet, FDDI, system resources, and network resources using the SNMP. The agent is extensible, allowing software developers to add MIBs to the agent and to participate in the SNMP.

The SNMP agent contains the following base system functionality:

- Full SNMP V1.0 agent capabilities
- MIB implementations for managing Internet MIB-2 objects, FDDI objects, and Token Ring objects

Dynamic Host Configuration Protocol (DHCP)

DIGITAL UNIX includes a complete DHCP server/client solution for centralizing and automating IP address administration using a graphical interface.

Point-to-Point Connections

The DIGITAL UNIX system supports point-to-point connections using Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP). The PPP subsystem is asynchronous and supports only IP. It provides authentification with Password Authentification Protocol

(PAP) and Cryptographic Authentification Protocol (CHAP).

Distributed Computing Environment (DCE)

DIGITAL UNIX provides the framework to support the Distributed Computing Environment (DCE), which provides users with access to resources regardless of their location on the network. It extends system level services to allow applications to interoperate, port to other platforms, and be distributed over the network. DCE is a layered product but the run-time service license is bundled with the operating system.

Open Network Computing (ONC)

DIGITAL UNIX supports Open Network Computing (ONC) V4.2 including: Network File System V2 and V3, PCNFSd, Lock Manager, Status Monitor, NFSportmon, Network Information Service (NIS), automount, and user level RPC.

Asynchronous Transfer Mode (ATM)

The DIGITAL UNIX Asynchronous Transfer Mode (ATM) subsystem supports the ATM Forum's User-Network Interface (UNI) V3.0 and V3.1 specifications, including the Interim Local Management Interface (ILMI) protocol for registration of up to 32 addresses per interface, UNI signaling for point-to-point connections, and best effort and CBR VCs for AAL5 PDUs. Also, per-VC cell pacing (to limit the rate at which an end-system transmits) is supported.

The ATM subsystem supports Classical IP (RFC 1577), including support for multiple IP subnets, per-VC MTU negotiation, and packetfilter access to data into and out of the host.

LAN Emulation over ATM is supported (Ethernet and IEEE 802.3 frames only), for carrying IP and LAT protocols. Support is based on the ATM Forum V1.0 specification. Packetfilter access is provided to emulated LAN data into and out of the host.

DIGITAL UNIX provides limited support for IP switching over ATM, based on the Ipsilon Networks Inc. reference model (RFC 1953 and 1954). Only one IP switching network device is supported per host, and an ATM adapter used for IP switching cannot simultaneously support ATM Forum UNI or ILMI protocols. The ATM subsystem (except IP Switching and PVC's) can be configured with the atmsetup utility to start automatically at boot time. The current form of the atmsetup utility will be replaced in the next major functional release of the operating system with a version that is part of the System Management application suite.

DIGITAL UNIX does not support the UNI V3.0 and V3.1 specifications for full ATM Simple Network Management Protocol (SNMP) Management Information Bases (MIBs), point-to-multipoint connections, Operations and Maintenance (OAM) flows, VBR VCs, AAL1, AAL3/4, or "raw" AAL.

Fast Ethernet

DIGITAL UNIX supports Fast Ethernet (IEEE 802.3 100Base-TX in full and half duplex).

Gigabit Ethernet

DIGITAL UNIX supports Gigabit Ethernet IEEE 802.3z Gigabit Ethernet Standard, IEEE 802.3x “Pause” Frame Flow control (X-on/X-off), both symmetric and asymmetric, and is Jumbo frame capable.

FDDI

DIGITAL UNIX provides FDDI fiber optic support based on all relevant ANSI and IEEE Standards, including SMT revision 7.2.

Token Ring

DIGITAL UNIX supports Token Ring (IEEE 802.5) with source routing support for multi-ring networks. Support also includes 4 and 16 MLps over STP and UTP media.

NetRAIN

NetRAIN support is provided for Ethernet, FDDI, and ATM controllers. NetRAIN allows for failover of communications from one controller to another in the event a fault is detected in the communications path.

IP Multicast

DIGITAL UNIX supports the Level 2 end-system IP Multicast functionality, specified in RFC 1112, on Ethernet and FDDI. The implementation provides integrated multicast address management for multi-protocol environments.

The DIGITAL UNIX implementation also provides kernel routines for encapsulating IP tunnels to enable wide area IP Multicast routing.

These routines include kernel code from public domain Multicast support Version 3.5 and mrouted (Version 3 Copyright 1989 by the Board of Trustees of Leland Standford University), which provides the Distance Vector Multicast Routing Protocol (DVMRP).

Name Services

DIGITAL UNIX supports the Domain Name System as described in RFC 1034 and RFC 1035, providing a host name and address lookup service for the Internet network. The DIGITAL UNIX implementation of the Domain Name System is based on BIND Version 4.9.3. The user can use BIND to supplement the host's database.

DIGITAL UNIX also supports Sun's Network Information Service (NIS), formerly known as Yellow Pages (YP). NIS can be used to replace or supplement hosts, aliases, group, networks, password, protocols, rpc, and services databases.

Network Time Protocol (NTP)

DIGITAL UNIX provides the Network Time Protocol (NTP) V3 to synchronize and distribute the time for all machines in a network environment. The time synchronization daemon, xntpd, is used to distribute time to all machines in a network.

Time Synchronization Protocol (TSP)

DIGITAL UNIX provides Berkeley's Time Synchronization Protocol (TSP) to synchronize the time of all machines in a network without ensuring the accuracy of the time that is provided.

Local Area Transport (LAT)

DIGITAL UNIX provides a STREAMS-based implementation of the Local Area Transport (LAT) that serves terminals to one or more service nodes on a local area network (LAN). LAT allows a host to function as both a service node and a server node. It also enables host applications to initiate connections to server ports (designated as application ports) to access remote devices such as printers.

LAT/Telnet Gateway

The LAT/Telnet gateway service supported in DIGITAL UNIX provides a gateway from a LAT terminal server to allow connections to TCP/IP nodes using intermediate LAT hosts.

Number of Logins

The following maximum number of logins is supported:

RLOGIN:	3,162*
Telnet:	3,162*
LAT:	4,575*

*These numbers can vary depending on hardware configurations and user workloads.

Netscape

DIGITAL UNIX includes the Netscape Communicator V4.05 Internet Client World-Wide-Web browser. The software license for this bundled version of the Netscape Navigator Internet client is included with the DIGITAL UNIX base license. Users of earlier versions of DIGITAL UNIX are licensed to use the Netscape Communicator Internet client when they update to V3.2C or V4.0 with an update license or with update services. The Netscape Navigator Internet client includes support for Latin, Japanese, Chinese, and Korean fonts.

DIGITAL UNIX also includes the Netscape Fastrack® V3.01 Internet World-Wide-Web server. The software license for this bundled version of the Netscape Fastrack V3.01 is included with the DIGITAL UNIX base license. Users of earlier versions of DIGITAL UNIX are licensed to use the Netscape Fastrack server when they update to V3.2C or V4.0 with an update license or with update services.

RFC Standards

The DIGITAL UNIX Operating System implements the following Internet RFC (Request for Comment) and Non-RFC standards:

RFC	Protocol	Name
678	_____	Standard File Formats
768	UDP	User Datagram Protocol
791	IP	Internet Protocol as amended by RFCs 922 and 950
792	ICMP	Internet Control Message Protocol
793	TCP	Transmission Control Protocol
821	SMTP	Simple Mail Transfer Protocol
822	MAIL	Format of Electronic Mail Messages
826	ARP	Address Resolution Protocol
854	TELNET	Telnet Protocol
855	______	Telnet option specifications
856	______	Telnet binary transmission
857	______	Telnet echo option
858	______	Telnet Suppress Go Ahead option
859	______	Telnet status option
868	TIME	Time Protocol
893	______	Trailer Encapsulations
894	IP-E	Internet Protocol on Ethernet Networks
903	RARP	Reverse Address Resolution Protocol
904	EGP	Exterior Gateway Protocol
919	______	Broadcast Datagram over IP
922	______	IP Broadcast Datagrams with Subnets
950	______	IP Subnet Extension

951	BOOTP	The Bootstrap Protocol
954	RPC	NICNAME/WHOIS (Obsoletes RFC 812)
959	FTP	File Transfer Protocol
1014	XDR	External Data Representation
1034, 1035	DOMAIN	Domain Name System
1042	IP-IEEE	Internet Protocol on IEEE 802
1049	______	Content-Type Field for Internet Messages
1050	RPC	Sun® Remote Procedure Calls
1055	SLIP	Serial Line Internet Protocol
1057	______	Portmapper
1058	RIP	Routing Information Protocol
1094	NFS	Network File System Protocol
1112	______	Host Extensions for IP Multicast
1116	______	Telnet Line Mode Option
1119	NTP	Network Time Protocol minus authentication
1122	______	Requirements for Internet Hosts Communication Layers (Must Level)
1123	______	Requirements for Internet Hosts Applications and Support (Must Level)
1144	CSLIP	Compressing TCP/IP Headers for Low-Speed Serial Links
1155	SMI	Structure of Management Information
1156	MIB	Management Information Base
1157	SNMP	Simple Network Management Protocol
1188	IP-FDDI	Transmission of IP over FDDI (Obsoletes RFC 1103)
1191	______	Path MTU Discovery (router specification, host specification (TCP only))
1212	______	Concise MIB definitions
1213	MIB-II	Management Information Base II (supercedes RFC 1158 and 1156)
1225	POP3	Post Office Protocol, Rev. 3
1231	______	IEEE 802.5 Token Ring MIB (Set operations are not supported)
1253	______	OSPF Version 2 Management Information Base
1256	ICMP	Router Discovery Messages
1282	______	BSD rlogin
1285	______	FDDI Management Information Base (Set operations are not supported)
1288	FINGER	Finger Protocol (Obsoletes RFC 1196)
1305	NTP	Network Time Protocol V3.0
1321	MD5	The MD5 Message Digest Algorithm
1323	TCP-HIPER	TCP Extensions for High Performance (Window Scale option only)
1332	IPCP	The PPP Internet Protocol Control Protocol (Obsoletes RFC 1172)
1334	PAP/ CHAP	PPP Authentication Protocols
1350	TFTP	Trivial File Transfer Protocol (Obsoletes RFC 783)
1483	______	Multiprotocol Encapsulation over ATM AAL5 (routed protocol encapsulation only)
1497	BOOTP	BOOTP Vendor Information Extensions (obsoletes RFC 1048, 1084, 1395; updates RFC 951)
1514	______	Host Resources MIB (Set operations are not supported)
1518	CIDR	An architecture for IP Address Allocation with CIDR
1521	______	MIME support as stated in Appendix A of this RFC
1533	DHCP	DHCP options and BOOTP Vendor Extensions
1534	______	Interoperation between DHCP and BOOTP
1541	DHCP	Dynamic Host Configuration Protocol
1542	______	Clarifications and Extensions for the Bootstrap Protocol (Obsoletes RFC 1532; Updates RFC 951)
1547	IS-PPP	Requirements for an Internet Standard Point-to-Point Protocol
1571	______	Telnet Environment Option Interoperability Issues
1572	______	Telnet Environment Option
1577	______	Classical IP over ATM
1583	OSPF	OSPF V2 (Obsoletes RFC 1247)
1589	______	A Kernel Model for Precision Time-keeping (the support to discipline the system clock to an external precision timing source is not supported)
1626	______	Default MTU for IP over ATM
1661	PPP	The Point-to-Point Protocol (Obsoletes RFCs 1548,1331, and 1171) (asynchronous IP only)
1700	______	Assigned Numbers (obsoletes RFC 1340, etc.)
1755	______	Signaling for IP of ATM
1813	NFS	Network File System Version 3 Protocol
1953	IFMP	Ipsilon Flow Management Protocol Specification for IPv4

1954	______	Transmission of Flow Labeled IPv4 on ATM Data Links
2001	______	TCP Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery Algorithms

Non-RFC Standards

- 4.3BSD and 4.4BSD Socket Interface
- 4.3BSD inetd
- 4.3BSD lpd
- 4.3BSD netstat
- 4.3BSD ping
- 4.3BSD rcp
- 4.3BSD rexecd
- 4.3BSD rlogin
- 4.3BSD rmt
- 4.3BSD rsh
- 4.3BSD Sendmail V5.65 with IDA enhancements
- 4.4BSD Sendmail V8.8.8 (default)
- 4.3BSD syslog
- uucp Basic Networking Utilities (HoneyDanBer)
- X/Open Transport Interface (XTI)
- Sun Open Network Computing (ONC) 4.2
- New rdist command packaged as optional nrdisk
- BSD Packet Data Compression (for PPP)

SECURITY

The DIGITAL UNIX Operating System, running Enhanced Security, is designed to meet, and in some cases, exceed the requirements of the C2 evaluation class of DoD 5200.28-STD "Trusted Computer System Evaluation Criteria", also known as the Orange Book.

DIGITAL UNIX supports various configurations and setup scripts which allow selection of desired Enhanced Security features such as extended passwords, audit, and Access Control Lists (ACLs).

System Administrators can choose between command line interfaces or GUIs.

Network Information Service (NIS) Compatibility

Support is provided for accessing NIS distributed databases while running Enhanced Security. NIS can also be used to distribute the Enhanced Security protected password database. The number of simultaneous logins allowed depends on the configuration.

Security Integration Architecture

All security mechanisms on DIGITAL UNIX are part of the Security Integration Architecture (SIA), which isolates security-sensitive commands from the specific security mechanisms, thus eliminating need to modify the security-sensitive commands for each new security mechanism.

The following C2 security functionality is included in DIGITAL UNIX:

Discretionary Access Controls (DAC) – Allows users to define how the resources they create can be shared. Optional access control lists (ACLs) provide greater granularity of file system object protection at the individual user level than the default DAC protection. The ACL mechanism is designed to POSIX draft 13, with some draft 15 enhancements.

Auditing – Allows users to monitor normal, as well as unauthorized usage of a system with a choice of a GUI or command line interface.

Identification and Authentication – Password length and lifetime are based on the Department of Defense Password Management Guideline (Green Book). Includes extensive login controls, such as automatic account lockout, account vacationing, per terminal settings for delays and maximum consecutive failed logins, password usage history and system generated password.

Object Reuse – Ensures that the physical storage that is assigned to shared objects or that is released prior to reassignment to another user does not contain data from previous users.

Integrity – Allows users to validate the correct operation of hardware, firmware, and software components of the Trusted Computing Base (TCB).

System Architecture – A separate execution domain is maintained for the Trusted Computing Base (TCB) components using hardware memory management to protect the TCB while it is executing.

Note: DIGITAL UNIX, with Enhanced Security, provides tools and mechanisms that help the system maintain the level of trust for which the system was designed. No system can provide complete security and Compaq cannot guarantee system security. However, Compaq continually strives to enhance the security capabilities of its products. Customers are strongly advised to follow industry recognized security practices

DEVELOPMENT ENVIRONMENT

DEC Ada Run-time Libraries

The DEC Ada run-time support libraries (libada.a and libada.so) enable users to run previously compiled programs that require the DEC Ada libraries at run-time. These libraries support Ada program functions in areas including Tasking, Exceptions, Timer Services, and Miscellaneous Computations.

DEC FORTRAN Run-time Libraries

The DEC FORTRAN run-time support libraries (libfor, libfutil, libUfor) enable users to run previously compiled programs that require the DIGITAL FORTRAN libraries at run-time. These libraries support FORTRAN program function areas including input and output, intrinsic functions, data formatting, data conversion, miscellaneous math functions, FORTRAN bindings to common operating system services, and more.

DEC C++ Run-time Libraries

The DEC C++ run-time support libraries (libcxx, libcomplex, libtask) enable users to run previously compiled applications containing DEC C++ code, without having DEC C++ installed on the target system. These libraries support DEC C++ program functions in areas including input and output, complex arithmetic, multitasking, and more.

DEC COBOL

It is Compaq Computer Corporation's strategy to recommend the use of Micro Focus COBOL, as resold by Compaq, for DIGITAL UNIX based COBOL application development. For customers developing DEC COBOL applications on VMS who also want to deliver DEC COBOL-based applications on DIGITAL UNIX, DEC COBOL run-time libraries are licensed with DIGITAL UNIX. The Compaq COBOL compilers are available as a separately licensed layered product.

The DEC COBOL run-time support libraries (libcob, libots2, libisamstub) enable users to run previously compiled programs that require the DEC COBOL libraries at run-time. These libraries support COBOL program functions in areas including file input and output, decimal arithmetic, COBOL ACCEPT/DISPLAY statements, STRING/UNSTRING operations, CALL and CANCEL, and more.

DEC Pascal Run-time Libraries

The DEC Pascal run-time support libraries (libpas.a, libpas.so, and libpas_msg.cat) enable users to run previously compiled programs that require the DEC Pascal libraries at run-time. These libraries support DEC Pascal program functions in areas including input and output, miscellaneous math functions, time and date services, miscellaneous file services, and more.

DIGITAL Portable Math Library

The DIGITAL Portable Math Library (DPML) is a common math library for FORTRAN, C, and Pascal. It provides IEEE single and double floating-point support.

ATOM Run-time Libraries

Analysis Tool with Object Modification (ATOM) enables software developers to build customized analysis tools. It uses the target application program, an instrumentation file, and an analysis file to create a new executable file which, when executed, collects analysis data for a wide variety of purposes. ATOM includes all of the runtime libraries necessary to execute ATOM-based analysis utilities and tools. The ATOM Run-time Libraries are licensed with DIGITAL UNIX. Several useful DIGITAL developed ATOM based analysis tools that facilitate program development are licensed with the DIGITAL UNIX Developers' Toolkit.

Java Development Kit

DIGITAL UNIX provides the Java® Development Kit V1.1.6, which is a port of the Java Development Kit under license from Sun Microsystems, Inc.

The Java Development Kit (JDK) includes the Java compiler (javac), Java debugger (jdb), the Code Generator for interfacing Java programs and C (javah), and the Java Virtual Machine (JVM). The javac, jdb, and javah components make up the basic set of command line tools needed to develop Java applets and applications. The JVM consists of the Interpreter, the Class Libraries, and Native Methods. Compaq has added the following enhancements: a Just-In-Time Compiler (JIT) to enhance runtime performance of the JVM; implementation of Java threads on native threads to allow the JVM to take advantage of multiple processor hardware using a pthreads interface that complies with the POSIX 1003.1c semantics; and 64-bit support. The JDK V1.1.6 for DIGITAL UNIX passes 100% of the tests provided in the Java Compatibility Kit. The JDK is included as part of the DIGITAL UNIX Operating System kit, and is subject to the terms of the Base license for DIGITAL UNIX, as well as the additional JDK license.

Memory Mapped File Support

DIGITAL UNIX supports the Berkeley mmap function and, therefore, allows an application to access data files with memory operations rather than file input and output operations.

Shells

DIGITAL UNIX provides the following shells:

- POSIX Shell
- C Shell
- Bourne Shell from System V
- Korn Shell

All shells are programmable and allow for a tailorable user environment.

Dynamic Loader

DIGITAL UNIX uses an SVR4-compatible loader to load shared libraries dynamically. This loader provides SVR4 symbol resolution semantics, including symbol preemption.

The COFF object file format is supported for all forms of object files.

Device Driver Kit (DDK)

The DIGITAL UNIX Device Driver Kit (DDK) enables OEMs, VARs, independent hardware vendors, and system integrators to quickly develop support for devices used in DIGITAL UNIX systems. Developers at companies that manufacture disk drives, printers, graphics devices, network devices, real-time devices, and so on, can use this kit to create the drivers that make it possible to sell into the growing base of DIGITAL UNIX servers and workstations.

The DIGITAL UNIX Device Driver Kit (DDK) provides documentation and templates for device driver developers, and the X Developers' kit, which makes it possible to develop device-specific X Windows support for graphics options.

To obtain the DIGITAL UNIX Device Driver Kit, refer to the "Ordering Information" section of this SPD.

DDK Customers must be licensed users of DIGITAL UNIX and the Developers' Toolkit for DIGITAL UNIX.

Data Access (ODBC and JDBC)

DIGITAL UNIX provides the family of INTERSOLV DataDirect software products to enable ODBC and JDBC connectivity for your applications. This is optional software for use in developing and deploying applications and is licensed as part of the DIGITAL UNIX operating system license.

SequeLink ODBC Edition is a universal ODBC client component. DataDirect SequeLink ODBC provides transparent connectivity to almost any type of client, network, server or database.

For developers working with Java, JDBC provides Java applications to access data sources and databases across platforms. The SequeLink Java Edition is a universal standards-based implementation of JDBC. It is flexible in design, providing scaleable connectivity from multivendor client, server, and web environments to industry-leading relational databases. It is optimized and tuned for the Java environment, extending the functionality and performance of existing systems and easily incorporating new technologies.

Data Link Interface (DLI)

DIGITAL UNIX provides a Data Link Interface to allow applications to directly use the data link layer services in order to interact directly with the network device drivers.

Loadable Subsystems Framework

DIGITAL UNIX includes configuration manager framework, which allows dynamic loading (and configuring) of kernel subsystems. The framework, composed of a configuration manager daemon (cfgmgr), a kernel loader daemon (kloadsrv), a system configuration database (sysconfigtab) and its management utility (sysconfigdb), allows kernel modules (such as device drivers) to be loaded after the system is booted.

Foreign Device Boot Support

DIGITAL UNIX provides the ability for device driver developers to build and deliver single binary drivers that work at installation time. This allows the device to be used during the installation process. This ability is currently only supported for graphics device drivers.

Loadable Drivers Framework

Device driver suppliers may now dynamically load their drivers into the kernel using the configuration manager framework. Functions provided to facilitate integration of third-party device support include:

- Autoconfiguration support
- Interrupt registration support
- Installation support
- Loadable driver support for the following buses:
- TURBOchannel
- EISA
- ISA
- PCI
- SCSI peripheral devices
- VMEbus

Common Access Method (CAM)

Common Access Method (CAM) is an ANSI standard for the software drivers that provide the interface between an operating system and a SCSI device. The DIGITAL UNIX CAM implementation is highly compatible with ANSI X3.131-1986, Level 2 and supports SCSI-2 based CAM.

Internationalization

The DIGITAL UNIX internationalization environment, tools, and localization features enable the development and execution of internationalized software without re-engineering the user application. The following character sets are supported:

Single Byte Character Sets - Languages (Locales)

Catalan (1)	Czech (2)	Danish (1)
Dutch (2)	English (3)	Finnish (1)
French (4)	German (2)	Greek (2)
Hebrew (2)	Hungarian (2)	Icelandic (1)
Italian (1)	Lithuanian (1)	Slovene (1)
Norwegian (1)	Polish (2)	Portuguese (1)
Russian (1)	Slovak (2)	Spanish (1)
Swedish (1)	Thai (1)	Turkish (2)

Multibyte Character Sets - Languages (Locales)

Simplified Chinese (8)	Traditional Chinese (20)
Japanese (6)	Hong Kong (7)
Korean (3)	

DIGITAL UNIX base operating system functionality includes:

- 32-bit wide character support
- XPG4 Worldwide Portability Interfaces (WPI)
- Multibyte Support Extensions (MSE) of the ISO C standard (ISO/IEC 9899:1990/Amendment 1:1994(E))
- Internationalized commands
- Internationalized X/Open Curses library (libcurses)
- iconv library (libiconv, an International Codeset Conversion Library)
- Locale utilities
- Date, time, currency, and numeric formats in the native languages
- Character Classification - isupper, islower, iscntrl, is * functions
- Collation - Character sort order of the codeset
- Yes and No response in the native language
- Fonts for supported character sets
- TTY Drivers - Support for various input functionalities for the native languages
- Translated CDE and Motif User Interface
- Keymaps for local keyboards
- Support for all Language Variants using the North American keyboard
- Input method support for Hebrew and Asian languages
- Printing in the native languages

Unicode Support

DIGITAL UNIX supports the Unicode Version 2.1 and ISO 10646 standards through a set of UCS-4 and UFF-8 based locales. Codeset conversion capability to/from UCS-4, UCS-2 (UTF-16) and UTF-8 formats is provided for all supported codesets. Conversion support from Unicode to/from a number of single-byte PC codepages and from those PC codepages to the ISO Latin codeset is provided. Limited Unicode character transformation support is also provided.

Unicode - Language (Locales)

Danish (1)	French (3)	Portuguese (1)
Dutch (2)	German (2)	Spanish (1)
English (1)	Italian (1)	Swedish (1)
Finnish (1)	Norwegian (1)	

Euro Currency Support

DIGITAL UNIX supports the processing of the new Euro currency symbol through the use of Unicode V2.1. Applications running in the Unicode (UTF-8) locales can display, process, and print the Euro provided the applications have been modified to recognize the Euro character.

Memory Requirements for Asian Language Variants

Applications running under a single Asian language variant can operate within the memory requirements of the base operating system. Running multiple Asian language variants in a single session requires additional memory for satisfactory performance.

OPTIONAL SOFTWARE

Developers' Toolkit

The Developers' Toolkit for DIGITAL UNIX provides a robust set of tools that help you write effective applications. You get an ANSI compliant C compiler with advanced optimization capabilities; a state-op-the-art debugger that supports threads services to optimize SMP systems; in depth profiling and reordering tools that analyze CPU usage, heap memory and streamline applications; porting tools that reduce the time and cost of moving applications from 32-bit UNIX, and OpenVMS systems to 64-bit DIGITAL UNIX; GUI-based development and traditional command line interfaces; plus an extensive library of routines that simplify the process of creating your own development tools. You can improve the quality of your applications, optimize the power of Alpha and streamline your development timeline. The Developers' Toolkit for DIGITAL UNIX is a prerequisite for all DIGITAL UNIX development tools. This product is licensed separately from DIGITAL UNIX Operating System. (SPD 44.36.xx)

Server Extensions

The DIGITAL UNIX Server Extensions provides system managers with the ability to set up and perform network installations using DIGITAL's Remote Installation Service (RIS), and includes support for dataless configurations. (SPD 44.35.xx)

Logical Storage Manager

The DIGITAL UNIX Logical Storage Manager is an integrated, host-based solution to data storage management, providing concatenation, striping, mirroring, and a graphical user interface that allows data storage management functions to be performed online, without disrupting users or applications. (SPD 51.24.xx). The Logical Storage Manager product can also be ordered as StorageWorks Software and StorageWorks Software PLUS.

TruCluster Available Server

The TruCluster Available Server Software solution significantly reduces downtime due to hardware and software failures. A TruCluster Available Server Software environment is an integrated organization of systems and external disks connected to shared SCSI buses that together provide highly available software and disk data to client systems. It is designed for computing environments that can tolerate a short disruption, but need critical applications automatically restarted. (SPD 44.17.xx).

TruCluster Production Server

TruCluster Production Server Software combines the advantages of symmetric multiprocessing, distributed computing, and fault resilience in a cluster configuration. TruCluster Production Server Software supports highly parallelized database applications. It allows the processing components of an application to concurrently access raw devices. It uses a Distributed Lock Manager (DLM) to synchronize cluster-wide access to shared resources thereby ensuring data integrity. (SPD 63.92.xx).

TruCluster MEMORY CHANNEL

TruCluster MEMORY CHANNEL Software is an enabler for highly optimized applications that require high performance data delivery over the MEMORY CHANNEL interconnect. The product's software library provides application programming interfaces (APIs) for access to MEMORY CHANNEL data transfer and locking functions. (SPD 60.55.xx).

Advanced File System Utilities

The Advanced File System Utilities extend the high availability and flexibility of AdvFS. The AdvFS Utilities provide a Graphical User Interface (GUI) to ease management tasks and online utilities to dynamically resize file systems, balance percentage of space used on volumes, undelete files using trashcans, stripe files, and clone files for hot backup. (SPD 44.52.xx). The Advanced File System Utilities product can also be ordered as StorageWorks Software and StorageWorks Software PLUS.

Networker

NetWorker Client Support provides the ability to save and restore file systems. NetWorker software is licensed separately from DIGITAL UNIX. (SPD 50.98.xx). The Networker Save and Restore product can also be ordered as StorageWorks Software PLUS.

StorageWorks

The DIGITAL StorageWorks Software package includes two key storage products: Logical Storage Manager and Advanced File System Utilities. StorageWorks Software delivers high availability, configuration flexibility online, optimal file system performance, and data protection. The StorageWorks Software PLUS includes StorageWorks Software and Networker Save and Restore, the leading UNIX storage management backup software. Part numbers are: StorageWorks Software (QB-5RXA*-AA) and StorageWorks Software PLUS (QB-5RYA*-AA).

System V Environment

The System V Environment for DIGITAL UNIX provides System V Release 4 (SVR4) system administration utilities, developer tools, and general user commands that extend the SVR4 functionality inherent in the DIGITAL UNIX Operating System. The System V Environment for DIGITAL UNIX is compliant with the System V Interface Definition, Issue 3 (SVID3) Volumes 1-3. (SPD 46.16.xx)

Advanced Server for DIGITAL UNIX

Advanced Server for DIGITAL UNIX (ASDU) provides seamless interoperability between DIGITAL UNIX servers, Windows NT servers, and Microsoft Windows clients. The ASDU software enables a DIGITAL UNIX system to run the services that make it appear as a Microsoft Advanced Server. Through the ASDU software, DIGITAL UNIX resources are available to Microsoft users without modification to their software.

The ASDU server is an evolution of the PATHWORKS Version 6.x for DIGITAL UNIX (Advanced Server) product, and provides improvements such as support for mixed-case and long file names and a seamless upgrade procedure. The ASDU media and documentation are delivered on the DIGITAL UNIX Associated Products Volume 2 CD-ROM. Two clients can use complimentary licenses after you install and configure the ASDU software. Additional ASDU licenses can be purchased and loaded into the License Management Facility (LMF) on the system where the ASDU software is installed (SPD 61.56.xx).

Open3D

DIGITAL Open3D provides a complete development and runtime environment for 2D and 3D applications. Open3D provides support for many graphic accelerators on Alpha systems. All Open3D TURBOchannel devices will be retired in the next major release of DIGITAL UNIX. Digital Open3D V4.4 will be the last version of Open3D to support the DDX and graphic adapters. See the DIGITAL UNIX V4.0E Release Notes for more information. (SPD 45.07.xx)

Prestoserve

Prestoserve for DIGITAL UNIX, available on most Alpha systems, is a disk write accelerator for disk block device write operations. (SPD 35.11.xx)

Multimedia Services

Multimedia Services for DIGITAL UNIX brings audio and video capabilities to Compaq's workstations, and provides a full programming library for use by developers of new applications. The Multimedia Services Runtime license is included with DIGITAL UNIX Base operating system. (SPD 48.92)

DECtalk

DECtalk Software for DIGITAL UNIX is an application and application programming interface based on Compaq Computer Corporation's industry leading text-to-speech synthesis technology. This version of DECtalk has been enhanced to work under the Common Desktop Environment (CDE) for UNIX. (SPD 48.98.01)

SCSI CAM Layered Components

SCSI CAM Layered Components (CLC) provides device drivers and tools for two types of SCSI devices: robotic medium changers (found in tape and optical libraries), and magneto-optical disk drives (both read-write optical and WORM). Permission to use CLC is granted for use with several applications, which are listed in the CLC Release Notes. Devices supported by CLC are those changer and optical devices supported by these applications. A partial list of supported devices can be found in the CLC Release Notes. (SPD 50.68.09)

SOURCE MATERIALS OPTIONS

A source kit is available for users who need to retrieve and modify selected source modules. Although every attempt is made to include accurate source modules, Compaq does not warrant the ability to build a binary kit. Limited documentation is also provided. Compaq does not warrant the results of using the source kit to change selected portions of the system.

Customers who are appropriately licensed by the Open Software Foundation (OSF) and by Santa Cruz Operation (SCO) may obtain optional source material for this software product.

Most users do not require source materials. Sources are used primarily by those with an in-depth knowledge of operating system internals to make highly specialized modifications to the software product.

The following minimum conditions must be satisfied prior to each distribution (initial distribution or revision) of source materials:

- Customers must be currently licensed by the OSF to use OSF/1 R1.2 source code on a designated CPU for which source materials are to be ordered. OSF must verify to Compaq that the customer's OSF/1 source license is valid.
- Customers must be currently licensed by the OSF to use Motif R1.2.3 source code on a designated CPU for which source materials are to be ordered. OSF must verify to Compaq that the customer's Motif source license is valid.
- Customers must be currently licensed by the Santa Cruz Operation (SCO) for the 3B2 implementation of UNIX System V Release 3.2 (or later) source code on a designated CPU for which source materials are to be ordered. SCO

must verify to Compaq that the customer's UNIX source license is valid.

- Customers must have signed DIGITAL's Software Program Sources License Agreement for the facility or site where the CPU is located.

Source kits provided by Compaq do not necessarily contain all source files used by Compaq to build object code kits. Compaq provides these source kits on a reference-only basis. Compaq does not provide support for source code as part of the standard SPS offerings. These sources are distributed on an "AS IS" basis.

The source code distribution provides users with a source license and the machine-readable source code for this software product. Subject to the terms and conditions of the OSF/1 source license from the OSF and the UNIX source license from SCO, this option gives customers the right to use this source code on any CPU at the facility/location (as specified in the above mentioned agreements with Compaq) that has a Single-Use License for the object code.

The source code distribution update option provides users with the machine-readable source code for a revised version of this software product. Subject to the terms and conditions of the OSF/1 source license from the OSF and the UNIX source license from SCO, this option gives users the right to use this revised source code on any CPU at the facility/location (as specified in the above mentioned agreements with Compaq) that has a Single-Use License for the object code and is also listed on the Source License for this product.

HARDWARE REQUIREMENTS

The DIGITAL UNIX Operating System can execute on valid DIGITAL Alpha systems and must include the following minimum system configuration:

DIGITAL UNIX requires the minimum component of main memory to be 64 MB.

- The minimum disk space requirement for installing the DIGITAL UNIX Operating System is changing due to additional features and services being added. Effective in the next major release of DIGITAL UNIX (no sooner than June, 1999), the minimum disk space required to support a single disk operating system installation will be 1GB (such as an RZ26) for default and custom installations.
- The following numbers were compiled from typical update installations from V4.0B, V4.0C, and V4.0D to V4.0E. The Additional Space Needed values represent the typical amount of space needed per file system by the update installation procedure during the course of an update. These values account for additional processing space for temporary files required by the update installation and vary with the specific hardware configuration and file system type. These values were determined before the use of the Update Administration Utility.

File System	File System Type	V4.0B Mandatory Subsets Only	V4.0E Mandatory Subsets Only	Additional Space Needed
/	Ufs	41.65	44.69	5.27
/usr	Ufs	171.43	205.64	38.12

File System	File System Type	V4.0B All Subsets	V4.0E All Subsets	Additional Space Needed
/	ufs	50.21	53.39	5.75
/usr	ufs	332.04	368.59	42.32
/var	ufs	5.40	5.21	0.00
/	AdvFs	51.41	54.61	6.93
/usr	AdvFs	331.57	368.33	56.80
/var	AdvFs	6.16	6.00	0.00

File System	File System Type	V4.0C Mandatory Subsets Only	V4.0E Mandatory Subsets Only	Additional Space Needed
/	Ufs	42.08	44.71	4.91
/usr	Ufs	171.88	205.95	38.10

File System	File System Type	V4.0C All Subsets	V4.0E All Subsets	Additional Space Needed
/	Ufs	50.68	53.45	5.40
/usr	ufs	332.08	368.56	42.29
/var	ufs	5.56	5.36	0.00
/	AdvFs	51.96	54.77	6.50
/usr	AdvFs	331.63	368.33	56.75
/var	AdvFs	6.34	6.20	0.00

File System	File System Type	V4.0D Mandatory Subsets Only	V4.0E Mandatory Subsets Only	Additional Space Needed

/	Ufs	41.12	44.60	5.69
/usr	Ufs	186.71	209.29	26.62

File System	File System Type	V4.0D All Subsets	V4.0E All Subsets	Additional Space Needed
/	Ufs	49.72	53.29	6.12
/usr	ufs	350.15	368.13	22.79
/var	ufs	5.68	5.36	0.00
/	AdvFs	50.90	54.65	7.52
/usr	AdvFs	349.70	367.88	36.61
/var	AdvFs	6.29	6.21	0.00

- For systems on which the number of installed subsets is greater than for the Default Installation but fewer than for the Custom Installation, selecting all BASE software subsets will require varying minimum disk space for an update installation. Refer to the *Installation Guide* for a list of subset sizes.
- The supported load devices include CD-ROM readers (such as RRD44) or a variety of network interfaces.
- DIGITAL UNIX requires one console terminal with ASCII capabilities or one DIGITAL graphics display console for Alpha systems.

In addition to base DIGITAL UNIX disk space requirements, the following amount of disk space is required for language variants.

The language variant components are structured with a common part and an individual part for each language variant. The common part is a prerequisite for any individual language component listed below.

Common Part:

Mandatory for base O/S	0.58MB
Optional for base O/S	2.76MB
Mandatory for workstations	2.46MB
Optional for workstations	80.86MB

- Mandatory for workstations is required for enabling windowing functionality.

Language	Required Base Subsets	Optional Base Subsets	Required Wrkstn Subsets	Optional Wrkstn Subsets	Total
Catalan	0.77mb	0.00mb	4.02mb	12.83mb	17.63mb
Chinese (PRC)	1.43mb	18.19mb	7.37mb	26.18mb	53.17mb
Czech	0.00	2.51	4.48	5.83	12.81
Danish	0.77	0.00	0.00	0.00	0.77
Dutch	0.77	0.00	0.00	0.00	0.77
Finnish	0.77	0.00	0.00	0.00	0.77
French	0.77	0.00	4.00	11.27	16.04
German	0.77	0.00	4.01	11.11	15.89
Greek	0.77	1.39	0.98	1.12	4.26
Hebrew	0.05	1.35	1.26	1.94	4.61
HongKong	3.00	31.35	17.83	48.06	100.24
Hungarian	0.00	2.50	4.40	5.83	12.74
Icelandic	0.77	0.00	0.00	0.00	0.77
Italian	0.77	0.00	4.50	9.12	13.94
Japanese	6.68	42.59	22.87	26.57	98.72
Korean	1.53	6.25	5.53	8.94	22.24
Lithuania	0.00	0.00	.091	3.43	4.34
Norwegian	0.77	0.00	0.00	0.00	0.77
Polish	0.00	2.51	4.52	5.83	12.87
Portuguese	0.77	0.00	0.00	0.00	.077
Russian	0.00	1.67	4.45	4.36	10.48
Slovene	0.00	2.46	0.92	3.40	6.78
Slovak	0.00	2.51	4.74	5.92	13.17
Spanish	0.77	0.00	4.02	12.83	17.63
Swedish	0.77	0.00	3.77	2.44	6.98
Taiwan	2.13	29.96	14.02	24.65	70.76
Thai	0.58	3.40	2.53	1.21	7.72
Turkish	0.77	2.45	1.01	3.27	7.49

OPTIONAL HARDWARE

Additional memory and/or secondary storage may be required depending upon the usage of the DIGITAL UNIX Operating System software and/or optional software products.

Combinations of hardware options are subject to limitations such as bandwidth, physical configuration restraints, thermal dissipation, electrical loads, and power supply.

System configuration details are described in the DIGITAL *Systems and Options Catalog*.

Hardware options supported by DIGITAL UNIX are listed in the Hardware Tables at the back of this SPD.

SUPPORTED HARDWARE

Combinations of hardware options are subject to limitations such as bandwidth, physical configuration constraints, and electrical load and power supply.

The hardware tables in this Software Product Description do not describe all possible hardware configurations or circumstances. Any particular configuration should be discussed with COMPAQ. Contact COMPAQ for the most up-to-date information on possible hardware configurations.

COMPAQ reserves the right to change the number and type of devices supported by DIGITAL UNIX. The minimum hardware requirements for future versions and updates of DIGITAL UNIX may be different from current requirements. For configuration details about Alpha systems, refer to the COMPAQ *Systems and Options Catalog* and the *Networks and Communications Buyer's Guide.*

Embedded and Real-time Boards

An Embedded and Real-time OEM is a hard goods/capital equipment manufacturer that utilizes Compaq's products embedded in the OEM's own products. The COMPAQ products act as specialized controllers of specific functions in the OEM's product, not as a general-purpose computer.

Compaq products may be physically embedded within the OEM's product (for example, a CPU board and software inside a telephone switch) or may be functionally integrated into the solution (for example, a system box and software controlling a flight simulator). The Compaq product is perceived by the end customer to be an integral and dedicated component of the Embedded and Real-time OEM's product, NOT a general-purpose computer.

SCSI Device Support

The DIGITAL UNIX Operating System supports the ANSI SCSI-2 standard. The SCSI devices listed in Table 1 at the back of this SPD have been certified for use with the DIGITAL UNIX Operating System. Refer to appropriate platform *Systems and Options Catalog* for system specific restrictions.

Symmetric Multiprocessing (SMP)

Symmetric multiprocessing (SMP) enables systems with two or more processors to execute the same copy of the operating system, access common memory, and execute instructions simultaneously. The SMP functionality fully exploits the additional compute capabilities of multiple processors. Capabilities include:

- Multiple threads from the same or different tasks can run concurrently on different processors.
- Process Affinity - Allows binding a process to a specific processor.
- Unattended Reboot - On a hard failure of a nonboot processor, the operating system tags the failing CPU and reboots the system, without enabling the defective CPU.
- Stop/Start CPU - Ability to stop/start a specified nonboot processor.
- Processor Sets - Ability to dedicate a process, or set of processes, to a specific processor or set of processors. Can also be used to partition the available processors among a set of users.

PC Card Support

DIGITAL UNIX provides PCMCIA (PC Card) support for the following platforms:

- AlphaStation 200, 255, 400, 600
- AlphaServer 1000
- DIGITAL Personal Workstation au models
-

The support is limited to:

- Support of supplied ISA to PCMCIA adapters
- Support of fax/modem PC Cards:
  - MEGAHERTZ XJ2288
  - MEGAHERTZ XJ1144
  - AT&T Paradyne KeepinTouch Card
  - DIGITAL PCMCIA V3.2bis 14,400 Fax
- Hot swap capability of PC Cards

GROWTH CONSIDERATIONS

The minimum hardware and software requirements for any future version of this product may be different from the requirements for the current version.

DISTRIBUTION MEDIA

DIGITAL UNIX is distributed on CD-ROM and is ISO 9660 Level 1 compliant.

ORDERING INFORMATION

The DIGITAL UNIX Operating System license provides the right to use the software as described in this SPD. Separate licenses are available for the right to use the development tools and the C compiler (see SPD 44.36.xx for DIGITAL UNIX Developers' Extensions), and the Remote Installation Service (see SPD 44.35.xx for DIGITAL UNIX Server Extensions).

DIGITAL UNIX Operating System

Software 2-User Base Licenses: QL-MT4A*-**

Software User Licenses: QL-MT7A*-**

Software Product Services: QT-MT4A*-**/ QT-MT7A*-**

Software Media Kit: DIGITAL UNIX Operating System: QA-MT4AA-H8

The Software Media kit includes CD-ROMs containing the operating system binaries and complete DIGITAL

UNIX online documentation. Hardcopy start-up documentation is also included in the Media kit, including the *Installation Guide*, *Release Notes* and *Technical Overview*.

Device Driver Kit: QA-MT4AV-G8

Software Documentation

Documentation for DIGITAL UNIX is provided on the Documentation CD-ROM. It is also available on the World Wide Web and in printed form.

The software Media Kit (QA-MT4AA-H8) includes the Documentation CD-ROM and printed versions of the books in the Startup Kit. The Documentation CD-ROM is also separately orderable (QA-MT4AA-G8).

The structure of the printed DIGITAL UNIX Documentation kit and its subkits follows. Each kit contains the subkits that are indented below it:

- DIGITAL UNIX Documentation Kit (QA-MT4AA-GZ)
    - End User Documentation Kit (QA-MT4AB-GZ)
        - Startup Kit (QA-MT4AC-GZ
        - System and Network Management Kit (QA-MT4AE-GZ)
        - General User Kit (QA-MT4AD-GZ)
    - Developer's Kit (QA-MT5AA-GZ)
        - General Programming Kit (QA-MT5AB-GZ)
        - Windows Programming Kit (QA-MT5AC-GZ)

Included in these kits are several books that are published by companies other than Compaq. Those books are available only in printed form. All of the other books in these kits are provided online on the Documentation CD-ROM.

Reference pages for DIGITAL UNIX are provided on the operating system CD-ROM, the Documentation CD-ROM, and the World Wide Web. They can also be purchased in printed form in a separately orderable kit (QA-MT4AG-GZ).

Documentation on writing device drivers is provided with the DIGITAL UNIX Device Driver Kit (QA-MT4AV-G8) and on the World Wide Web.

The URL to view the DIGITAL UNIX documentation is:

http://www.UNIX.digital.com/faqs/publications/pub_page/pubs_page.html

Source Distribution

Source License/Distribution: QB-MT4AA-E8

Update Source License/Distribution: QB-MT4AE-E8

Education Source License/Distribution: QB-MT4BA-E8

Education Update Source License/Distribution: QB-MT4BE-E8

For more information see the Source Materials Options section of this SPD.

* Denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

SOFTWARE LICENSING

DIGITAL UNIX Operating System software is furnished under the licensing of Compaq Computer Corporation's Standard Terms and Conditions.

Four types of DIGITAL UNIX Operating System licenses are available on Alpha processors:

Operating System Base License (QL-MT4A*-6*)

LMF Product Name: OSF-BASE

This license grants the right to noninteractive use of the file, application, batch, print, and compute services of DIGITAL UNIX Operating System on a single processor.

This license also authorizes up to two concurrent interactive users of the system. An interactive user, either a person or device, is one that is logged in to a DIGITAL UNIX processor or is interactively using the operating system software by means other than a login. The two interactive users authorized as part of the Operating System Base License are additive with Concurrent Use License quantities, but may not be separated from the Operating System Base License.

In addition to the two interactive users, login as root is authorized for system management purposes only. If a DIGITAL UNIX Base License is not registered and activated using the LMF, then login by root only is permitted for system management purposes.

The Operating System Base License is a prerequisite for Concurrent Use Licenses, Unlimited Interactive User Licenses, and SMP Extensions to Base Licenses.

Symmetric Multiprocessing (SMP) Extension to Base License (QL-MT4A9-6*)

LMF Product Name: OSF-BASE

SMP Extensions extend the Operating System Base License to enable symmetric multiprocessing (SMP) capability on those DIGITAL UNIX systems supporting SMP. SMP Extensions to Base are permanently tied to the Operating System Base License and may not be separated from the Operating System Base License if an SMP board is removed from the system.

One SMP Extension License is needed for each active processor in the SMP system that is additional to the initial processor authorized by the Operating System Base License.

SMP Extensions grant the right to use the same version of the Operating System software as permitted by the corresponding Operating System Base License at the time when the SMP Extension is installed.

Concurrent Use Licenses (QL-MT7AM-3*)

LMF Product Name: OSF-USR

An Operating System Base License is a prerequisite for Concurrent Use Licenses on the same system.

These licenses grant the right to interactive use of the DIGITAL UNIX Operating System. The Concurrent Use Licenses are available in various quantities, which can be combined to match any total desired.

Multiple user licenses of the same or different quantities may be installed and used together on a given system to authorize system use by the sum of their quantities. These user licenses authorize users in addition to the two users authorized as part of the Operating System Base License.

Concurrent Use Licenses are redesignatable and can be installed and used only on a single DIGITAL UNIX system at a time.

An interactive user, either a person or device, is one that is logged in to a DIGITAL UNIX processor or is interactively using the operating system software by means other than a login.

Unlimited Interactive User Licenses (QL-MT7A*-AA)

LMF Product Name: OSF-USR

An Operating System Base License is a prerequisite for an Unlimited Interactive User License for use on the same system.

This license grants the right to use the DIGITAL UNIX Operating System by an unlimited number of interactive users on a system.

An Unlimited Interactive User License grants the right to use software versions authorized under the Operating System Base License in effect at the time of the grant of the Unlimited Interactive User License.

SOFTWARE PRODUCT SERVICES

A variety of service options are available from Compaq. For more information, contact your local Compaq office.

All licenses bundled with the DIGITAL UNIX Operating System are covered for services and support under the DIGITAL UNIX Operating System support contract.

SOFTWARE WARRANTY

This software is provided by Compaq with a 90-day conformance warranty in accordance with the Compaq warranty terms applicable to the license purchase.

Table 1[1]
Supported Systems

ALPHA SERVERS	MODEL	MODEL	MODEL	MODEL	MODEL
DEC 2000	300	500			
DEC 3000	300 300L 300X 300LX	400 400S 500 500S	500X 600 600S	700 800 800S	900
DEC 4000	6XX	7XX			
DEC 7000	6XX	7XX			
AlphaServer 300	4/266				
AlphaServer 400	4/166	4/233			
AlphaServer 800	5/333	5/400	5/500		
AlphaServer l000	4/200	4/226	5/300		
AlphaServer l000A	4/233	4/266	5/300	5/333	5/400 5/500
AlphaServer 1200	5/466	5/533			
AlphaServer 2000	4/200	4/233	4/275	5/250	5/300 5/375
AlphaServer 2l00	4/200	4/233	4/275	5/250	5/300 5/375
AlphaServer 2100A	4/275	5/250	5/300		
AlphaServer 4000	5/300	5/300E	5/400	5/466	5/533 5/600
AlphaServer 4100	5/300	5/300E	5/400	5/466	5/533 5/600
AlphaServer 8200	5/300	5/350	5/440	5/625	
AlphaServer 8400	5/300	5/350	5/440	5/625	
Compaq AlphaServer	GS60 6/525	GS140 6/525			
ALPHA WORKSTATIONS	**MODEL**	**MODEL**	**MODEL**	**MODEL**	**MODEL**
AlphaStation 200	4/100	4/166	4/233		
AlphaStation 250	4/266				
AlphaStation 400	4/233	4/266			
AlphaStation 255	4/233	4/300			
Personal Workstation	433au	500au	600au		
Ultimate Workstation	533au				
AlphaStation 500	5/266	5/333	5/400	5/500	
AlphaStation 600	5/266	5/300	5/333		
AlphaStation 600A	5/500				
BOARDS & COMPONENTS	**MODEL**	**MODEL**	**MODEL**	**MODEL**	**MODEL**
Embedded & Real-time Boards	AXPpci 33	AXPpci 33S	AXPvme 64 AXPvme 100 AXPvme 160 AXPvme 230	Alpha VME 4/244 Alpha VME 4/288 Alpha VME 5/352 Alpha VME 5/480	AlphaVME 2100 (190, 275 MHz)
Modular Computing Components	EBM43-AZ	EBM44-AZ	EBM21-AZ	EBM23-AZ	
Single Board Computers	EB66+	EB164	AlphaPC 64	AlphaPC 164	AlphaPC 164/LX AlphaPC 164/SX

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Table 2[1]

SCSI Device Support Table

CD-ROM Drives:	RRD42 RRD43	RRD44 RRD45	RRD46 RRD47
Disks:	RZ24L RZ25 RZ25F RZ25L RZ25M RZ26 RZ26F RZ26L RZ26N RZ28 RZ28B	RZ28D RZ28L RZ28M RZ29B RZ29L RZ40 RZ55 RZ56 RZ57 RZ58	RZ73 RZ74 RZ1BB RZ1BC RZ1CB RZ1CC RZ1CD RZ1DB RZ1DF RZ1EF
Solid State Disks:	EZ31 EZ32	EZ41 EZ42 EZ51 EZ54 EZ58	EZ64 EZ69 EZ705 EZ711 EZ716
Floppy Diskettes:	RX26	RX33	
FDI Floppy Diskettes:	RX23	RX23L	
Tapes:	TLZ04 TLZ06 TLZ07 TLZ09 TLZ10 TKZ08 TKZ09 TKZ60	TKZ61 TKZ62 TKZ63 TKZ64 TSZ07 TZ30 TZ85	TZ86 TZ87 TZ88 TZ89 TZK10 TZK11 TZK20 TZS20
RAID Controllers:	HSZ10 HSZ20	HSZ22 HSZ40	HSZ50 HSZ70

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Table 3[1]
Network Adapters

DE203 (ISA Ethernet)	DGLTA (TC ATM)
DE204 (ISA Ethernet)	DEFPA (PCI FDDI)
DE205 (ISA Ethernet)	DEFTA (TC FDDI)
DE422 ((EISA Lance Ethernet)	DEFZA (TC FDDI)
DE425 (EISA Tulip Ethernet)	DW110 (ISA Token Ring)
DE434 (PCI Ethernet)	DW300 (EISA Token Ring)
DE450 (PCI Ethernet)	KZPCM (PCI, 2 SCSI, 1 Ethernet)
DE500 (PCI Fast Ethernet)	KZPSM (PCI/ 1 SCSI/ 1 Ethernet)
DEFAA (FBUS + FDDI)	P2SE (PCI, 2 SCSI, 1 Ethernet)[5]
DEFEA (EISA FDDI)[1]	PBXNP (PCI Token Ring)
DEMFA (XMI Ethernet)	PBXDI
DETRA (TC Token Ring)	PMAD (Thickwire Ethernet)
DGLPB (PCI ATM)	

Table 4[1]

CI Storage Controllers

HSC40	HSC70
HSC50	HSC90
HSC65	HSC95

[1] Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/

Table 5[1]
Storage Adapters and Controllers

CIXCD-AC (XMI CI)	KZPSA (PCI FWD)
KDM70 (XMI CI)	KZPSC (PCI RAID)
KZESC (EISA RAID)	KZPSM (PCI, 1 SCSI, 1Ethernet)
KZMSA (XMI)	KZTSA (TC FWD SCSI)
KZPAA (PCI)	P2SE (PCI, 2 SCSI, 1Ethernet)
KZPAC (PCI RAID)	PMAZB (TC Dual Slow SCSI)
KZPBA (PCI)	PMAZC (TC Dual Fast SCSI)
KZPCM-DA (PCI, 2 SCSI 1 Ethernet)	PB2HA-SA: Adaptec 1742 (EISA)
KZPDA (PCI)	

Table 6[1]
Miscellaneous Adapters

KFE70-AA (EISA Bridge)	
KFTIA (ITIOP)	

Table 7[1]
ATAPI Devices

Toshiba XM-5602B	Toshiba XM-6102B
Toshiba XM-5702B	

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Table 8[1]
Graphic Subsystems

PB2GA-AA	PBXGE-XX
PB2GA-FA (ATI Mach 64 CX)	PBXGI-AX
PB2GA-JX (TRIO 64 PCI Card)	PBXWT-A (CALCOMP DB III)
PBCGI-AA/G	PMAGC-XX
PBXGA-Ax/Bx/Cx	PMAGB-BX
PBXGK-XX (ELSA/COMET) PCI	PMAGB-JX
PBXGB-XX	PMAGD-XX
PBXGC-XX	

Table 9[1]
DSA Disk Drives

RA60	RA81
RA71	RA82
RA72	RA90
RA73	RA92

Table 10[1]
DSA Tape Drives

TA78	TA90
RA79	TA91

Table 11[1]

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

DIGITAL Printers

Colormate PS	LA100	LG12
DEClaser 1100	LA120	LG12plus
DEClaser 1150	LA210	LG31
DEClaser 2100	LA30N	LGL04plus
DEClaser 2150	LA30W	LGL08plus
DEClaser 2200	LA324	LJ250
DEClaser 2250	LA424	LJ252
DEClaser 3200	LA50	LN03
DEClaser 3250	LA70	LN03 Plus
DEClaser 3500	LA75	LN03R ScriptPrinter
DEClaser 5100	LG02	LN17
	LG04plus	LN17ps
	LG06	
	LG08plus	

Table 12[1]
Third Party Parallel Printers

Epson FX-1050	Hewlett Packard LaserJet 4	IBM Proprinter
Epson FX-80	Hewlett Packard LaserJet 4M Plus	NEC Silentwriter 290
	Hewlett Packard LaserJet IIID	
	Hewlett Packard LaserJet IIIP	
	Hewlett Packard LaserJet IIP	

Table 13[1]
Worldwide Printers

CP382-D	LA280	LA88
DEClaser 1152	LA380	LA88-C
DEClaser 2300	LA380-CB	LA90
DEClaser 2400	LA380-K	LN03S-JA
DEClaser 2500	LA84	LN82R
DL510-KA	LA86	Epson LQ-1050+

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Table 14[1]
Asynchronous Terminals

VT100	VT240	VT340
VT102	VT300	VT420
VT200	VT320	VT510
VT220		

Table 15[1]
Monitors

PC7XV-DE	VRC16-H4	VRCX1-W3/W4/WA
PC7XV-DG	VRC16-HX	VRCX5-W3/W4/WA
PCXAV-F	VRC16-H4/HA	VRM17
PCXBV-DE/DF/PC	VRC16-PA/P4	VRM19
VRC14-PA/P4	VRC17-W	VRTX7-W3/W4/WA
VRC15-KA/K4	VRC21	VRT16
VRC15-KX/WX	VRC21-HA/HB/H4	VRT17
VRC15-PA/P4	VRC21-K4/KA	VRT17-PA/P4
VRC15-W	VRC21-LA/L4	VRT17-PX/WX
VRC15-WA/W3/W4	VRC21-LX/WX	VRT17-WA/W3/W4
VRC16	VRC21-PA/P4	VRTX7-W3
VRC16-HA	VRC21-W	VR319
	VRC21-WA/W3/W4	VR320

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Table 16[1]
Keyboards

PCXAL	LK47W
PBXWT (CALCOMP DB III)	LK450
LK401	LK461
LK411	LK46W
LK411	LK471
LK421	LK471
LK443	LK47W
LK444	LK97W
LK46W	LK97W

Table 17[1]
Mouse/Tablet

PBXAS-AA/AB (3 button)	PCXAS-AA
PBXWS-AA (3 button)	PCXLN-AD
PBXWS-WA (3 button)	VSXXX-AA
PBXWT-A (CalComp DB III)	VSXXX-AB
PC7XS-AA (2 button)	VSXXX-FA
PC7XS-CA (3 button)	VSXXX-GA

Table 18
Modems

PCXBF-AA (2400/9600)	PCXDF-AA/BA (FAX/Modem)
PCXCF-AA (9600/9600)	DF02
PCXDF-AA (14400/9600)	DF03
PCXDF-BA	DF296

[1] **Refer to the appropriate platform Systems and Options Catalog for system specific restrictions. http://www.digital.com/info/SOC/**

Note: This product includes software developed by the University of California, Berkeley and its contributors.