COMPAQ

Software Product Description

PRODUCT NAME: Tru64 UNIX Operating System Version 5.1   **SPD 70.70.03**

DESCRIPTION

The Compaq Tru64™ 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. Tru64 UNIX is the Compaq Computer Corporation implementation of The Open Group's OSF/1 R1.0, R1.1, and R1.2 technology, and the Motif graphical user interface and programming environment.

Tru64 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 6.3 (X11R6.3) from The Open Group are supported.

Tru64 UNIX complies with other standards and industry specifications, including the The Open Group, POSIX, FIPS, and System V Interface Definition (SVID). By providing support for SVID, Tru64 UNIX supports System V applications. The Tru64 UNIX Operating System is compatible with Berkeley 4.3 programming interfaces.

SYSTEM MANAGEMENT

Tru64 UNIX System Management (SysMan) includes an easy to use suite of tools for installing, configuring, and managing a Tru64 UNIX system. SysMan provides centralized administration (the `sysman` command) for all system management tasks. Tru64 UNIX system management provides a set of features for the automation of system installations and configurations.

The SysMan tools and applications provide several user interfaces that allow administrators to manage a Tru64 UNIX system from anywhere:

- A Java based interface for managing over the Web or from a PC

- A graphical interface based on X windows

- A Curses interface for character-cell environments

- A command-line interface for scripting, automation, and for auditing system configurations

SysMan's Division of Privileges (DoP) utility allows users to perform privileged actions without the need to know the root password.

SysMan also includes a comprehensive event management mechanism for posting, subscribing, and viewing all system events, including hardware and software.

Installation

Tru64 UNIX can be installed from either a CD-ROM or a remote installation server. Administrators have a choice of full, update, and cloned installations. Installation Services are available for those customers who would like an experienced Compaq Software Specialist to install the software.

Full Installation

The full installation procedure installs Tru64 UNIX operating system onto any supported Alpha system and uses a "wizard-like" interface to walk administrators through the required steps. Full installations create new file systems and swap space and overwrite existing partitions, system files, and user data on the disks that are to be installed. During installation, the default file system type is the Advanced File System (AdvFS), which is the Compaq journaling file system. Alternatively, administrators can choose the UNIX file system (UFS). Administrators can configure the Tru64 UNIX system disks for Logical Storage Manager (LSM) during the initial system installation. Administrators can also select and install Worldwide Language Support software during the initial installation.

Update Installation

The update installation procedure updates the operating system from Tru64 UNIX Version 4.0G or Version 5.0A to Version 5.1, while preserving appropriate system files and existing user-customized files. The *Installation Guide* shows the successive update paths to reach if a system is running a version of the operating system other than Version 4.0G or 5.0A.

During an update installation of the base operating system, Worldwide Language Support (WLS) software is automatically updated as well. It is not necessary to remove WLS software before updating the operating system or to update WLS software as a separate task.

Administrators can invoke the update installation with the optional -u flag to run in an unattended mode. Unattended means that barring any problems with the update, no user interaction is required. The only exception to this is the switching of CD-ROMs if WLS software is being updated. The -u flag builds a kernel with all kernel components, but does not provide the chance to archive obsolete files.

At the beginning of the update installation process, a Tru64 UNIX system will look for the following:

- Layered products that prevent the update from continuing
- Layered products that should be reinstalled after the update
- Fatal and nonfatal file system type conflicts
- Available disk space

If layered products or nonfatal file conflicts are discovered, administrators can resolve them directly from the update user interface; there is no need to exit the update, resolve the conflict, and restart the update. In addition, if a system does not have enough available disk space for new software and for update processing, disk space recovery options are recommended.

System Cloning

Cloning allows administrators to take a snapshot of a fully installed and configured system. Later, administrators can automatically install and configure other systems without the need to go through the set of installation and configuration steps. After a system's configuration has been saved, administrators can apply it manually or automatically to other systems at any time.

System cloning, combined with user-defined scripts, can execute customized scripts during different phases of the installation process, so that administrators can run a completely unattended installation and configuration of a system. Administrators can use cloning for repetitive installations and configurations on multiple systems.

Configuration

To do an initial system configuration after a full installation, SysMan automatically runs Quick Setup the first time administrators log in. Quick Setup determines the configuration utilities that are right for a system, then uses a wizard-like interface to help administrators set up client systems. Administrators can use the resulting system "as is" or customize it using settings from the full-featured configuration applications. Quick Setup is also available from the System Setup menu.

Bootable Tape

Tru64 UNIX supports the Bootable Tape application to create and recover a disk image from a system, so that administrators can restore a system from a directly attached tape device.

System Management Menu (SysMan)

The SysMan Menu provides a framework to easily execute system management tasks. Administrators have a choice of interfaces, including:

- X11-capable display
- Personal computer running Windows 95, Windows 98, or Windows NT
- Character-cell terminal

System Management Station (SMS)

The SysMan Station provides a graphical representation of the system and enables administrators to manage the system from a personal computer. The SysMan Station is a Java tool that is fully integrated with Compaq TruCluster™ Server Version 5.0A or later. SMS allows administrators to remotely manage systems from anywhere — PCs clients, UNIX workstations, or any Alpha system.

The Event Manager

Event Manager provides a centralized means of gathering, distributing, storing, and reviewing event information, regardless of how the events are posted. Event Manager makes event information more accessible and provides a flexible and adaptable event infrastructure. Event Manager's Application Programming Interface enables any third-party or customer-developed applications to be customized to take advantage of this system data.

Monitoring and Tuning

Tru64 UNIX provides the following monitoring and tuning capabilities:

- Kernel Tuner displays and changes parameters of the kernel subsystem.

- Class Scheduler allows the administrator to prioritize jobs and tasks.

- Process Tuner displays, monitors, and manages system processes. A number of sort and filter options are provided to format the information display.

- Environmental Monitoring monitors the thermal, fan, and redundant power supply of Alpha systems that have prerequisite hardware sensor support. The functionality sets user-defined scripts, temperature levels, collection rate, and shutdown grace period, and can start or stop the environmental monitoring state.

  - Collect is a lightweight, highly flexible performance collector. Collect can run continuously 7x24 and manage its own logs. For more information, see the Collect reference page.

Compaq Insight Manager Agents

Tru64 UNIX provides Web-Based Enterprise Management (WBEM) capabilities through integrating the Compaq Insight Manager™ Agents, `insight_manager(5)`. Insight Manager enables Web-based device monitoring and fault management of local and remote system hardware and software resources. Administrators can access features from any browser using the Compaq dedicated 2301 HTTP port.

Compaq Insight Manager for Tru64 UNIX includes SNMP-based subagents and WBEM capabilities for presenting SNMP data through any Web browser. The SNMP subagents supply a rich set of Compaq Enterprise MIBs that provide hardware information, status, and statistics of CPU and memory boards, I/O devices, SCSI-based storage devices, Network Interface Cards, and Environmental devices, such as temperature sensors, fans, and power supplies.

Administrators can access the Tru64 UNIX System Management Home Page, System Management Menu, SysMan Station, and the UniCensus Configuration reports easily from any browser using the Compaq dedicated 2301 HTTP port.

Storage Management

Tru64 UNIX Logical Storage Manager (LSM) is an integrated host-based solution for data storage management. Basic LSM functionality, including disk spanning and concatenation, is provided with the base operating system free of charge. Additional features, such as 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, 0 +1 and 5. See the LAYERED PRODUCTS section of this SPD and the LSM SPD 51.24.xx for more information.

NetWorker provides automated backup and recovery of files on a local system. This SingleServer version is licensed free of charge with Tru64 UNIX and provides automated backup and recovery of the directly attached storage device. Users can purchase the full NetWorker product from Legato Systems, Inc. See the LAYERED PRODUCTS section of this SPD for more information.

Service Tools

Tru64 UNIX provides graphical presentation of the following commands:

- `Iostat` command (I/O statistics)

- `netstat` command (network statistics)

- `vmstat` command (virtual memory statistics)

- `who` command

Tru64 UNIX provides the following service tools on the Associated Products CD-ROM:

WEB-Based Enterprise Service (WEBES) is an extension of Compaq's industry-leading Web-Based Enterprise Management (WBEM) technology and provides a core of common service tool functionality across Compaq's product platforms. The WEBES tools integrate a high availability system fault management architecture, Distributed Enterprise Service Tools Architecture (DESTA), with Compaq's architecture for distributed, Web-Based System Management.

- The tool functionality contained in the WEBES kit includes the following:
  - Compaq Analyze (symptom directed hardware diagnosis tool)
  - Compaq Crash Analysis Tool (symptom directed operating system software diagnosis tool)
  - Revision and Configuration Management tool (collects system configuration and revision data)
  - Service Cockpit server (used to interface to the Service Cockpit client)

- Compaq Analyze

  Compaq Analyze is a hardware diagnosis software tool that provides analysis for single errors or fault events at a rudimentary level, as well as multiple event and complex analysis. Compaq Analyze

provides automatic notification and isolation of hardware components to quickly identify areas of the system that may be having problems. Compaq Analyze is the successor to DECevent and supports the newer EV6 based systems. Refer to the release notes for the products that are supported.

- Compaq Crash Analysis Tool (CCAT)

  CCAT is a software application tool that helps service engineers and system managers to analyze operating system crashes. This tool collects data that describes system crashes and matches that data against a set of operating specific rules. The rules are used to determine if the footprint of the collected crash data matches any known crash data footprints for which a solution or corrective action is known. This capability significantly reduces downtime by shortening the time required to analyze system crashes.

  The WEBES architecture accommodates expansion beyond fault analysis in its traditional sense. This architecture supports the implementation of CCAT on a customer's system, and eliminates the need for a link back to a Compaq host system to apply CCAT rules against a crash dump footprint.

- Revision and Configuration Management (RCM)

  The RCM tool collects system configuration and revision data information. The data is stored in the RCM Server at Compaq Services and the server is then used to create detailed revision and configuration reports.

  The following reports can be generated from the Web-based user interface to the RCM Server:
  - Configuration report showing detailed hardware and software configuration reports
  - Change report showing configuration or revision changes over time
  - Comparison report showing differences between two systems

- Compaq Service Cockpit (server)

  The Compaq Service Cockpit (server) contained in the WEBES kit provides the internal interface to another piece of software, called the Compaq Service Cockpit (client). The client provides access to the WEBES component tools through a web browser.

  The Compaq Service Cockpit client communicates with the WEBES server and allows a user to run the WEBES components locally and to run some WEBES components remotely. The Compaq Service Cockpit (client) is designed to serve as the control center for a wide range of WEBES standards-based service and maintenance applications for distributed computing environments.

Sys_check is a data gathering and reporting tool that gives the current state of a system, including configuration information, microcode information, and Tru64 UNIX parameter settings.

Compaq DECevent is supported using the dia utility, which provides error reporting and binary-to-text translation capabilities. DECevent provides system-directed diagnostic capability for the Compaq AlphaServer ™ 8200 and 8400 EV6 platforms, the AlphaServer GS60 and GS140.

FILE SYSTEMS

The Tru64 UNIX file system architecture is based on the 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 files reside.

Tru64 UNIX supports the file system types described in this section.

Advanced File System (AdvFS)

The Advanced File System is the Compaq journaled, self-tuning, local file system that provides higher availability and greater flexibility than traditional UNIX file systems. AdvFS files belong to filesets (equivalent to traditional file systems) that share a single storage pool called a file domain.

Administrators can resize file domains dynamically to allocate or deallocate storage while the system is running, and to set quotas for users, groups, and filesets. Quotas can have hard and soft limits, which specify a period of time that a quota can be exceeded.

Using transaction journaling, AdvFS provides increased file system integrity and recovers file domains in seconds rather than hours after an unexpected restart. The AdvFS defragment utility reduces the number of file extents in a file domain by making files more contiguous, thus improving the read/write performance because less I/O operations are required to access a fragmented file. AdvFS also supports direct I/O, which allows applications to avoid the unified buffer cache (UBC), thus achieving near raw disk performance.

The AdvFS /, /usr, and /var filesets are configured during installation. The system has generous

configuration capabilities. Administrators can mount 2^{32-1} filesets and file domains.

Users can select Data Logging on a file which guarantees file data integrity after a crash.

A file domain may contain up to 256 volumes with a AdvFS Utilities license. See the *Configuration and Tuning* guide for volumes per domain, file domain, and fileset recommendations.

- The maximum volume size is 1 TB-512 K.

- The maximum number of files in a fileset is 2^{31}. (This number is limited by the length of the tag that is used to uniquely identify a file in a fileset.)

- The maximum size of an AdvFS file and fileset is 16 TB - 512 K ($2^{13} * 2^{32}$), with an 8 K page size and a 31-bit page number.

AdvFS supports backups of mounted filesets. These backups are done with the vdump or rvdump utilities, which back up files and any associated extended attributes (including ACLs) from a single mounted fileset or clone of the fileset to a local or remote storage device. For more information, see the *AdvFS Administration* guide. The vrestore and rvrestore commands restore any associated extended attributes, including ACLs, in the archive data.

An AdvFS API exists for applications needing acces to AdvFS-specific file attributes.

The disk-structure analysis commands allow the system administrator to examine the low-level structures of files, filesets, and file domains. The verify utility validates domains and can fix a set of known disk corruptions. The salvage utility is useful when, due to hardware or software problems, disk metadata has become corrupt. It recovers the noncorrupted files from the file domains to disk or to tape.

The right to use the Advanced File System is granted by the Tru64 UNIX Operating System license.

AdvFS Utilities is a separately licensed layered product that expands the capabilities of AdvFS as follows:

- Adding more than one volume to a file domain.

- Cloning to perform online backups of active files by making a read-only copy (clone) of an active fileset.

- Performance tuning, such as striping files across multiple volumes to improve read/write performance, balancing to even out the percentage of free space among the volumes of a multivolume file domain, and migration to optimize disk usage.

- Creating a trashcan directory to store files that are deleted.

See the LAYERED PRODUCTS section of this SPD for more information on AdvFS Utilities.

UNIX File System (UFS)

UFS is compatible with the Berkeley 4.3 Tahoe release. Tru64 UNIX supports up to 2,147,483,647 UNIX File System and Memory File System (MFS) mounts. The max-ufs-mounts attribute controls the maximum number of UFS and MFS mounts. The default value is 1000.

If the underlying storage volume alters its size, the administrator may use expandfs to grow the file system.

Network File System (NFS)

Tru64 UNIX NFS V2 allows transparent file access over TCP/IP networks. The Network Information System (NIS) is provided for centralized system management of files. The automount service automatically mounts and unmounts NFS file systems. AutoFS provides the same services as the automount daemon but provides greater scalability and improved performance. The NFS locking service allows advisory and record locks to be used with remotely mounted files.

Tru64 UNIX provides an NFS V3 server and client protocol implementation 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 Tru64 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 Tru64 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. Tru64 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 that 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 that 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 eight levels)

- File time stamps

Open Group 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.

CDFS supports the organization of multiple sessions on one CD-ROM volume. The maximum number of CDFS mounts is 512. Note that the contents of all sessions are available as one file system and are not separately available. Users can access DVD disks using the CDFS file system.

DVD File System (DVDFS)

The Tru64 UNIX implementation of DVDFS is based on the ECMA 167 Universal Disk Format (UDF) specification version 2.00

DVDFS supplies the administrator with the ability to mount and read UDF formatted Digital Versatile Disks on both single nodes and clusters.

File-on-File Mounting File System (FFM)

The File-on-File Mounting File System 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 pipe implementation for improved performance.

/proc File System

The SVR4-compatible `/proc` file system for Tru64 UNIX allows running processes to be accessed and manipulated as files by ordinary system calls: `open`, `close`, `read`, `write`, `seek`, and `ioctl`.

NETWORKING

TCP/IP

Tru64 UNIX allows for TCP/IP network communications over supported network devices. The TCP/IP protocol suite is implemented in the socket framework.

Sockets

Tru64 UNIX provides sockets that are based on the Berkeley UNIX Operating System structure, which provides a framework for I/O over a network.

STREAMS

Tru64 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)

The 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)

Tru64 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. Tru64 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 Tru64 UNIX Packetfilter supports two filtering models: the CMU/Stanford model supported in Compaq 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. The packetfilter pseudo-driver can support up to 255 simultaneous open filters (each filter is usually mapped to one instance of an application program).

Several public domain applications that use the Packetfilter are integrated in Tru64 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 full SNMP V2.c agents, fully compatible with V1.0 MIB implementations, for managing Internet MIB-2 objects, FDDI objects, and

Token Ring objects. Support for AgentX is provided in V5.0A.

Dynamic Host Configuration Protocol (DHCP)

Tru64 UNIX includes a complete DHCP server/client solution for centralizing and automating IP address administration using a graphical interface.

Point-to-Point Connections

The Tru64 UNIX system supports point-to-point connections using Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP). The PPP subsystem implements PPP V2.3.1, which supports asynchronous point-to-point connections and IP. It provides authentication with Password Authentication Protocol (PAP) and Cryptographic Authentication Protocol (CHAP).

Open Network Computing (ONC)

Tru64 UNIX supports Open Network Computing 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 Tru64 UNIX Asynchronous Transfer Mode 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.

Tru64 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 PVCs) 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.

Tru64 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.

Slow Ethernet

Tru64 UNIX supports Slow Ethernet (10Base).

Fast Ethernet

Tru64 UNIX supports Fast Ethernet (IEEE 802.3 100Base-TX) in full and half duplex.

Gigabit Ethernet

Tru64 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.

Fiber Distributed Data Interface (FDDI)

Tru64 UNIX provides FDDI fiber optic support based on all relevant ANSI and IEEE standards, including SMT revision 7.2.

Token Ring

Tru64 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

Tru64 UNIX provides NetRAIN support for Ethernet, Gigabit Ethernet, FDDI, and ATM controllers (LANE only). NetRAIN allows for failover of communications from one controller to another in the event a fault is detected in the communications path.

IP Multicast

Tru64 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 Tru64 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 Stanford University), which provides the Distance Vector Multicast Routing Protocol (DVMRP).

Name Services

Tru64 UNIX supports the Domain Name System (DNS) as described in RFC 1034 and RFC 1035, providing a host name and address lookup service for the Internet network. The Tru64 UNIX implementation of the Domain Name System is based on BIND Version 8.1.2. The user can use BIND to supplement the host's database.

Tru64 UNIX also supports the Sun 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)

Tru64 UNIX provides the Network Time Protocol 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)

Tru64 UNIX provides Berkeley's Time Synchronization Protocol to synchronize the time of all machines in a network without ensuring the accuracy of the time that is provided.

Local Area Transport (LAT)

Tru64 UNIX provides a STREAMS-based implementation of the Local Area Transport 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 Tru64 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 number of logins has been tested:

RLOGIN: 7,043*
Telnet: 12,395*
LAT: 4,575*

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

Netscape

Tru64 UNIX also includes the Netscape FastTrack V3.01 Internet World Wide Web server. The software license for this bundled version of the Netscape FastTrack V3.01 is included with the Tru64 UNIX base license. Netscape FastTrack will be retired in a future release, no sooner than June, 2001.

RFC Standards

The Tru64 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)
1212	_____	Concise MIB definitions
1213	MIB-II	Management Information Base II (supersedes RFC 1158 and 1156)
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-	TCP Extensions for High

	HIPER	Performance (Window Scale option, Time stamp option and PAWS)
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
1633	_____	Integrated Services
1652	SMTP	Service Extension for 8bit-MIME transport
1661	PPP	The Point-to-Point Protocol (obsoletes RFCs 1548,1331, and 1171) (asynchronous IP only)
1700	_____	Assigned Numbers (obsoletes RFC 1340, and so forth)
1755	_____	Signaling for IP of ATM
1813	NFS	Network File System Version 3 Protocol
1869	SMTP	Service Extensions

1870	SMTP	Service Extension for Message Size Declaration
1891	SMTP	Service Extension for Delivery Status Notification
1892	_____	Multipart/ Report Content Type for the Reporting of Mail System Administrative Messages
1893	_____	Enhanced Mail System Status Codes
1894	_____	Extensible Message Format for Delivery Status Notifications
1939	POP3	Post Office Protocol, Rev. 3
1953	IFMP	Ipsilon Flow Management Protocol Specification for IPv4
1954	_____	Transmission of Flow Labeled IPv4 on ATM Data Links
1985	SMTP	Service Extension for Remote Queue Starting
2001	_____	TCP Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery Algorithms
2018	SACK	Selective Acknowledgement
2060	IMAP4	Internet Message Protocol, Version 4 rev. 1
2205	RSVP	Resource Reservation Protocol for FDDI and ethernet
2211	_____	Controlled Load Services

Non-RFC Standards

The Tru64 UNIX Operating System implements the following Non-RFC (Request for Comment) 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
- 4.4BSD Sendmail V8.9.3
- 4.3BSD syslog
- uucp Basic Networking Utilities (HoneyDanBer)
- New rdist command packaged as optional nrdisk
- BSD Packet Data Compression (for PPP)

SECURITY

The Tru64 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.

Tru64 UNIX supports various configurations and setup scripts, which allow selection of such desired Enhanced Security features as extended passwords, audit, and access control lists (ACLs).

System administrators can choose between command-line interfaces or GUIs.

Network Information Service (NIS) Compatibility

Tru64 UNIX provides support 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 Tru64 UNIX are part of the Security Integration Architecture (SIA), which isolates security-sensitive commands from the specific security mechanisms. This eliminates the need to modify the security-sensitive commands for each new security mechanism.

Tru64 UNIX includes the following C2 security features:

- Discretionary Access Controls (DAC) — Allows users to define how the resources they create can be shared. Optional 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.1e draft 13 with some draft 15 enhancements.

- Auditing — Allows users to monitor normal and 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). Features include 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.

PRINTING

Advanced Printing Software

Advanced Printing Software from Compaq is a printing system for Tru64 UNIX, developed in collaboration with Xerox and based on PrintXchange technology from Xerox. It is a distributed client/server printing system intended for use in workgroup and enterprise environments. Advanced Printing Software is based on a printing model defined by ISO 10175 and a command set defined by POSIX 1387.4. To provide inter-operation with the default BSD based printing system on Tru64 UNIX, Advanced Printing Software uses inbound and outbound gateways to move print jobs to or from the lpr/lpd print subsystems.

LPD Printing

Tru64 UNIX includes printing software based on the Berkeley Software Distribution (BSD) lpr/lpd printing model. It utilizes extended Line Printer Daemon (LPD) protocol (RFC 1179) to transfer print jobs to and from remote hosts. Print filters are supplied for a wide variety of printer models, both networked and directly connected. See Supported Hardware Section for information about supported printer models.

UNIX/ WINDOWS INTEROPERABILITY

Data Access – Object Database Connection and Java Database Connection (ODBC and JDBC)

- Tru64 UNIX provides the family of Merant 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 Tru64 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 also 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.

Common Object Model (COM) for Tru64 UNIX

COM, the Component Object Model, is middleware that Microsoft developed for the Windows platform. COM implements a binary standard that allows two or more applications to work together, regardless of whether they were written by different vendors, in different languages, at different times, on different platforms running different operating systems. DCOM, the Distributed Component Object Model, extends the COM model and provides applications with a way to interact remotely over a network.

COM for Tru64 UNIX implements Microsoft COM as well as the required underlying Windows capabilities for the Compaq Tru64 UNIX platform. The Compaq implementation provides all the basic functions, libraries, and tools that a COM application in a heterogeneous NT client/Tru64 UNIX server environment requires. Programmers who develop only in Windows NT environments will find the same COM Application Programmer Interface (API) and the same behavior in a heterogeneous Windows client/Tru64 UNIX server environment.

COM for Tru64 UNIX provides traditional COM and DCOM capabilities for applications. These capabilities conform to the Microsoft ActiveX Core Technology Specification. They include:

- MIDL, the Microsoft Interface Definition Language Compiler that is used to create the component object interface.

- The interfaces and APIs defined by Microsoft as those needed to support COM on platforms other than Windows.

- Support for COM capabilities, such as Monikers, OLE Automation, Uniform Data Transfer (UDT), Connectable Objects, and type libraries.

- Multithreaded apartment threading model (formerly known as free threads).

- RPC, Remote Procedure Call, that provides the mechanism for communication across the network.

- Registry, the database of COM components and relevant configuration information, and Registry tools, such as sermon and regsvr, that allow the modification of Registry contents.

- Security in the form of call security that allows a client or server to apply an appropriate security level to method calls, and the Security Support Provider Interface (SSPI) standard that defines security providers, which can be accessible to DCOM applications. Microsoft NT uses the Windows NT Distributed Security Provider (also called NTLM SSP). COM for Tru64 UNIX supports "pass-through" NTLM SSP calls.

- Internationalization capability, including UNICODE support of wide characters.

- Error-handling conventions that allow COM objects in different environments to share status information.

Windows 2000 Single Sign-On

Tru64 UNIX allows Windows users to authenticate to Tru64 UNIX using their Windows 2000 username and password. Secure authentication between the Tru64 UNIX system and Active Directory occurs using Kerberos technology. UNIX user account information can be stored in the LDAP-enabled Active Directory, to give administrators a single user account directory spanning Tru64 UNIX and Windows 2000. Administrators can also manage the additional Tru64 UNIX attributes using the Microsoft Management Console (MMC) snap-in extensions provided with this kit.

USER INTERFACES

The following sections describe Tru64 UNIX user interface environments.

Netscape Communicator

Tru64 UNIX includes the Netscape Communicator Internet Client World Wide Web browser. The license for this software is included with the Tru64 UNIX base license. Support for several language fonts, such as Japanese, Korean, Unicode, Simplified Chinese, and Western is included.

Common Desktop Environment (CDE)

CDE is the default user interface for Tru64 UNIX.

CDE V1.0 includes Motif and is dependent on the underlying Open Group X Window System, Version 11, Release 6 (X11R6.3) as described in this document.

CDE V1.0 provides a common user interface that is available across multiple vendor platforms. CDE offers 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

Tru64 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).

Tru64 UNIX also supplies `mail` and `mailx` for character-cell systems. The mailx/Mail system is compatible with SVID 2, XPG4, and the Berkeley Enhanced mailer (`/usr/bin/ucbmail`).

For compatibility with previous Tru64 UNIX releases, the MH 6.7.1 user agent is provided. The RAND Corporation developed the MH mail agent as an interface to the mail system.

Motif

Tru64 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)
- Compaq 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)

Tru64 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 Group 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 Tru64 UNIX, and supports the following Open Group standards:

- X Image Extensions (V5)
- Inter-Client Communications Conventions Manual Update — Tru64 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

Tru64 UNIX supports selected Release 6.1 (X11R6.1) features, including the X Keyboard extension (XKB) (Version 0.65) and the double buffering extension (DBE).

STANDARDS

UNIX 95

Under The Open Group's UNIX branding program, Compaq has received the UNIX 95 brand for the Tru64 UNIX Operating System, and is licensed to use the UNIX trademark in conjunction with the Tru64 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)
- XPG4 Internationalized Terminal Interfaces (XCurses)

The UNIX 95 Conformance Statement Questionnaire for Tru64 UNIX is provided on The Open Group web site at the following URL:

http://www.opengroup.org/csq/

XPG4 UNIX

Tru64 UNIX conforms to Single UNIX Specification, which includes the following Common Application Environment (CAE) specifications:

- System Interface Definitions, Issue 4, Version 2
- System Interfaces and Headers, Issue 4, Version 2
- Commands and Utilities, Version 2
- Networking Services, Issue 4
- X/Open Curses, Issue 4

XPG4 Common Desktop Environment (CDE)

Tru64 UNIX conforms to the XPG4 Common Desktop Environment. Although the XPG4 Common Desktop Environment specifies only X11R5 components, Tru64 UNIX fully implements X11R6, while maintaining compliance with the XPG4 CDE Standard.

Tru64 UNIX has the XPG4 CDE Profile brand, which includes the XPG4 X Window System Application Interface V2 brand.

The CDE Conformance Statement Questionnaire for Tru64 UNIX is provided on The Open Group Web site at the following URL:

http://www.opengroup.org/csq/

Motif

Tru64 UNIX provides the OSF/Motif Application Environment, which is based on CDE 1.0 (OSF/Motif R1.2.4) and conforms to the IEEE POSIX 1295 specification.

POSIX.1 and FIPS 151-2

Tru64 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.

IEEE Std 1003.1b-1993

Tru64 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].

IEEE Std 1003.1c-1995

Tru64 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].

IEEE Std 1003.1g/D6-1997 (March)

Tru64 UNIX includes support for the POSIX 1003.1g Sockets, as defined in POSIX 1003.1g, March 1997, Part XX: Protocol Independent Interfaces (PII) Section 5: Detailed Network Interface – Socket.

IEEE Std 1003.2-1992

Tru64 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]
- [POSIX2_UPE]

SVID

Tru64 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). Tru64 UNIX provides more than 400 commands and interfaces that comply with SVID3/SVR4.

System V Release 3.2 (SVR3)

SVID, Issue 2

Tru64 UNIX conforms to the Base System as specified in Issue 2.

A license to use Tru64 UNIX binaries includes the right to use the included System V Release 3.2 derivatives.

System V Release 4.0 (SVR4)

SVID, Issue 3

Tru64 UNIX includes a significant number of commands and interfaces compatible with SVID3.

The Tru64 UNIX shared library scheme is patterned on and compatible with the SVR4 shared library scheme.

Tru64 UNIX implements the SVR4 /proc file system, which provides the capability of accessing processes using file semantics.

Tru64 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

Tru64 UNIX provides a real-time user and programming environment. The real-time programming environment conforms to the POSIX 1003.1b-1993 standard.

The Tru64 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

Tru64 UNIX provides software developers the ability to write multithreaded programs that take full advantage of SMP using POSIX Threads. POSIX Threads provide a pthreads interface that complies with the POSIX 1003.1c semantics. The POSIX Threads implementation provides user space threads which are supported by and cooperate with the threaded kernel of Tru64 UNIX in a comprehensive two-level scheduling model that transparently maintains full concurrency when a thread blocks. In addition, for building libraries whose routines can be called in either a single-threaded or multi-threaded context, POSIX Threads provide a thread-independent services (TIS) interface.

The Visual Threads tool is available to help programmers analyze and debug multi-threaded applications for common problems such as deadlock, protection of shared data, and thread usage errors. It can also be used to monitor the thread-related performance of the application.

Shared Libraries

Tru64 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. Tru64 UNIX provides the following shared libraries:

libDXm	Compaq Motif Extensions library
libMrm	Motif Resource Manager library
libots	Compaq 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	POSIX Thread library routines
libcurses	Curses screen control library

libdnet_stub	DECnet library
libesnmp	Extensible SNMP library
libiconv	Codeset Conversion library
libm	Compaq Portable Mathematics library
libmach	Mach library
libmxr	Library used by mxr, the ULTRIX binary interpreter for OSF/1
libpthread	POSIX Thread library POSIX 1003.1c threaded interface
libpthreads	POSIX Thread 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
liblCE	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

Tru64 UNIX also provides static versions of most of these libraries.

DEVELOPMENT ENVIRONMENT

Compaq Fortran Run-Time Libraries

The Compaq 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.

Compaq C++ Run-Time Libraries

The Compaq C++ run-time support libraries (libcxx, libcomplex, libtask) enable users to run previously compiled applications containing Compaq C++ code, without having Compaq C++ installed on the target system. These libraries support Compaq C++ functionality in areas including input and output, complex arithmetic, multitasking, and more. The shared versions of the libcomplex and libtask libraries will be retired in a future version of Tru64 UNIX. Instead, they will be available with the Compaq C++ compiler as archive libraries.

Compaq COBOL Run-Time Libraries

Compaq recommends the use of Micro Focus COBOL, as resold by Compaq, for Tru64 UNIX based COBOL application development. For customers developing Compaq COBOL applications on Compaq OpenVMS™ who also want to deliver Compaq COBOL based applications on Tru64 UNIX, Compaq COBOL run-time libraries are licensed with Tru64 UNIX. The Compaq COBOL compilers are available as a separately licensed layered product.

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

Compaq Pascal Run-Time Libraries

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

Compaq Portable Mathematics Library

The Compaq Portable Mathematics Library (CPML) 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 that, when executed, collects analysis data for a wide variety of purposes. ATOM includes all of the run-time libraries necessary to execute ATOM-based analysis utilities and tools. The ATOM Run-Time Libraries are licensed with Tru64 UNIX. Several useful ATOM based analysis tools developed by Compaq to facilitate program development are licensed with the Tru64 UNIX Developers' Toolkit.

Java Development Kit

Tru64 UNIX provides the Java Development Kit V1.1.8 (JDK) and the Java 2 SDK, Standard Edition, version 1.2.2 (J2SDK), which are ports of the Java technology under license from Sun Microsystems, Inc. The JDK

V1.1.8 is the default version and the J2SDK V 1.2.2 is provided as an optional subset.

The Java Development Kit and the J2SDK 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:

- Just-In-Time Compiler (JIT) to enhance run-time 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

- 64-bit support

Both the JDK V1.1.8 and the J2SDK for Tru64 UNIX pass 100 percent of the tests provided in the Java Compatibility Kit. The JDK and J2SDK are included as part of the Tru64 UNIX Operating System kit and are subject to the terms of the Base license for Tru64 UNIX, as well as the additional JDK and J2SDK licenses.

Memory-Mapped File Support

Tru64 UNIX supports the Berkeley mmap function and, therefore, allows an application to access data files with memory operations rather than with file input and output operations.

Shells

Tru64 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

Tru64 UNIX uses an SVR4-compatible loader to dynamically load shared libraries. This loader provides SVR4 symbol resolution semantics, including symbol preemption.

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

Data Link Interface (DLI)

Tru64 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

Tru64 UNIX includes the 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

Tru64 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.

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 is an ANSI standard for the software drivers that provide the interface between an operating system and a SCSI device. The Tru64 UNIX CAM implementation is highly compatible with ANSI X3.131-1986, Level 2 and supports SCSI-2 based CAM.

Internationalization

The Tru64 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 (2)	Czech (2)	Danish (2)
Dutch (4)	English (5)	Finnish (2)
French (8)	German (4)	Greek (2)
Hebrew (2)	Hungarian (2)	Icelandic (2)
Italian (2)	Lithuanian (1)	Slovene (1)
Norwegian (2)	Polish (2)	Portuguese (2)
Russian (1)	Slovak (2)	Spanish (2)
Swedish (2)	Thai (1)	Turkish (2)

Multibyte Character Sets — Languages (Locales)

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

Tru64 UNIX base operating system includes the following internationalization functionality:

- 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 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

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.

Unicode Support

Tru64 UNIX supports Unicode Version 3.0 and ISO 10646 standards through a set of UCS-4 and UTF-8 based locales. Codeset conversion capability to and from UCS-4, UCS-2 (UTF-16) and UTF-8 formats is provided for all supported codesets. Conversion support from Unicode to a full range of codesets, including the ISO 8859 series (Latin-1, Latin-2, ISO-Greek, etc.), PC codepages, and a wide variety of Asian encodings, is also provided. Limited Unicode character transformation is supported.

Unicode — Language (Locales)

Catalan (1)	Finnish (1)	Korean (1)
Chinese (3)	French (4)	Norwegian (1)
Danish (1)	German (2)	Portuguese (1)
Dutch (2)	Italian (1)	Spanish (1)
English (4)	Japanese (1)	Swedish (1)

Euro Currency Support

Tru64 UNIX supports the processing of the new euro currency symbol through the use of ISO Latin-9, and Unicode V3.0. Applications running in the Unicode UTF-8 or the ISO 8859-15 locales can display, process, and print the euro currency symbol, provided that the applications have been modified to recognize the euro character, and the UTF-8 and ISO 8859-15 character sets.

LAYERED PRODUCTS

Developers' Toolkit

The Developers' Toolkit for Tru64 UNIX provides a robust set of tools that help developers write effective applications to improve quality, optimize the power of Alpha systems, and streamline development time. The Developers' Toolkit includes:

- An ANSI-compliant C compiler with advanced optimization capabilities

- A state-of-the-art debugger that supports threads services to optimize SMP systems

- In-depth profiling and post-link optimizers 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 Tru64 UNIX

- GUI-based development and traditional command-line interfaces

- An extensive library of routines that simplify the process of creating custom development tools

The Developers' Toolkit for Tru64 UNIX is a prerequisite for all Tru64 UNIX development tools. This product is licensed separately from theTru64 UNIX Operating System. The Developers' Toolkit description is in SPD 44.36.xx.

Logical Storage Manager (LSM)

The Tru64 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.

Users can purchase Logical Storage Manager separately or conveniently bundled with AdvFS Utilities (Compaq StorageWorks™ Software package). The Logical Storage Manager description is in SPD 51.24.xx.

TruCluster Server Software Version 5.1

TruCluster Server provides highly available and scalable solutions for users in mission-critical computing environments. It delivers easy to use, but sophisticated UNIX clustering capabilities by adding a fully clustered shared file system to the rich functionality already found in the Compaq TruCluster products.

By combining the advantages of symmetric multiprocessing, distributed computing, and fault resilience, a cluster running TruCluster Server offers high availability with scalability beyond the limits of a single system. TruCluster Server significantly reduces, but does not eliminate, the impact of hardware and software failures. The TruCluster Server description is in SPD 70.79.xx.

Advanced File System Utilities (AdvFS)

The AdvFS Utilities extend the high availability and flexibility of AdvFS. The AdvFS Utilities provide a graphical user interface to ease management tasks and online utilities to dynamically resize file systems, balance the percentage of space used on volumes, undelete files using trashcans, stripe files, and clone files for hot backup.

Users can purchase AdvFS Utilities separately or conveniently bundled with Logical Storage Manager (StorageWorks Software package). The AdvFS Utilities description is in SPD 44.52.xx.

NetWorker

NetWorker provides automated backup and recovery of files on a local system. NetWorker SingleServer and the 30-day evaluation are included with the Tru64 UNIX Associated Products CD. SingleServer is licensed free of charge with Tru64 UNIX and provides automated backup and recovery of the directly attached storage device. After 30 days, contact Legato for an authorization code at service@legato.com. To purchase the full NetWorker product, contact Legato at **compaqanswers@legato.com**, phone 408-530-3296, or visit their Web site at www.legato.com/compaqanswers/.

StorageWorks Software

The StorageWorks Software package includes two key storage products: Logical Storage Manager and AdvFS Utilities. StorageWorks Software delivers high availability, online configuration, optimal file system performance, and data protection. The part number for StorageWorks Software is QB-5RXA*-AA.

Advanced Server for Tru64 UNIX (ASU)

Advanced Server for Tru64 UNIX provides seamless interoperability between Tru64 UNIX servers, Windows NT servers, and Microsoft Windows clients. The ASU software enables a Tru64 UNIX system to run the services that make it appear as a Microsoft Advanced Server. Through the ASU software, Tru64 UNIX resources are available to Microsoft users without modification to their software.

The ASU server is an evolution of the PATHWORKS Version 6.x for Tru64 UNIX (Advanced Server) product and provides improvements, such as support for mixed-case and long file names and a seamless upgrade procedure. The ASU media and documentation are delivered on the Tru64 UNIX Associated Products Volume 2 CD-ROM. Two clients can use complementary licenses after administrators install and configure the ASU software. Additional ASU licenses can be purchased and loaded into the License Management Facility (LMF) on the system where the ASU software is installed (SPD 61.56.xx).

Graphic Drivers

Graphic drivers assist developers with the development and run-time environment for 2D and 3D applications. These drivers are located on the Associated Products CD, or can be downloaded from:

http://www.support.compaq.com/open3d

Multimedia Services

Multimedia Services for Tru64 UNIX brings audio and video capabilities to Compaq workstations, and provides a full programming library for use by developers of new applications. The Multimedia Services Run-time license is included with the Tru64 UNIX base operating system (see SPD 48.92).

SCSI CAM Layered Components

SCSI CAM Layered Components (CLC) provides drivers and tools for two types of SCSI devices:

- Robotic medium changers found in tape and optical libraries

- Magneto-optical disk drives used in both read-write optical and WORM

Devices supported by CLC are those changer and optical devices supported by these applications. The functionality formerly in the CLC layered product has now been incorporated into the base operating system.

Server Extensions for Tru64 UNIX

Compaq Tru64 UNIX Server Extensions is an integrated layered product for the Tru64 UNIX Operating System that provides server services bundled with all Alpha Servers. The Server Extensions include remote installation and dataless configuration support. It requires a separate license, which is bundled with all Alpha servers free of charge.

Remote Installation Service (RIS)

The Tru64 UNIX Server Extensions includes the Remote Installation Service. The RIS sets up a framework on a Tru64 UNIX server system that enables other Tru64 UNIX client systems to do a full, update, or cloned installation (except New Hardware Delivery) of the operating system software and the Worldwide Language Support software over the network from the server system. Additional software (part of option software) can be loaded onto the client system from the RIS server system after the client has been installed. BOOTP is the boot protocol used to initiate the installations. Because of the high bandwidth requirements, RIS is supported only in local area network environments that use Ethernet, Gigabit Ethernet, FDDI, and Token Ring network addresses.

A RIS client can be booted from the following interfaces:

- Internal Ethernet
- The PMAD TURBOchannel Ethernet option card
- The DE422 and DE425 EISA Ethernet option cards
- The DE203, DE204, and DE205 ISA Ethernet option cards
- The DE434, DE435, and DE436, DE500 PCI Ethernet option cards
- The DEFEA EISA family of FDDI option cards
- The DEFPA PCI family of FDDI option cards
- The DEFTA TURBOchannel family of FDDI option cards
- The DETRA Token Ring option card

RIS supports the installation of a third-party or foreign graphics kit into the RIS area. This is useful when the user has installed a new graphics device into the system that requires a new driver. With the driver in the RIS area, the user can use the graphics device during installation.

Firmware Requirements for RIS Option Cards

Console firmware and all option firmware in the DMS or RIS server and in every client system must be compatible with the version of Tru64 UNIX system software that will be running on that system.

See the Release Notes Overview included with the Console Firmware CD-ROM, which is packaged along with the Tru64 UNIX Operating System software kit (QA-6ADAA-H8), to determine the firmware version compatibilities.

Dataless Configurations

The Tru64 UNIX Server Extensions include support to install and operate systems in a dataless configuration. A

server system maintains the root, /usr, and /var file systems for all client systems. The server maintains one copy of root for each client. The /usr file system is exported read-only and is shared by all clients registered in the environment. Each client has its own /var file system. Dataless clients access the file systems maintained on the server utilizing NFS. A minimum of one disk drive is required on each client for the purposes of dumping and swapping.

The Dataless Management Utility (dmu) enables the server to register and manage the software areas used by Tru64 UNIX dataless clients. BOOTP is the protocol used to boot the clients and mount the remote file systems.

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 warranty the ability to build a binary kit. Limited documentation is also provided. Compaq does not warranty the results of using the source kit to change selected portions of the system.

Customers who are appropriately licensed by The Open Group (TOG) and by Santa Cruz Operations (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 Open Group to use Motif R1.2.3 source code on a designated CPU for which source materials are to be ordered. The Open Group must verify to Compaq that the customer's Motif source license is valid.

- Customers must be currently licensed by the Santa Cruz Operations (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 the Compaq 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 Software Product Services (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 Motif R1.2.3 source license from The Open Group 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 Motif R1.2.3 source license from The Open Group 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 Tru64 UNIX Operating System can execute on valid Alpha systems and must include the following minimum system configuration:

- Tru64 UNIX requires the minimum component of main memory to be 64 MB.

The minimum disk space requirement for installing the Tru64 UNIX Operating System is 1 GB. The 1 GB disk space requirement does not include the additional space required to update the Worldwide Language Support component of Tru64 UNIX. However, Compaq recommends that systems have at least two 2 GB disks to ensure sufficient disk space for swap, patches, and storage.

- The supported load devices include CD-ROM readers (such as RRD44) or a variety of network interfaces.

- Tru64 UNIX requires one console terminal with ASCII capabilities or one Compaq graphics display console for Alpha systems.

- Recommended minimum root partition should be 128 MB (single system only).

- Recommended minimum usr partition should be 700 MB (single system only).

Hardware Partitioning

Tru64 UNIX provides the enabling technology to support static hardware partitions on the Compaq AlphaServer GS series systems. The partition guide is now available at the following web page for configuration guidelines at:

http://www.digital.com/alphaserver/products/options.html

QuickSpecs describes how to configure and order Intel, Alpha, and VAX workstations and servers. QuickSpecs are located at:

http://www.digital.com/info/SOHOME/SOHOMEHM.HTM

http://www.compaq.com/alphaserver/

Use of Tru64 UNIX in hardware partitions requires a Tru64 UNIX Hardware Partitioning License for each additional partition. For more information, see the Software Licensing section in this document.

Disk Space Requirements for Language Variants

In addition to base Tru64 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 here.

Language	Required World-wide Subsets (MB)	Optional World-wide Subsets (MB)	Required World-wide Wrkstn Subsets (MB)	Optional World-wide Wrkstn Subsets (MB)	Total (MB)
Catalan	0.77	00.00	4.02	12.83	17.63
Chinese (PRC)	1.43	18.19	7.37	26.18	53.17
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
HongKon	3.00	31.35	17.83	48.06	100.2
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
Norwegia	0.77	0.00	0.00	0.00	0.77
Polish	0.00	2.51	4.52	5.83	12.87
Portugues	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 Tru64 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.

SUPPORTED HARDWARE

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

Compaq reserves the right to change the number and type of devices supported by Tru64 UNIX. The minimum hardware requirements for future versions and updates of Tru64 UNIX may be different from current requirements.

Supported AlphaServer Systems
AlphaServer Models

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
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 DS10
Compaq AlphaServer DS20, DS20E
Compaq AlphaServer ES40
Compaq AlphaServer GS60, GS60E, GS140
Compaq AlphaServer GS80, GS160, GS320

Supported Alpha Workstation Systems
Alpha Workstation Models

AlphaStation 200, 4/100, 4/166, 4/233
AlphaStation 250, 4/266

AlphaStation 400, 4/233, 4/266
AlphaStation 255, 4/233, 4/300
Ultimate Workstation 533au
AlphaStation 500, 5/266, 5/333, 5/400, 5/500
AlphaStation 600, 5/266, 5/30, 5/333
AlphaStation 600A, 5/500
AlphaStation DS20E
AlphaStation ES40
Compaq Professional Workstation XP1000, XP900
Personal Workstation 433au, 500au, 600au

SCSI Device Support

The Tru64 UNIX Operating System supports the ANSI SCSI-3 standard. SCSI devices have been certified for use with the Tru64 UNIX Operating System.

Printer Support

Printer models supported on Tru64 UNIX can be found on the following web pages:

For Advanced Printing software:

`http://tru64unix.compaq.com/printing/apx/apx_pri nters.html`

For BSD based printing software:

`http://tru64unix.compaq.com/printing/bsd/printer s.html`

Symmetric Multiprocessing (SMP)

Symmetric multiprocessing 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:

- Concurrent multiple threads—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 —Occurs 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— Provides the ability to stop and start a specified nonboot processor.

- Processor sets—Provide the ability to dedicate a process, or set of processes, to a specific processor or set of processors. This can also be used to partition the available processors among a set of users.

PC Card Support

Tru64 UNIX provides PCMCIA (PC Card) support for the following platforms:

- AlphaStation 200, 255, 400, 600

- AlphaServer 1000

- 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

Tru64 UNIX is distributed on CD-ROM and is ISO 9660 Level 1 compliant.

ORDERING INFORMATION

The Tru64 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 Tru64 UNIX Developers' Extensions), and the Remote Installation Service (see SPD 44.35.xx for Tru64 UNIX Server Extensions).

Tru64 UNIX Software Media Kit

Tru64 UNIX Operating System: QA-6ADAA-H8

The Software Media kit includes CD-ROMs containing the operating system binaries and complete Tru64 UNIX online documentation. Hardcopy start-up documentation is also included in the Media kit, including the *Installation Guide*, *Release Notes,* and *Technical Overview*.

Software Documentation

Documentation for Tru64 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-6ADAA-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-6ADAA-G8).

The structure of the printed Tru64 UNIX Documentation kit and its subkits follows. Each kit contains the following subkits:

- Tru64 UNIX Documentation Kit (QA-6ADAA-GZ)
  - End User Documentation Kit (QA-6ADAB-GZ)
    - Startup Kit (QA-6ADAC-GZ)
    - System and Network Management Kit (QA-6ADAE-GZ)
    - General User Kit (QA-6ADAD-GZ)
  - Developer's Kit (QA-6ADAF-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 on line on the Documentation CD-ROM.

Reference pages for Tru64 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-6ADAG-GZ).

Users can view the Tru64 UNIX documentation at:

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

Source Distribution

Source License/Distribution: QB-6ADAA-E8

Update Source License/Distribution: QB-6ADAE-E8

Education Source License/Distribution: QB-6ADBA-E8

Education Update Source License/Distribution: QB-6ADBE-E8

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

SOFTWARE LICENSING

Tru64 UNIX Operating System software is furnished under the licensing of Compaq Computer Corporation's Standard Terms and Conditions.

There are five different types of Tru64 UNIX Operating System licenses:

- Operating System Base License (QL-MT4A*-6*)
- Symmetric Multiprocessing (SMP) Extension to Base License (QL-MT4A9-6*)
- Tru64 UNIX Hardware Partitioning License (QM-MT4AA-AA)
- Concurrent Use Licenses (QL-MT7AM-3*)
- Unlimited Interactive User Licenses (QL-MT7A*-AA)

The following sections describe each type of license.

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 Tru64 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 Tru64 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 Tru64 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, Hardware Partitioning 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 capability on those Tru64 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 added 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.

Tru64 UNIX Hardware Partitioning License (QM-MT4AA-AA)

A Hardware Partition extends the Operating System Base License to allow use of a copy of the Tru64 UNIX Operating System in a static hardware partition on systems supporting this feature. The Tru64 UNIX Base License provides the right to enable Tru64 UNIX in a single hardware partition. A Tru64 UNIX Hardware Partition License is required for each additional Tru64 UNIX hardware partition within the same system. For example, a system divided into two (2) Tru64 UNIX partitions requires one (1) Tru64 UNIX Base License and one (1) Tru64 UNIX Hardware Partition License.

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 Tru64 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 Tru64 UNIX system at a time.

An interactive user, either a person or device, is one that is logged in to a Tru64 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 Tru64 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.

For more information on licensing please refer to:

http://www.compaq.com/products/software/info/

SOFTWARE PRODUCT SERVICES

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

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.