HP-UX 7.0 operating system

Technical data

HP 9000 Series 300/800

Available on HP 9000 Series 300 and Series 800 computers, HP-UX is based on AT&T's UNIX® System V Release 3.0, and passes AT&T's System V Interface Definition (SVID 2). It also incorporates selected features from U.C. Berkeley Software Distribution 4.3 (BSD). In addition, HP-UX conforms to X/Open®'s Portability Guide Issue 2 (XPG2), the IEEE's POSIX 1003.1 and the Federal Information Processing Specification (FIPS) 151-1. Compliance with these standards facilitates portability of applications developed on other standards-based operating systems. Furthermore, Hewlett-Packard is committed to implementing industry standards as they are established, and is actively involved in establishing these standards. Hewlett-Packard is one of the original founders of the Open Software Foundation (OSF) and a member of the X/Open and the MIT's X consortiums.

HP-UX meets the growing need for highly available, powerful systems by supporting a disk mirroring product[1] for environments where no data can afford to be lost due to disk failures. In addition, HP-UX supports a diskless computing environment, which significantly reduces costs and increases the information shared by different users over the LAN. Hewlett-Packard's standards-based operating system also contains features intended to fulfill the Department of Defense C2 Trusted System Requirements. And finally, HP-UX supports all the popular languages in the computing world and a rich assortment of tools for computer aided software engineering (CASE), Networking, Database Management, and Graphics.

HP-UX 7.0 conforms to all the major existing standards

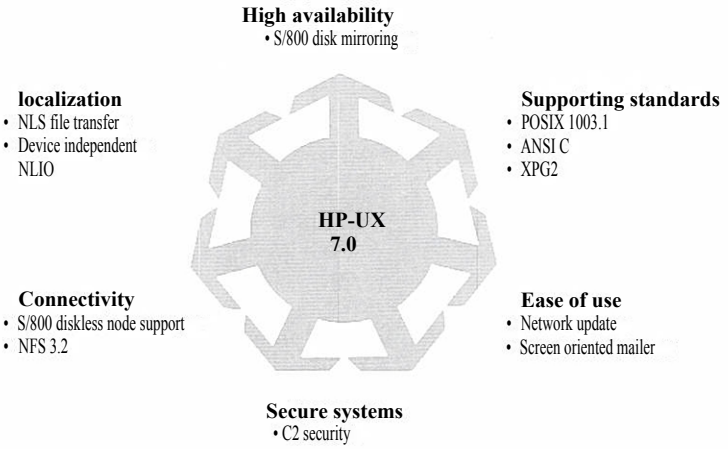
- AT&T's System V Interface Definition (SVID 2)
- X/Open Portability Guide Issue 2 (XPG2)
- IEEE's POSIX 1003.1
- Federal Information Processing Specification (FIPS) 151-1
- ANSI C

'Available only on S/800

HP-UX features

- support for clusters of HP 9000 diskless computer nodes
- C2 secured functionality
- support for disk mirroring[1]
- automatic restart after power failure[1]
- a screen-oriented mail system (ELM)
- an ANSI C compiler[2]
- a menu-driven system administration utility (SAM)
- support for a remote update, and backup systems over a TCP/IP Network
- BSD 4.3 selected features[11]
- support for X Window System Version 11
- National Language Support for 22 languages
- real-time functionality
- device I/O library for use in programming HP-IB instruments
- transparent access of ISO 9660 standard CD-ROMS
- support for NFS 3.2

Figure 1. HP-UX 7.0 new features



Software application development

C compiler

The C compiler, which conforms to the new X3.159-1989 ANSI C standard on the Series 800, runs under HP-UX and provides access to HP-UX subsystems and other HP-UX languages. C is the system programming language for many operating systems and is a vehicle for transporting software between UNIX operating systems. This general-purpose programming language features modern control flow and data structures, a rich set of operators, and economy of expression. C combines the convenience and portability of a high-level language with the flexibility and efficiency of assembly language.

Additional languages

In addition to C, HP offers FORTRAN 77, Pascal, COBOL, LISP, and Ada. Ada is only available on Series 300; other langauges are available from third party vendors. FORTRAN 77 is a superset of the ANSI X3.9-1978 FORTRAN standard, conforms to MIL-STD-1753, and includes most of DEC'S VMS FORTRAN extensions. On the S/300, Pascal is based on the ANSI/ISO Pascal language standard, and handles most of the ANSI/ISO standard features. COBOL is the Micro Focus COBOL/2, which meets the ANSI X.3.23-1985 High Level standard. LISP is Common LISP, as defined by the ANSI X3J13 committee. And finally, Ada which is currently available only on the Series 300 systems, conforms to the ANSI MIL-STD-1815A-1983.

[2]Currently available only on Series 800 systems, but soon will also be available on the Series 300 systems

[11]including job control, fast, file system, symbolic links, long file names, and the C shell

Symbolic debuggers
Symbolic Debugger/HP-UX (xdb) is a powerful, full-featured symbolic debugger which helps find and correct program errors. It supports interactive source-level debugging for the HP-UX languages C, Pascal, and FORTRAN 77. xdb is based on the industry-standard cdb, but is easier to use and has increased functionality, for example, a window-oriented interface, an on-line help facility, and a macro facility. For COBOL, HP-UX supports a screen-oriented debugger (Animator).

HP assembler
Assembler/HP-UX is an implementation of an assembly language for HP 9000 computer systems, and provides access to HP-UX subsystems and other HP-UX languages. The Series 800 version provides access to all architectural features of HP Precision Architecture computer systems. The Series 300 version is capable of producing code for the Motorola MC680X0 microprocessors. In addition, the Series 300 FP code-generator supports the MC68881/MC68882 floating point processors as well as the HP98248A/B accelerators.

CASE tools
HP-UX supports leading CASE tools that are available in the software application environment today. HP SoftBench provides an integrated set of X Window-based programming tools for HP-UX workstations. HP Encapsulator extends the HP SoftBench environment allowing you to add more tools. HP Teamwork is used for implementing the structured analysis method of systems analysis and design. And finally, FrameMaker, which can be used for documenting software projects by providing a complete word processor, support for mixed graphics and text, and an interactive page and document layout facility.

Graphics
Users of graphics applications will find HP-UX an ideal operating system for CAD/CAM, CAE, and other graphics intensive environments. HP-UX supports Starbase Graphics Library software (based on evolving ANSI and ISO standards), device-independent Graphics Library (DGL), and Advanced Graphics Package (AGP) software. HP-UX also supports HP GKS Graphics Library, which conforms to level 2b of the ANSI/ISO standard.

Database management
For users of database applications, HP-UX supports ALLBASE/SQL Database Management System which has a relational interface, end-user query and reporting facility, and a 4GL transaction-oriented application generator. HP-UX also supports leading third party database products from vendors such as Ingres, Informix, Sybase, Oracle, Unify, and others.

HP-UX real-time functionality
Real-time features in HP-UX allow HP 9000 computers to be used in computer-integrated manufacturing (CIM) applications where response time can be critical. These features include the ability to set real-time priorities for processes, time-based scheduling calls, asynchronous I/O driver, reliable software signals, process locking, and file locking. They assure a fast, deterministic real-time response, as measured by process dispatch latency. HP-UX[1] also supports a Real Time I/O Interface Card (RTI). A developer's kit allows users to create software that uses the RTI card for faster interrupt handling.

International support

HP-UX provides transparent support for a user's national language, as well as tools for software developers to internationalize applications. To support a foreign language, a codeset that contains the characters must be defined. Hewlett-Packard has defined codesets to support 22 languages, preserving the ASCII codeset. Library routines and messages appropriate to a particular language are selected by simply entering the name assigned to that language prior to initiating an operation. By supporting the National Language Input/Output (NLIO), HP-UX assures that Asian languages are also supported by keyboard and character set capabilities of terminals, printers, and plotters. The NLIO subsystem provides the ability to input and output Asian characters from or to a terminal or printer, and enables Asian characters to be bit-mapped display in X Window. The National Language Support is compliant with the Internalization Extern tion of XPG2 base.

DOS/HP-UX

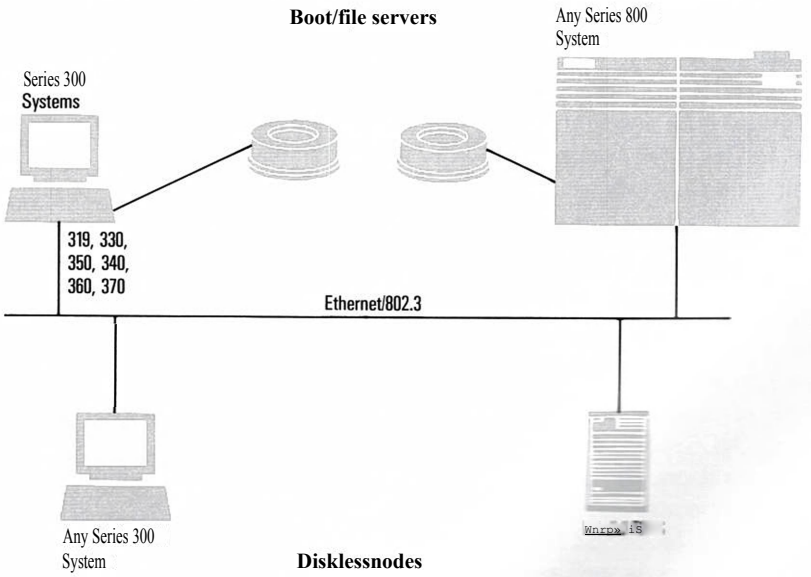
HP-UX supports software MS-DOS® emulation (SoftPC), providing PC-XT complete compatibility for systems as well as multi-user/terminal based systems. Using X Window Version 11, multiple HP SoftPC window sessions can run on the same display.

Networking

Diskless computing environment

HP-UX supports diskless computing (see figure 2), allowing lower per-seat computing costs by sharing disks among a number of systems and by providing a central point for system administration. The HP-UX diskless capability runs on top of an IEEE 802.3 network, allowing it to coexist with systems from HP or other vendors, along with the Network File System (NFS). The HP-UX diskless capability passes the System V Verification Suite (SVVS) for easy application portability, further demonstrating HP's commitment to standards and compatibility. Any Series 800 system can be a server for a cluster of diskless Series 300 systems and/or diskless nodes of 815 systems. A Series 300 system can be

Figure 2. HP-UX diskless environment



used as a server to diskless Series 300 computers. An entire cluster comprising Series 800 systems and/or Series 300 systems may be viewed as a single system with one global file system, and a single system clock.

Asynchronous data communication

HP-UX includes asynchronous multiplexer manager software, which supports CCITT modem communication, BSD job control, block-mode communication, and non-blocking I/O. The asynchronous multiplexer manager supports communication with other operating systems via one or more multiplexer channels, and hardwired or modem links using the uucp (file transfer) capability of HP-UX. The uucp commands provide file transfer, remote process execution (uux), and virtual terminal (cu) capabilities.

Networking standards

HP-UX supports industry standard LAN software for communication between HP 9000 computers, HP 3000 computers, HP 1000 A-Series systems, and systems from other computer vendors. HP-UX also supports MAP 3.0 on the Series 800 for multivendor networking in the manufacturing environment, ARPA/Berkeley network services for multivendor communication, and Network File System (NFS) 3.2 for file sharing over the LAN.

High availability

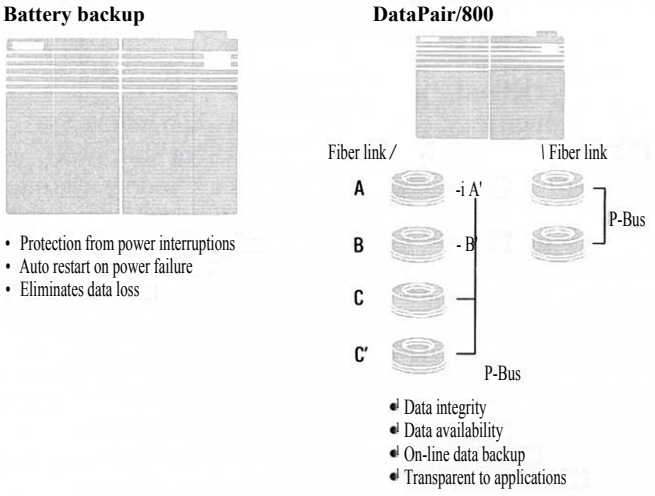
Disk mirroring

HP-UX supports DataPair/800, a disk mirroring product (see figure 3) offered on Series 800 systems[4]. By transparently creating a pair of disk sections that are identical copies of each other, DataPair/800 provides two distinct benefits. First, in an environment where data loss due to disk failure is unacceptable, a mirrored disk increases data availability and integrity. Thus, even if one disk of the pair fails, the application can still access and store data on the remaining disk without interruption. Second, DataPair/800 substantially reduces the planned downtime. With this product, routine tasks such as disk backup, repairs, and replacements can be done without interrupting applications.

Automatic restart after power failure

Offered on the Series 800 (see figure 3), HP-UX supports battery backup which assures full recovery of processing. If AC power is lost and restored within 15 minutes, HP-UX is automatically restarted and processing can resume without data loss.

Figure 3. HP-UX elements of high availability



[4] Except the Model 815S

Usability

Menu-driven System Administration Manager (SAM)
Standard on HP-UX, SAM is a menu-driven user interface to common system administrative tasks. With SAM, commonly used tasks such as network configuration, spooler administration, and file system management, can be executed quickly and easily. Users can remotely login and access all functionality over a TCP/IP Network via HP's standard networking services. SAM also provides diskless and disk mirroring configuration capability, which significantly improve the productivity of system administrators.

ELM Mailer
To improve the communication between users, HP-UX includes a softkey driven, screen oriented mail system geared for general users. The ELM Mailer is more user friendly than other mail systems, easier to learn, and fully compatible with other mail systems such as mail and mailx. Thanks to its simple command set, a database of mail addresses can be created more quickly and simply than with other mail systems.

Network update and backup
HP-UX can be updated remotely via TCP/IP network onto any HP 9000 system that has been initialized as a network software distribution ("netdist") server. In addition, HP's databases, compilers, graphics, and networking software can be both installed and updated using the "netdist" program.

Security

HP-UX contains the features intended to fulfill the Department of Defense (DoD) Trusted Computer Systems Evaluation Criteria for C2. This level of security includes an auditing facility for security relevant events, additional access control lists for better file control, a shadow password file for storing encrypted passwords where only privileged users can read them, and security related documentation for system administrators and end-users.

User interface

HP-UX supports X Window Systems® Version 11 (or simply X), which provides a window system for the HP 9000 Series 300 and Series 800 computers. X consists of the display server, a group of useful programs (clients), a library of functions (Xlib), and a standard toolkit (X Toolkit) for constructing applications. Hewlett-Packard's set of development tools (X Widget), which has been adopted by OSF as the foundation for the OSF/Motif® user environment, is designed to allow easy creation of sophisticated, easy-to-use human interfaces. This easy-to-use interface is consistent with Presentation Manager, and has an enhanced 3D appearance. HP's X Window System also allows programs written in the GKS, Starbase, and other graphics libraries to have full access to HP graphics capabilities, thus combining the power of these graphics libraries with an easy-to-use human interface.

File system

Virtual memory management
HP-UX supports virtual **memory** for processes, so users can run programs that do not fit into the system's physical memory. Virtual memory allows processes to be partially memory-resident and partially disk-resident. Virtual memory is managed automatically and transparently to the user. Series 800 systens support a 48-bit address space, used by HP-UX as multiple 32-bit address spaces that are all seated one per process. Processes may have up to 64 megabytes of data, 64 megabytes of text (instructions), 8 megabytes of stack, and multiple shared memory segments up to 64 megabytes each. Series 300 virtual memory supports 4 Gbytes per process for models 330, 332, 340, 350.360, and 370.

McKusick/Berkeley file system
The HP-UX file system is based on the McKusick/Berkeley implementation of the UNIX operating system file system, which is generally considered the fastest standard UNIX file system. This file system is better suited for multiuser and real-time applications, which are often dependent on file system throughput. Interchange of data with other computers is supported by a set of utilities, which selectively convert and copy files in the HP-UX format to the Logical Interchange Format (LIF). LIF is a vehicle for transporting ASCII files on removable data storage media between a wide variety of Hewlett-Packard computers.

Transparent access to CD-ROMs
HP-UX provides transparent access to industry standard CD-ROMs, as specified by the ISO 9660 standard. This standard, which has gained widespread acceptance in MS-DOS, enables information access to large databases on CD-ROMs formatted using this standard. HP-UX provides transparent access to this file system format from the standard HP-UX call, library, and command interface.

Figure 4. HP-UX software solutions

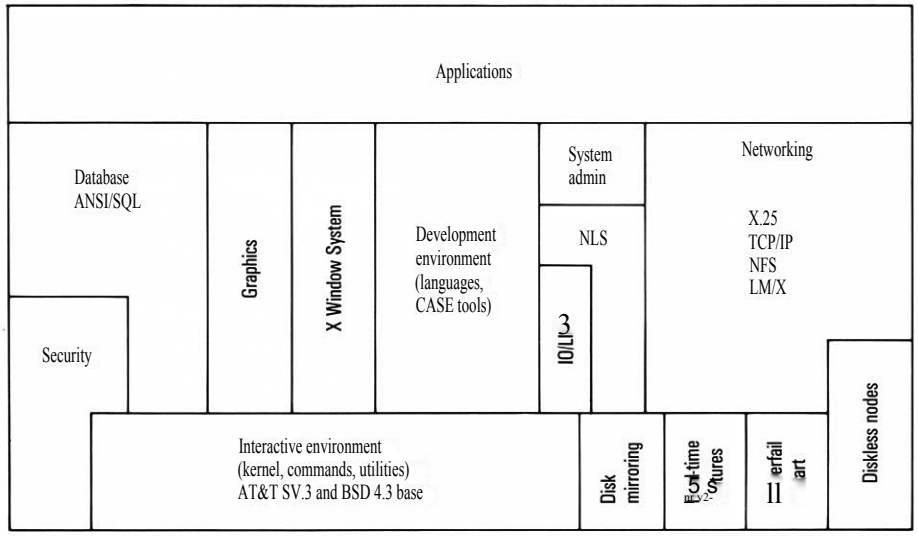


Table 1. Configuration

	S/800	S/300
Memory		
Required	8 Mbytes	4 Mbytes
Maximum	128 Mbytes	48 Mbytes (ECC only)
Hie system		
Maximum size	4 Gbytes	6.8 Gbytes
Processes		
Maximum	configurable	configurable
Disk usage		
Minimum for a typical system	300 Mbytes	80 Mbytes[1]/^ Mbytes[2]
Minimum for a diskless server	600 Mbytes	160 Mbytes^OO Mbytes[4]

Notes:
Minimum disk size for configurations using only the HP 98515 B/L, 98595 B/L, or 98596 B/L HP-UX Application Execution Environment.
Recommended minimum disk size for configurations using an HP-UX Application Execution Environment and HP 98597 C/L HP-UX Programming Environment, or the HP 98594 A7L HP-UX Software Bundle.
[3]Minimum disk size for configuration using the SCSI Hard Disk Drive (HP7958S)
[4]Minimum disk size for configurations using the HP-IB Hard Disk Drive (HP7959B)

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