Convergent

CTIX Operating System

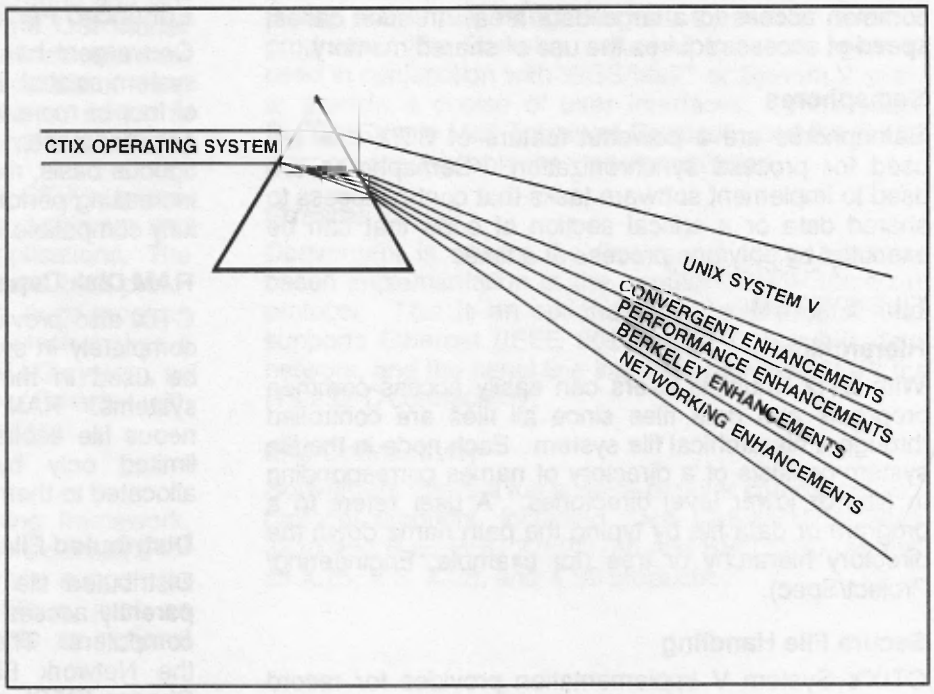
- **Based on AT&T UNIX System V Release 3**
- **Demand-paged virtual memory**
- **High-speed 'hardened' file system**
- **Powerful networking support**
- **Simplified system setup and administration tools**
- **Enhancements for database access, realtime applications, and communications**
- **Berkeley 4.3 UNIX extensions**

CTIX™ is Convergent's enhanced, high-performance version of UNIX® System V, Release 3, for the S/Series™ family of WorkGroup Servers™. CTIX offers all the benefits of System V Release 3, including demand-paged virtual memory, nationalization, and powerful networking support. The Streams interface provides a powerful mechanism for implementing protocols, while the Transport Interface offers the capability of building protocol- and media-independent applications. CTIX complies with the System V Interface Definition (SVID).

In addition to the productivity and performance enhancements that characterized previous releases, CTIX also includes a 'hardened' high-performance file system, enhancements for database access, realtime and communications support, loadable device drivers, simplified system administration tools, and the most powerful features of Berkeley 4.3 UNIX.

AN INDUSTRY STANDARD

CTIX is based on UNIX System V, Release 3, from AT&T – the recognized standard for multiuser, multitasking operating systems. Emerging standards such as the IEEE Posix, P1003 standard, National Bureau of Standards Federal Information Processing Standard (FIPS), and the X/Open Common Application Environment (CAE) have roots in SVID from AT&T. CTIX's compliance with SVID places it in a new strategically advantageous position to comply with these new standards as they are ratified and accepted.



DEMAND-PAGED VIRTUAL MEMORY

Demand-paged virtual memory is a key feature of modern multitasking operating systems and allows programs to run that are much larger than the physically available memory. The developer can, therefore, concentrate on applications rather than memory limits. With demand-paged virtual memory, each CTIX task functions as though all of its program and data were in physical memory; CTIX actually keeps part of the data on a mass storage device. If the process tries to access information not currently resident in physical memory, CTIX moves the necessary information from disk into memory – activity that is transparent to the task. Application developers need not manage program overlays or swap data to mass storage under program control.

INTERPROCESS COMMUNICATION

CTIX offers several services that allow interprocess communication and synchronization, including message queues, shared memory, and semaphores.

Message Queues

Message queues are used to exchange data between two cooperating processes and are best used when processes communicate by exchanging small packets of data. Message queues are a CTIX system resource and can be protected with multiple permission levels.

Shared Memory

CTIX allows two processes to share the same virtual memory, and thereby share the data within it. Shared memory is useful when multiple processes need common access to a large data area. In such cases, speed of access requires the use of shared memory.

Semaphores

Semaphores are a powerful feature of CTIX that are used for process synchronization. Semaphores are used to implement software tasks that control access to shared data or a critical section of code that can be executed by only one process at a time.

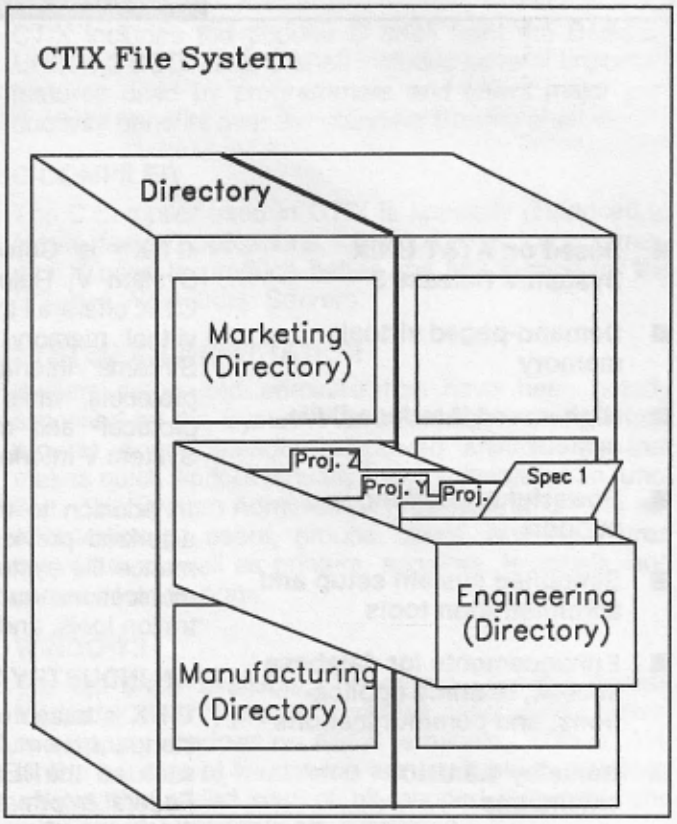
FILE SYSTEM

Hierarchical

With CTIX, multiple users can easily access common programs and data files since all files are controlled through a hierarchical file system. Each node in the file system consists of a directory of names corresponding to files or lower level directories. A user refers to a program or data file by typing the path name down the directory hierarchy or tree (for example, Engineering/Project/Spec).

Secure File Handling

CTIX's System V implementation provides for record and file locking. Many sophisticated applications – especially those requiring extensive data management – use record and file locking for data integrity on a multiuser system.



Read, write, and execute status of a file can be controlled to multiple levels of permission.

Enhanced Performance

Convergent has enhanced the standard System V file system so that its performance is multiplied by a factor of four or more for most file operations. Through these enhancements, disk blocks are allocated on a contiguous basis, minimizing disk space fragmentation and increasing performance. This bit-mapped file system is fully compatible with the SVID.

RAM Disk Capability

CTIX also provides RAM-based file systems that exist completely in system memory. Such file systems can be used in the same manner as ordinary disk file systems. RAM file systems provide nearly instantaneous file access. The size of these file systems is limited only by the amount of physical memory allocated to them.

Distributed File Systems

Distributed file systems allow CTIX users to transparently access files over a heterogeneous network of computers. The two popular distributed file systems, the Network File System (NFS) and Remote File Sharing (RFS), are available as optional products.

NFS is used to provide file sharing over a multiple-vendor computer network. This popular distributed file system runs on a wide variety of computers, including MS-DOS personal computers (PCs). Since it is designed to be independent of the operating system, it is easily portable to non-UNIX operating systems.

RFS is a powerful addition to the CTIX environment that provides the framework for distributed applications. Transparent access to remote files or other machines on the network is provided through existing mechanisms. UNIX file system semantics are unchanged so that existing applications can run. RFS is protocol- and media-independent; should more efficient protocols be available in the future, networking applications could use those services through RFS without modification. Another benefit of RFS is that remote peripherals such as printers and plotters can be used as though they were on a local system.

Networking

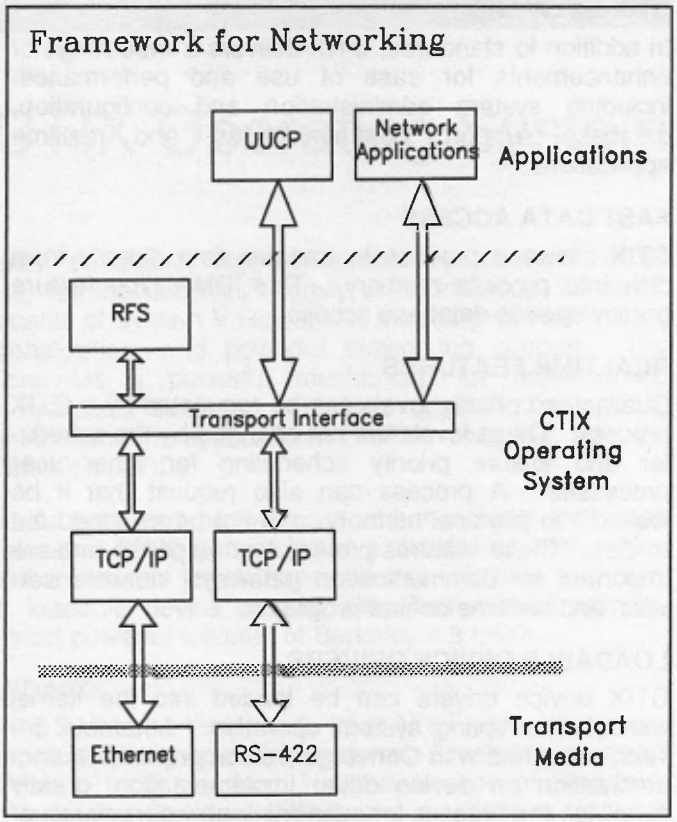
CTIX provides a powerful and consistent framework for networking, which includes the streams mechanism and the Transport Interface. RFS, which is available as an optional product from Convergent, is based on this framework.

The streams mechanism provides a consistent framework for the implementation and support of popular protocols, such as TCP/IP, SDLC, BSC, and the ISO Open Systems Interconnect (OSI) protocol stack. Streams are used within the CTIX kernel to separate protocol functions into modules that can be stacked in a layered fashion. This supports the layering and service interface concepts advocated by the OSI model. Modularity and adherence to well-defined interface standards insulate developers from the details of lower level protocols and also make it simpler to switch to more efficient protocols when they become available.

The Transport Interface is the core of CTIX's framework for networking and provides both datagram and virtual circuit capability to networking applications. The use of this functionality makes applications both protocol- and media-independent. Both the *uucp* program and RFS are based on this interface, which makes it possible for *uucp* to run on the character I/O system, as in earlier versions of CTIX, and also over Ethernet with Convergent's streams-based TCP/IP protocol.

Berkeley Extensions

In addition to the System V networking framework, CTIX also supports the popular Berkeley extensions for networking. The Berkeley sockets library, support for TCP/IP over Ethernet, and popular utilities, such as *rlogin*, *telenet*, *ftp*, and *rcp* are available as optional products.



COMMUNICATIONS

Flexible Electronic Mail

CTIX provides a powerful and flexible electronic mail facility that is fully integrated with the WGS™ suite of products. The Berkeley *sendmail* transport agent is used in conjunction with WGS/Mail™ or System V *mailx* to provide a choice of user interfaces. UNIX *uucp*, SMTP (Simple Mail Transport Protocol), and the X.400 protocol are available for mail transmission.

Streams TCP/IP

Convergent is one of the first to provide a streams-based implementation of the popular TCP/IP transport protocol. This is an optionally available product that supports Ethernet (IEEE 802.3), the X.25 public data network, and the serial line interface protocol (SLIP) for RS-232-C connectivity.

IBM Connectivity

Convergent offers a full suite of popular communication protocol products, including SNA LU6.2/PU2.1, SNA 3270 and RJE, BSC 2780/3780 and BSC 3270, as well as X.25, X.3, X.28, and X.29 products.

CTIX DELIVERS

In addition to standards, CTIX delivers a wide range of enhancements for ease of use and performance, including system administration and configuration, database support, communications, and realtime applications.

FAST DATA ACCESS

CTIX allows a process to transfer data directly from disk into process memory. This 'DMA'-type feature greatly speeds database access.

REALTIME FEATURES

Guaranteed priority levels can be requested by a CTIX process. These levels are not changed by the scheduler and assure priority scheduling for other user processes. A process can also request that it be locked into physical memory, and not be swapped out to disk. These features provide fast response and are important for communication gateways, network servers, and realtime control programs.

LOADABLE DEVICE DRIVERS

CTIX device drivers can be loaded into the kernel without interrupting system operation. Loadable drivers, combined with Convergent's comprehensive documentation on device driver implementation, greatly simplifies the process for supporting new peripherals or adding new devices.

EXPANDABLE SWAP SPACE

Disk swap space can be increased without reconfiguration of the kernel or disk. When the memory requirements of a running process exceed that available swap space, more space may be added immediately to allow the process to continue.

AUTOMATIC KERNEL CONFIGURATION

CTIX automatically senses which peripherals are present on a system at power up. Only the drivers necessary for operation are loaded; the kernel data structures are sized accordingly. Therefore, more memory is available for user tasks.

C SHELL

CTIX includes the popular C shell from the Berkeley UNIX 4.2 BSD. The C shell includes several important features used by programmers and offers major productivity benefits over the standard Bourne shell.

C COMPILER

The C compiler used in CTIX is specially enhanced to create faster applications. An optimized code generator is used to produce better and faster code for the S/Series WorkGroup Servers.

SYSTEM ADMINISTRATION

System setup and administration have been greatly simplified by the System Administration utilities, which provide a user-friendly, windowed environment that makes quick work of virtually every administration function. The System Administration utilities handle the administration of users, groups, disks, and local area networks, as well as printers, spoolers, terminals, and communication ports.

WINDOWS

The optionally available Convergent Terminal Access Method (CTAM™) product provides concurrently active, overlapping windows on ASCII terminals. With CTAM, all the benefits of windowing are available to the user, without the added cost of bit-mapped terminals, and most popular terminals are supported.

WGS/DESKTOP

Since standard UNIX has a programmer-oriented interface, Convergent has designed an easy-to-use alternative for the user. WGS/DESKTOP™, an optional package, presents a visual, object-oriented interface to CTIX. The user can use CTIX functionality without remembering or typing complicated commands. WGS/DESKTOP also allows application developers to easily integrate their applications into this interface.

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