Accent
Advanced Network Operating System

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│          USER           │
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│  ACCENT WINDOW MANAGER                     │
│  • Fully supports covered window paradigm  │
│  • Icons for window control and process    │
│    status                                  │
│  • Up to 64 simultaneous windows           │
│  • Windows can be on local machine or on   │
│    another machine on the network          │
│  • Progress bars in both the icon and win- │
│    dow title                               │
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│  ACCENT          │ │  QNIX ENVIRONMENT       │ │  LISP ENVIRONMENT    │
│  ENVIRONMENT     │ │  • Complete UNIX System │ │  • Full Common Lisp  │
│  • Client-server │ │    V environment,       │ │    implementation    │
│    paradigm      │ │    licensed from AT&T   │ │  • Compiler and      │
│  • Consistent    │ │  • Provides System V    │ │    interpreter       │
│    user interface│ │    system calls         │ │  • Screen editor     │
│  • Screen-       │ │  • Over 150 utilities   │ │    based on EMACS     │
│    oriented editor│ │  • Use of the network  │ │    and extensible    │
│  • Over 100      │ │    is transparent       │ │    in Lisp           │
│    utilities     │ │  • Standard UNIX shell  │ │                      │
│  • Integrated    │ │                         │ │                      │
│    on-line HELP  │ │                         │ │                      │
│    facility      │ │                         │ │                      │
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│  ACCENT KERNEL                             │
│  • Message-based interprocess communication│
│  • Demand paging                           │
│  • Priority scheduling with pre-emption and│
│    aging                                   │
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┌─────────────────────────┐
│      WORKSTATION        │
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Accent

Accent is a highly sophisticated, distributed, communication-oriented operating system designed to maximize the performance of the LINQ™ network. As a multiprocess, message-based operating system, Accent provides LINQ users with transparent access to remote files, interprocess communication (IPC), virtual terminal emulation, computation down-loading, and other network services. The Accent architecture can be divided into three basic levels joining the user with the workstation:

- Accent Kernel
- Co-equal Environments
- Accent Window Manager

Accent Kernel

Accent is composed of a kernel and a number of cooperating processes. A process consists of a 32 bit virtual address space, process state (including the state of any macrocode and microcode registers essential to execution) and access to one or more port capabilities. An Accent port is a kernel-managed and protected simplex communications channel. Message-passing is the sole means of communication in Accent, both process-to-process and process-to-kernel.

One of the kernel's main functions is to handle the interprocess communication (IPC). Most other operating system functions are provided by sending messages through the IPC facility to server processes. Server processes may reside on the local machine or may be accessed through the network. In this interaction, neither the client process nor the server process ever needs to know that the partner in the transaction is not on the local machine.

The Accent kernel provides priority scheduling with preemption and aging. An aging algorithm automatically lowers the priority of a compute-bound process, thus allow-

ing fast response for highly interactive processes.

Workstation memory and disk space are managed by a demand paging feature in the kernel. This paging process is responsible for handling references to virtual addresses which are not currently resident in physical memory. This job is done completely by passing messages between the kernel, the pager, and other server processes.

The kernel also provides facilities which offer unique microcode implemented language support, yielding multiple virtual machine environments. Under Accent, each process utilizes an instruction set which is optimized for the language in which the process is written—Pascal, C, FORTRAN, or Lisp. Accent changes instruction sets dynamically depending upon the language of the process which is executing. This results in the ability for processes to fundamentally run more efficiently. Along with multiple instruction set enhanced performance, Accent also provides facilities for processes written in different languages to communicate with each other by means of the Accent IPC.

The file system incorporated into the Accent kernel features a tree-structured directory. Reliability has been enhanced through the use of special hardware. The file system is transparent across the network, so access to remote files is the same as access to local files. Access Control Lists protect file access for system security.

Co-equal Environments

One of the most unique features of Accent is its ability to support multiple, co-equal environments for optimal software development and operational flexibility. These include the native Accent environment, a Lisp environment for artificial intelligence applications, and Qnix™— an advanced UNIX™ System V implementation. All of these environments can be coresidents of the Accent operating system, e.g. a window on the screen can be running Lisp, while at the same time a second window is running Qnix, and a third is operating under the native environment. Programs written in Lisp or under the UNIX operating system can easily be ported to Accent using this feature.

Qnix, licensed by PERQ Systems directly from AT&T, provides a UNIX System V user interface and access to System V system calls and utilities. The standard UNIX shell is incorporated. Because Qnix is built on top of Accent's virtual memory management, file system, and IPC facilities, Qnix users have transparent access to network resources.

Integrated into the native Accent environment is a screen-oriented EMACS-like editor that provides an extraordinarily useful means for editing standard text, as well as Pascal, C, or FORTRAN programs. The Accent editor permits users to simultaneously edit multiple files with its ability to move text back and forth between separate windows. The editor also utilizes the PERQ™ graphics tablet and pointing device to insure efficiency and ease of use. The Lisp environment offers another editor which provides similar capabilities but is written entirely in PERQ Lisp (a superset of Common Lisp). The Lisp editor lets users edit Lisp expressions, saving results in both a source file and the Lisp environment.

Accent Window Manager

The user interface to Accent is provided exclusively by a high level window manager. Windows act as multiple virtual displays; they are rectangular regions of the screen that contain one or more processes. They can be fully visible, partially visible, partially covered, or totally covered while the processes are operating as well as when they are idle. Under Accent, up to 64 active windows can concurrently exist, either on or off the screen. The Window Manager offers protected access to rectangular bitmaps, including graphics raster-op and special string display functions. Icons are provided to assist the user in window control and actively monitor process status. Progress bars appear on screen in both the icon and the window title. The Window Manager also reflects Accent's dedication to transparent communications by allowing users to create windows on a local machine that control processes running on any other machine residing on the LINQ network.