

# Arix Corp. Arix Systems

## MANAGEMENT SUMMARY

### Company Background

Arix Corporation, formerly known as Areté Systems Corporation, has been designing, manufacturing, and distributing multiuser superminicomputer-class systems since 1983. Arix has steadily gained recognition as a premier supplier of UNIX-based midrange computer systems, with annual revenue growth at a compound rate of 130 to 140 percent over the last five years. Revenues continue to soar to new highs. Annual figures for 1988 topped \$60 million, a 45.1 percent increase over fiscal 1987 sales of \$41.5 million. Furthermore, the value of shipments placed Arix third in both U.S. and worldwide markets for midrange UNIX-based computer systems.

### Company and Product Strategy

### Market Approaches

Arix markets its products almost exclusively through indirect sales channels: original equipment manufacturers (OEMs), value-added resellers (VARs), distributors, and system integrators. This indirect sales approach gives Arix' products broad visibility and taps into the marketing, sales, and technical strengths of its distribution partners to generate sales and to support customers.

Through its indirect sales force, Arix systems address a number of different organizations and requirements. Primary targets include discrete manufacturing, telecommunications, financial service companies, and government agencies. Within these markets, Arix systems primarily run applications for online transaction processing, database systems, departmental computing, management information systems, and office automation.

OEMs market, sell, and support Arix models under their own private labels, or as components embedded in larger systems. The company's largest OEM customer is Unisys Corporation, which repackages, renames, and resells three upper end Arix models. Unisys has resold over 2,000 Arix systems to customers primarily within the commercial, service, and government sectors. Other important OEMs include Marubeni Electronics Company, a Japanese company which, in association with Nixdorf Computer Corporation, markets Arix computers throughout Japan; SAGEM, a French company which markets Arix models in France; and Pacific Bell, a U.S. based telecommunications company which uses Arix models to create dedicated systems.

Arix addresses vertical markets through VARs, which integrate Arix systems with industry- or niche-specific applica-

The Arix Systems are UNIX derivatives and feature proprietary designs coupled with standards-based hardware, software, and communications. The models are positioned for commercial processing—general time-sharing, online transaction processing, and office automation—and selected specialized online applications at the department or enterprise level. They are primarily sold through VARs, OEMs, and system integrators.

**MODELS:** Arix 800 Series and the System90. The Arix 800 Series consists of four models: Arix 800, Arix 825, Arix 850, and Arix 875. The System90 comes in two versions: the System90 Model 40 and the Model 80.

**MEMORY:** From 4M to 64M bytes on the Arix 800 Series; from 8M to 416M bytes on the System90.

**DISK CAPACITY:** From 170M to 10.5G bytes on the Arix 800 Series; up to 86G bytes on the System90.

**WORKSTATIONS:** Up to 128 concurrent workstations on the Arix 800 Series; up to 512 concurrent workstations on the System90.

**PRICE:** From \$25,000 to \$150,000 for the central system of an Arix 800 Series model; from \$95,000 to \$500,000 for the central system of a System90 model.

## CHARACTERISTICS

**VENDOR:** Arix Systems Corp., 821 Fox Lane, San Jose, California 95131. Telephone (408) 432-1200.

### DATA FORMAT

**BASIC UNIT:** 32-bit word.

**INTERNAL CODE:** ASCII.

### MAIN STORAGE

The Arix 800 series and the System90 models support a virtual memory architecture. The Arix 800 series provides 4M to 64M bytes of physical memory for holding pages of virtual memory. The System90 models accommodate from 8M to 416M bytes of physical memory. See Table 1 for memory sizes of specific models.

Physical memory on the Arix 800 series consists of 4M-, 8M-, 16M-, and 32M-byte memory boards. Physical memory on the System90 is implemented with 8M-, 16M-, or 32M-byte memory boards.

**Arix Corp. Arix Systems**

**TABLE 1. SYSTEM COMPARISON**

MODEL	Arix 800	Arix 825	Arix 850	Arix 875
<b>SYSTEM CHARACTERISTICS</b>				
Date of introduction	May 1987	November 1987	November 1987	November 1987
Field upgradable from	Not applicable	Arix 800	Not applicable	Arix 850
Field upgradable to	Arix 825	Not applicable	Arix 850	Not applicable
Operating system	Arix-OS 5.3 Release 2.1 (UNIX System V.3.1)	Arix-OS 5.2 Release 2.1 (UNIX System V.3.1)	Arix-OS 5.3 Release 2.1 (UNIX System V.3.1)	Arix-OS 5.3 Release 2.1 (UNIX System V.3.1)
<b>CENTRAL PROCESSOR ARCHITECTURE</b>				
No. of CPUs <sup>1</sup>	1 or 2	1 or 2	1 to 3	1 to 3
Microprocessor type	MC68020	MC68020	MC68020	MC68020
Microprocessor cycle time	12.5MHz	25MHz	25MHz	25MHz
Floating-point co-processor	MC68881 (std. on each CPU)	MC68881 (std. on each CPU)	MC68881 (std. on each CPU)	MC68881 (std. on each CPU)
Cache memory (bytes)	8K incl. w/each CPU	64K incl. w/each CPU	64K incl. w/each CPU	64K incl. w/each CPU
<b>PHYSICAL MEMORY</b>				
Minimum capacity (bytes)	4M	4M	4M	4M
Maximum capacity (bytes)	16M	64M	64M	64M
<b>I/O CONTROL</b>				
High-speed system I/O bus	Data Transfer Bus (25MB/sec)	Data Transfer Bus (25MB/sec)	Data Transfer Bus (25MB/sec)	Data Transfer Bus (25MB/sec)
Low-speed system I/O bus	Communications and Control Bus (8MB/sec)	Communications and Control Bus (8MB/sec)	Communications and Control Bus (8MB/sec)	Communications and Control Bus (8MB/sec)
Intelligent I/O controllers	Yes	Yes	Yes	Yes
Total available I/O slots <sup>2</sup>	6	6	12	12
Max. no. of disk/tape controllers	2	2	4	4
Max. no. of local communications controllers	5	5	11	11
Max. no. of remote communications controllers	20	20	32	32
Total available ports <sup>3</sup>	320	320	512	512
Max. no. of local ports	80	80	128	128
Max. no. of remote ports	Up to 320	Up to 320	Up to 512	Up to 512
Max. no. of LAN interfaces	1	1	1	1
<b>DISK STORAGE</b>				
Max. internal capacity (bytes)	510M	1.1G	2.5G	1.6G
Max. external capacity (bytes)	6.6G	6.6G	10.5G	10.5G
<b>NUMBER OF WORKSTATIONS</b>				
Physical capacity	320	320	512	512
No. concurrently active	Up to 48	Up to 80	Up 128	Up to 128
<b>COMMUNICATIONS PROTOCOLS</b>				
	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net
<b>PURCHASE PRICE</b>				
Range for central system	\$25,000 to 40,000	\$32,000 to 75,000	\$45,000 to 150,000	\$50,000 to 150,000
<b>COMMENTS</b>				
	Upwardly compatible with previously announced Arix models and the other family members. Multibus I bus is available as an option. From 1G to 6G bytes of optical disk can be accommodated.	Upwardly compatible with former Arix models and the later relatives. Multibus I bus is available as an option. From 1G to 6G bytes of optical disk can be accommodated.	Upwardly compatible with former Arix models and current family members/relatives. Up to 11 Multibus I bus adapter cards can be configured. Up to 28G bytes of disk storage can be attached.	Upwardly compatible with former Arix models and current family members/relatives. Up to 11 Multibus I bus adapter cards can be configured. Up to 28G bytes of disk storage can be attached.

<sup>1</sup>Each CPU consists of a single board with microprocessor and VLSI technology.

<sup>2</sup>Each I/O slot holds one I/O controller/processor.

<sup>3</sup>This entry lists the maximum number of communications ports that can be configured on the system through local and remote controllers.

**Arix Corp. Arix Systems**

**TABLE 1. SYSTEM COMPARISON (Continued)**

MODEL	Arix System90 Model 40	Arix System90 Model 80
<b>SYSTEM CHARACTERISTICS</b>		
Date of introduction	January 1989	January 1989
Field upgradable from	Not applicable	Not specified
Field upgradable to	Not specified	Not applicable
Operating system	Arix-OS/90 (UNIX System V.3.1)	Arix-OS/90 (UNIX System V.3.1)
<b>CENTRAL PROCESSOR ARCHITECTURE</b>		
No. of CPUs <sup>1</sup>	1 to 4	1 to 8
Microprocessor type	MC68020	MC68020
Microprocessor cycle time	25MHz	25MHz
Floating-point co-processor	MC68881 (std. on each CPU)	MC68881 (std. on each CPU)
Cache memory (bytes)	64K incl. w/each CPU	64K incl. w/each CPU
<b>PHYSICAL MEMORY</b>		
Minimum capacity (bytes)	8M	8M
Maximum capacity (bytes)	160M	416M
<b>I/O CONTROL</b>		
High-speed system I/O bus	Data Transfer Bus (25MB/sec)	Data Transfer Bus (25MB/sec)
Low-speed system I/O bus	Communications and Control Bus (8MB/sec)	Communications and Control Bus (8MB/sec)
Intelligent I/O controllers	Yes	Yes
Total available I/O slots <sup>2</sup>	10 w/o I/O expansion cabinet; 29 w/I/O expansion cabinet	Not specified
Max. no. of disk/tape controllers	4 w/o I/O expansion; 8 with expansion	Up to 16 w/I/O expansion
Max. no. of local communications controllers	16 w/I/O expansion	32 w/I/O expansion
Max. no. of remote communications controllers	Available; amount not specified	Available; amount not specified
Total available ports <sup>3</sup>	Not specified	Not specified
Max. no. of local ports	Not specified	Not specified
Max. no. of remote ports	Up to 16 per remote link; up to 4 links per local communications controller	Up to 16 per remote link; up to 4 links per local communications controller
Max. no. of LAN interfaces	Available; amount not specified	Available; amount not specified
<b>DISK STORAGE</b>		
Max. internal capacity (bytes)	3.5G	3.5G
Max. external capacity (bytes)	39.5G	82.5G
<b>NUMBER OF WORKSTATIONS</b>		
Physical capacity	Not specified	Not specified
No. concurrently active	Up to 256	Up to 512
<b>COMMUNICATIONS PROTOCOLS</b>		
	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net	Ethernet TCP/IP, DARPA, Berkeley, UNIX async, OSI/X.25, Arix X.25, 2780/3780, HASP, BSC/3270, SNA/3270, SNA/3770, PCworks, MacLine, Net/One, 3Comm 3Plus, Ms-Net, PC-Net
<b>PURCHASE PRICE</b>		
Range for central system	\$95,000 to 250,000	\$110,000 to 500,000
<b>COMMENTS</b>		
	Upwardly compatible with previously-announced Arix models and the other family members. Multibus I and VME buses are available as options. Optical disks can be accommodated.	Upwardly compatible with former Arix models and the later relatives. Multi-bus I and VME buses are available as options. Optical disk can be accommodated.

<sup>1</sup>Each CPU consists of a single board with microprocessor and VLSI technology.

<sup>2</sup>Each I/O slot holds one I/O controller/processor.

<sup>3</sup>This entry lists the maximum number of communications ports that can be configured on the system through local and remote controllers.

tion software to provide turnkey solutions to end users. Arix employs a two-tier VAR strategy: within the U.S. and Canada, four regional distributors service the needs of smaller VARs; while the company markets directly to larger VARs with more specialized vertical applications and broader geographic coverage.

By the end of 1988, Arix had agreements with more than 30 VARs. To support its VARs and attract new VARs, Arix has instituted Arix Accord, a comprehensive program that provides volume discounts, marketing support, training, seminars, and field service.

All physical memory resides on a high-speed central processor-memory bus. The central processors read from and write to memory via a memory management unit (MMU). I/O processors on the Arix 800 models access memory through a direct memory access (DMA) controller. The I/O processors of the System90 read from and write to memory via I/O link cards.

**PROCESSING COMPONENTS**

Each Arix computer features a distributed architecture. At the center is a compute engine that processes applications. ➤

## Arix Corp. Arix Systems

➤ Arix sells to the government primarily through system integrators, which combine Arix models with diverse equipment and customized software and communications to address the customers' specific needs. Arix is currently working with several integrators on proposals for a number of domestic and foreign government procurements. In addition, it is seeking to broaden its market base into systems integration.

### Technology Approaches

Arix computers are designed with microprocessors and a multiuser operating system that supports multiprogramming and multitasking. This technology typically offers superminicomputer performance and capabilities at much lower costs. Furthermore, Arix computers offer "openness" that reduces costs when moving to or from other system platforms or when porting applications to the platform.

The Arix computer architecture couples standards and commodity components—such as MC68020 microprocessors and UNIX—with proprietary innovations. This approach allows Arix to leverage relatively low-cost commodity technologies into attractive price/performance packages. Distinguishing characteristics that contribute to performance include:

- A compute engine with multiple, MC68020 microprocessor-based CPUs tightly coupled into arrangements that share main storage and I/O. A single copy of the operating system performs dynamic load-balancing.
- Highly tuned microprocessor-based I/O controllers dedicated to specific I/O tasks.
- Proprietary internal buses with high communications bandwidths.
- A customized UNIX operating system.

By using off-the-shelf components and popular software facilities, Arix reduces its cost of building and delivering computers. The time and expense of researching, developing, and manufacturing products are reduced; Arix can deliver products more quickly and at a lower price than vendors building proprietary systems from scratch.

Furthermore, using off-the-shelf components and de facto, industry-standard facilities allows Arix to minimize technological obsolescence. Arix can incorporate new technologies into its computers as they become available. For example, Arix can incorporate Motorola MC68030 chips into the architecture once Motorola reaches full production and the chips have been tested and approved for the Arix computers.

Also, by building the Arix systems around widely employed hardware and software, Arix reduces the customer's cost of migrating from or to another vendor's system that employs such common facilities. Featured on the Arix computer are ➤

➤ The compute engine comprises one or more CPUs and main storage. The CPUs are single board processors with microprocessor technology and very large-scale integration (VLSI) designs.

Each CPU on the Arix 800 consists of:

- One Motorola MC68020 microprocessor with a 12.5MHz clock
- One Motorola MC68881 floating point co-processor
- 8K bytes of cache
- A memory management unit (MMU)
- A console port
- A diagnostic port
- An electronically programmable read-only memory (EPROM) containing diagnostics and start-up routines

The CPU for the Arix 825 comes with:

- One 25MHz Motorola MC68020 microprocessor
- One Motorola MC68881 co-processor
- A 64K-byte cache with 80-nanosecond (ns.) memory
- An MMU
- A console port
- A diagnostic port
- An EPROM with diagnostics and start-up routines

Each CPU on the Arix 850 and Arix 875 features:

- One 25MHz Motorola MC68020
- One Motorola MC68881
- A 64K-byte cache with 35-ns. memory
- An MMU
- A console port
- A diagnostic port
- EPROM-based diagnostics and start-up routines

The CPUs on the System90 each contain:

- One 25MHz Motorola MC68020
- One Motorola MC68881
- A 64K-byte system cache
- An MMU
- A high-speed page descriptor cache
- EPROM-based diagnostics

The MC68020 is a full 32-bit processor. Each contains 16 general-purpose, 32-bit data and address registers; two stack registers and program counters; an on-chip instruction cache; a high-speed 32-bit execution unit; an instruction prefetch and decode unit; and a bus controller unit. ➤

## Arix Corp. Arix Systems

the Motorola MC68020 chip; the SCSI, SMD, and ESMD peripheral interfaces; a UNIX System V.3 operating system; and system software such as the Oracle relational database system and IEEE 802.3 TCP/IP Ethernet networking. In addition, these commonly available facilities enable Arix to provide users with access to a broad range of low-cost peripherals and an increasingly large applications base.

Arix' Arix-OS, an implementation of AT&T UNIX System V.3, fully complies with the *AT&T System V Interface Definition (SVID)* specification. Arix-OS maintains source-code compatibility with any implementation of UNIX conforming to the SVID definition. Applications written under the SVID guidelines can be ported to the Arix series; however, program code has to be modified.

To protect its target markets, Arix ensures that production-oriented applications software is readily available. The major source of applications is independent software developers—i.e., independent software houses and VARs. To attract and retain these independent software suppliers (ISVs), Arix offers a business program that helps providers port software to the Arix platform.

Many of Arix' target markets require extensive database management capabilities. Arix answered this need through a series of business agreements that make the industry's most widely used database management products available. Offered are Oracle Corporation's Oracle and Oracle with TCP; Unify Corporation's Unify; Informix Corporation's Informix, Informix SQL, and Informix Turbo; and Progress Corporation's Progress.

Arix supplies third-party office automation and user productivity software to satisfy office automation and desktop automation requirements.

All Arix models implement an "open network computing" philosophy to attract customers with a multivendor or multiple-architecture computer infrastructure. Arix' proprietary and third-party communications and networking software provides the openness required in a departmental or distributed processing environment. Tools are available to interact with IBM PCs and similar and dissimilar workstations, departmental systems, and host systems connected to IEEE 802.3-recommended Ethernet or X.25 communications lines. The Arix systems can also communicate with IBM System/370-architecture systems via SNA or BSC communications facilities.

Arix turns its product line over rapidly. The Arix line has already been revised several times since its introduction in December 1983.

Presently, the product line consists of the Arix 800 Series and the System90 Series. The Arix 800 Series includes the Arix 800, 825, 850, and 875. The System90 comes in two types: System90 Model 40 and System90 Model 80. As the featured models, these Arix systems offer more computer performance and have more capabilities than previously

► The Motorola MC68881 floating point co-processor is integrated with the MC68020. It off-loads floating point arithmetic and increases the speed of single- and double-precision operations. Single- and double-precision operations conform to the IEEE-standard format for single- and double-precision floating point arithmetic. The co-processor interface to the MC68020 allows overlapped execution of MC68020 and MC68881 instructions.

The cache memory provides the MC68020 with high-speed access to frequently used instructions and data. The cache accesses and sends instructions and data to the MC68020 faster than main storage could. Using the cache overcomes the discrepancy between memory cycle speed and the faster data access rate of the MC68020. The cache reduces the time the MC68020 waits to receive instructions and data for processing, enabling the MC68020 to execute more instructions per second.

The MMU is tightly integrated with the MC68020. It is responsible for demand paging, mapping processes, writing and reading and providing virtual input/output (I/O) and direct virtual memory access from I/O devices.

The MMU employs a two-level address translation technique which allows the CPU to map all processes at logical address zero and scatter load processes into any set of 4K-byte physical pages. It provides multiple protection modes to protect any physical page from an illegal access. To allow the implementation of efficient, demand-paged virtual memory algorithms, the MMU hardware also keeps access statistics on each physical page.

Each CPU communicates with main storage via a processor-memory bus, which supports direct memory access for I/O as well as CPU and memory communications. The bus on the Arix 800 series allows direct, shared access to main memory at 12M bytes per second. The bus on the System90 is a 64-bit, parallel, synchronous bus that can sustain a data transfer rate of 128M bytes per second. The System90 contains memory modules with front-end high-speed command buffers that queue the multiple requests coming off the bus.

The multiple CPUs are tightly coupled, sharing main storage, I/O, and a single copy of the operating system. The sharing of a single queue of runnable processes allows dynamic load-balancing and ensures optimal use of resources. Coupling is performed through system buses and the operating system.

I/O processing is off-loaded from the CPU or tightly coupled CPUs by intelligent (microprocessor-based) I/O processors. The 32-bit data transfer bus interfaces between main storage and the file processors and transfers disk and tape data at up to 25M bytes per second. The communications and control bus carries serial I/O—terminal, Ethernet, and remote communications—between the compute engine and the workstations and data communications processors. It runs at 8M bytes per second. The DMA memory controller on the Arix 800 series provides the interface that links the system I/O buses with main storage. The I/O links within the System90 architecture connect the system I/O buses to the processor-memory bus which supports the CPUs, service processor, and main storage.

Besides carrying serial I/O, the communications and control bus synchronizes and coordinates component system parts, providing a means for the master CPU to acquire status from, and send commands to, all other processors in the system. A register, accessible through the communications and control bus, allows the master CPU to determine the type of board in each slot of the backplane, allowing automatic system configuration during power-up.

## Arix Corp. Arix Systems

➤ announced models. Furthermore, as part of research and development, Arix ensures that its models are upwardly compatible, which preserves users' investments in software and peripherals when they move to a larger or higher performance model.

### Competitive Position

The Arix series is competitive in price, performance, and capabilities. Such competitors are midrange systems that perform on-line transaction processing, general-purpose timesharing, and office automation. Principal UNIX-based competitors include the Sequent product line, the Pyramid computers, the AT&T 3B Series, the Unisys U/5000 and U/7000, and the NCR Tower. Mainstream proprietary architectures which compete with Arix models are the IBM AS/400, Digital VAX Series, Hewlett-Packard HP 3000, and Data General Eclipse/MV Series.

Although competitive, these Arix midrange UNIX-based systems do not have the visibility of such well-established and popular systems as the NCR Tower 32, Unisys U/5000 or U/7000, Digital VAX, or the IBM AS/400. Gaining market share will not be easy for Arix since these competitors dominate Arix' targeted markets—online transaction processing, information systems, general-purpose timesharing, and office automation in manufacturing, service, and government organizations.

Arix will continue to sell systems to its installed base. Arix would like installations with the aged and obsolete Arix 1000 Series models—the Arix 1100, 1200, and 1600—to move to the more strategic Arix 800 Series and System90. Additionally, Arix hopes installations with smaller Series 800 models—such as the Arix 825 or Arix 850—will move to more powerful Series 800 models—the Arix 875, for example—or the System90. At upgrade, compatibility allows users to preserve software, peripheral, and communications investments. Additionally, Arix recommends that large environments expand their existing Arix installation. By networking computers, customers can upgrade an installation without discarding previously installed systems. The compatibility between models provides “smooth” communications—the networking scheme does not need to accommodate incompatibilities between distributed nodes—and, thus, increases overall performance.

But Arix' success at replacing proprietary systems will remain limited. Customers rarely move between diverse architectures; the disruption and financial cost is often prohibitive. Arix computers, however, give Arix a better chance in competing for new corporate accounts and first-time automation sales.

Arix is very competitive when the customer has UNIX requirements. Demand for UNIX-based systems is growing at 20 to 30 percent annually, compared to 5 to 7 percent growth for proprietary systems. A variety of customers, especially small business, increasingly install UNIX-based systems because the UNIX platform reduces system migra-

➤ The communications and control bus is a single master, multiple slave bus. The master CPU is responsible for the timing of all transfers across the communications and control bus. Each slave responds to an address derived from the slot location of that slave. Slaves may request the attention of the bus master by several prioritized interrupt request lines. Polling is used to determine which of several slaves requires service if more than one slave is assigned to the same interrupt request level.

### INPUT/OUTPUT CONTROL

Arix computers perform I/O processing with file processors and intelligent communications processors.

The file processors interface with Winchester fixed disk drives, streaming cartridge drives, and 0.5-inch 9-track tape drives. Each file processor consists of a single board that contains an MC68000 microprocessor, local memory, and the appropriate peripheral interfaces.

The file processor used on the Arix 800, 825, 850, and 875 comes in two versions. The standard version supports fixed disk drives with the SMD interface. The enhanced file processor supports any combination of SMD-, HSMD-, or ESMD-compatible disk drives.

The file processor of the System90 also comes in two versions. The HSMD version supports up to four HSMD fixed disk drives and either a streaming cartridge tape drive or a 0.5-inch, 9-track tape drive. The SCSI version provides an SCSI interface that accommodates up to 14 SCSI-based devices. In addition, the SCSI version provides a QIC02 interface for the attachment of a streaming cartridge tape drive.

Available intelligent communication processors include:

- A local data communications processor
- A remote communications controller
- An Ethernet local area network (LAN) interface

Descriptions of the communications and LAN processors are in the “Communications” section of this report.

### CONFIGURATION RULES

The Arix 800 Series and System90 address small, medium, and large environments. Table 1 depicts the performance ratings, system capacities, configuration rules, and operational capabilities of each model.

A system cabinet and one or two expansion cabinets house the central system of both the Arix 800 and Arix 825. The system cabinet of the Arix 800 contains:

- One or two CPUs
- 4M to 16M bytes of real memory
- One DMA memory controller
- One backplane with slots for six I/O cards
- One or two database/file processors
- One to five local, intelligent communications processors
- One to three 170M-byte Winchester fixed disk drives
- Connections for one to eight Winchester disk drives external to the system cabinet

## Arix Corp. Arix Systems

tion and application porting costs and increases application accessibility. To ensure UNIX compatibility, and System90, Arix developed Arix-OS to *AT&T System V Interface Definition (SVID)* specifications, thus maintaining source-code compatibility with any UNIX implementation conforming to SVID.

### Decision Points

Several points should be considered when analyzing and evaluating Arix systems for purchase.

*Architecture.* Although the Arix systems contain proprietary innovations and designs, they still provide a degree of openness: a compute engine based on the popular Motorola MC68020 microprocessor; industry-standard peripheral interfaces, such as SCSI, SMD, and ESMD; a UNIX-based operating system compatible with UNIX System V.3; industry-standard database management products, such as Oracle; and networking based on facilities such as TCP/IP Ethernet. Thus, the Arix computers can reduce the cost of migrating from or to another vendor's system that employs such common facilities. In addition, these facilities provide Arix users with access to a broad range of low-cost peripherals and an increasingly large application base.

*Applications Availability.* Arix does not directly market, write, or support production-type, end-user application systems. Arix depends upon VARs and independent software houses to supply applications.

Only a few end-user application packages have been developed specifically for the Arix series. But overall applications software base is larger because of the system's capability to run applications developed under SVID-compliant UNIX System V. These SVID-compliant UNIX applications, however, are only source-code compatible and must undergo modifications to execute on the Arix platform.

*Modularity.* The modularity and expandability of the Arix models are important advantages. Processing power can be increased simply by adding application, file, and communications processors to the existing configuration to meet work load demands and reduce bottlenecks. For example, an Arix 825 can start out containing one application processor providing approximately 2 MIPS and be upgraded to a system containing three application processors and providing approximately 6 MIPS. Furthermore, all the processors are contained in one system unit. Customers need not exchange processor unit boxes as processing power is increased.

*Compatibility.* Compatibility among Arix models promotes system upgrading and application porting.

All Arix models maintain program, file, and data compatibility with one another. Applications developed for one can run on any other. Software moved to a higher performance Arix maintains object-code compatibility without recompile-

- ▶ • One streaming cartridge tape drive
- Connections for external 0.5-inch, 9-track magnetic tape drives
- Up to 80 serial communications ports
- From one to four parallel interfaces
- One Ethernet local area network (LAN) interface

Each expansion cabinet on the Arix 800 can accommodate:

- One or two database/file processors
- One to four Winchester fixed disk drives with capacities ranging from 170M to 824M bytes
- An optional streaming cartridge tape drive
- Connections to external 0.5-inch, 9-track magnetic tape drives

The system cabinet for the Arix 825 contains:

- One or two CPUs
- 4M to 64M bytes of real memory
- One DMA memory controller
- One backplane with slots for six I/O cards
- One or two database/file processors
- One to five local, intelligent communications processors
- One to six 170M-byte Winchester fixed disk drives
- Connections for one to eight external Winchester disk drives
- One streaming cartridge tape drive
- Connections for external 0.5-inch, 9-track magnetic tape drives
- Up to 80 serial communications ports
- One to four parallel interfaces
- One Ethernet local area network (LAN) interface

Like the expansion cabinet on the Arix 800, each expansion cabinet on the Arix 825 has:

- One or two database/file processors
- One to four Winchester fixed disk drives with capacities ranging from 170M to 824M bytes
- An optional streaming cartridge tape drive
- Connections to external 0.5-inch, 9-track magnetic tape drives

The Arix 850 and Arix 875 each package the central system within one system cabinet and from one to four expansion cabinets. Each system cabinet contains:

- One to three CPUs
- 4M to 64M bytes of real memory
- One DMA memory controller

## Arix Corp. Arix Systems

▷ lation or modification. Software moved to a lower performance Arix maintains source-code compatibility, but must undergo modification and recompilation.

*Model Upgrades.* Although Arix models are compatible with one another, migration from a lesser model to a new or more powerful platform can be somewhat expensive. Not every base processor can be preserved during a model upgrade. Some upgrades require a reinvestment in the system's main unit; i.e., the processor boxes must be exchanged. In most cases, replacing the entire main unit requires more effort and more expense than performing a field upgrade. The Arix series supports field upgrades, but not throughout the product line. With field upgrades, a model is transformed into a higher performance system simply by replacing or adding a few circuit boards. Table 1 indicates field upgradable models.

*Communications and Networking.* A decided advantage of the Arix series is the amount of communications and networking software available. Arix provides a variety of data communications facilities, including Ethernet TCP/IP networking, DDN protocols, X.25, and communication with IBM and IBM-compatible host systems. The Arix series also is compatible with the Network File System (NFS) client/server model. Furthermore, Arix provides several PC connectivity products. Such fluency in a number of different data communications languages provides the open connectivity required for departmental processing. Through these facilities, the Arix performs as a peer system on a local area network; operates as a distributed processor within a hosted environment; functions as a cluster controller within an SNA network; and offers X.25 connectivity to packet-switching public data networks. Towers models also can act as resource servers for a network of distributed personal computers/microcomputers.

Of special significance is the industry-standard Ethernet LAN support. By employing Ethernet, the Arix system provides a common communications channel for interacting with other Arix systems, with workstations and with superminicomputers. Ethernet reduces costs for system interconnection and increases data transfer speeds relative to those afforded by hard-wired communications schemes.

The SNA and BSC emulators also are very important. Such facilities are needed in departmental or distributed processing environments which access files and application services residing in IBM mainframe environments.

*PC Integration.* The PC integration tools provided on the Arix computer are essential within today's information system environment. Once attached to the host, the IBM PC, PC compatible, and Apple Macintosh microcomputers reduce peripheral cost, provide access to both host and microcomputer applications, broaden information access capabilities, and improve host performance and throughput by conducting specialized or localized processing.

*Vendor Support.* Buying from Arix requires some consideration. Arix does not supply a complete computer system. ▷

- ▶ • One backplane with slots for 12 I/O cards
- One or four database/file processors
- One to eleven local, intelligent communications processors
- One to three 170M-, 337M-, 380M-, or 824M-byte Winchester fixed disk drives
- Connections for 1 to 12 external Winchester disk drives
- One streaming cartridge tape drive
- One 0.5-inch, 9-track magnetic tape drive
- Connections for additional 0.5-inch, 9-track magnetic tape drives
- Up to 128 serial communications ports
- One to eight parallel interfaces
- One Ethernet local area network (LAN) interface

Each expansion cabinet on the Arix 850 and Arix 875 accommodates:

- One or four database/file processors
- One to four Winchester fixed disk drives with capacities ranging from 170M to 824M bytes
- An optional streaming cartridge tape drive
- An internal 0.5-inch, 9-track tape drive
- Connections for additional 0.5-inch, 9-track magnetic tape drives

### INPUT/OUTPUT UNITS

Arix computers require storage peripherals with industry-standard interfaces. The Arix 800 series computers use Winchester fixed disk drives with SCSI, SMD, HSMD, and ESMD interfaces; streaming cartridge tape drives with the QIC02 interface; and 0.5-inch, 9-track tape drives with the Pertec interface.

Presently, Arix supplies the Arix 800 series and System90 with the following fixed disk drives:

- 170M-byte disk drive with a 5.25-inch form factor
- 337M-byte disk drive with an 8-inch form factor
- 380M-byte disk drive with a 5.25-inch form factor
- 824M-byte disk drive with an 8-inch form factor

Arix supplies the following magnetic tape drives for the Arix 800 series and System90:

- A streaming cartridge tape drive with 0.25-inch media.
- A 0.5-inch, 9-track reel-to-reel tape drive that uses the PE format and records at 1,600 or 3,200 bits per inch (bpi).
- A 0.5-inch, 9-track reel-to-reel tape drive that uses the GCR format and records at 6,250 bpi.

Arix computers support ASCII-based alphanumeric terminals, industry-standard PCs, and Centronics-compatible ▶

## Arix Corp. Arix Systems

Workstations, printers, and other user peripherals must be acquired from another party. Furthermore, Arix provides product servicing and support through independent OEM, VAR, and third-party maintenance organizations. Additionally, sales to end users are supported by a limited amount of VARs.

Even though Arix does not directly support end users, it does provide marketing, sales and technical support to its resellers and third-party maintenance organizations. Thus, Arix works with a trained third-party sales and support force. □

printers. The terminal devices come from third parties. Arix currently does not manufacture or directly supply workstations or printers.

PCs require the appropriate PC support to interface with the Arix system. PCs communicate with the host through terminal emulation, file transfer, and application-to-application facilities. They physically attach to the Arix system via an asynchronous or synchronous connection, or through local area networking.

### COMMUNICATIONS

The data communications processor, a local controller which resides on the computer's backplane, supplies multifunction support to a mixture of synchronous and asynchronous lines. The data communication processor off-loads character-oriented I/O and line control from the computer's main computational subsystem. The data communications processor consists of a single board with an MC68000 microprocessor and up to one megabyte of on-board memory. The data communications processor software includes a PROM-resident monitor (which provides bootstrapping routines) and the downloaded nucleus (realtime kernel) and supporting application software. The data communications processor realtime nucleus manages all the controller's resources and provides common services to its local applications.

Each data communications processor on an Arix 800, 825, 850, or 875 includes one of the following connectivity options:

- An adapter with six asynchronous RS-232-C ports, two synchronous RS-232-C ports, and one Centronics parallel port
- An adapter with eight asynchronous RS-232-C ports
- An adapter with 16 asynchronous RS-232-C ports

Each data communications processor for a System90 has one of the following connectivity options:

- An adapter with six asynchronous RS-232-C ports, two synchronous RS-232-C ports, and one Centronics parallel port
- An adapter with eight asynchronous RS-232-C ports
- An adapter with 16 asynchronous RS-232-C ports
- An adapter with four V.11 synchronous ports

The remote communications controller provides connectivity to an Arix system for remote asynchronous devices and connection to a network with full implementation of X.25. The

remote communications controller attaches to the data communications controller via synchronous trunks. Each trunk supports one to 16 virtual circuits.

The Ethernet controller provides the connection to an IEEE 802.3 Ethernet local area network. The functionality of this microprocessor-based controller includes the physical and data link layers of the network; the downloading of the network layer and transport layer; and support for Arix local area network software, including the TCP/IP protocol.

### SOFTWARE

**OPERATING SYSTEM:** The Arix 800 Series computers run under the Arix-OS operating system. The System90 features the Arix-OS/90 operating system. Both are native implementations of AT&T's UNIX System V Release 3.1 (UNIX V.3.1). The operating systems contain all the standard System V features and the complete suite of UNIX utilities. In addition, Arix-OS and Arix-OS/90 extend UNIX functionality to take advantage of the Arix architecture.

Arix' modifications to UNIX V.3 include support for a multiprocessor architecture. Arix-OS and Arix-OS/90 perform multiprogramming and multitasking for multiple central processors. A single copy of the operating system controls all the central processors, which are tightly coupled and share memory, I/O, and a single queue of runnable processes. The operating system controls the workflow to each central processor and dynamically balances the work load to prevent one processor from becoming overburdened. All multiprocessor support is transparent to the programmer and end user.

Arix also modified UNIX V.3 to support a distributed-intelligence architecture. Arix transferred peripheral driver code and other I/O functions of UNIX away from the central processor, placing responsibility for these processes in the microprocessor-based I/O processors. This distribution frees the central processors, allotting more time for application code processing.

Arix enhanced the I/O system within UNIX V.3 to address on-line transaction processing. Arix' UNIX has a faster file system and includes disk striping and disk mirroring. Disk striping allows a logical file to span multiple physical volumes. Disk mirroring allows data and files within the database or file system to be mirrored to preserve data integrity and availability. Mirroring also allows the complete contents of a disk to be duplicated and stored on another disk.

Arix is committed to providing a standard portable operating environment for UNIX. Adhering to AT&T's System V Interface Definition, Issue 2 (SVID) specification gives Arix-OS and Arix-OS/90 source-code compatibility with any implementation of UNIX that conforms to the SVID definition. In addition, Arix developed its UNIX to be compliant with the draft POSIX standard and the base X/Open standard.

Although the Arix systems run Arix-OS and Arix-OS/90, program and file compatibility is maintained between an Arix with Arix-OS and the System90. Applications developed for one Arix system can be run on any other Arix.

The Arix-OS/90 maintains binary compatibility with the Arix-OS. Applications developed under Arix-OS can be ported to the System90 and run under Arix-OS/90 without recompilation or modification. Software moved down to an Arix 800 Series or older Arix model is only source-code compatible and must be recompiled and modified.

## Arix Corp. Arix Systems

► **DATABASE MANAGEMENT:** Arix computers support the following commodity relational database management systems:

- Oracle Corporation's Oracle
- Oracle Corporation's Oracle Transaction Processing Facility (TPF)
- Unify Corporation's Unify
- Informix' Informix, Informix SQL, and Informix Turbo
- Progress Corporation's Progress

Both the runtime and development system versions of these database management systems are accommodated. For descriptions of these commodity database systems, refer to the product reports that appear in Volume 3 of *Datapro's Datapro Reports on Minicomputers*. Also, *Datapro Reports on UNIX Systems* and Volume 3 of *Datapro 70* contain in-depth profiles on these database management systems.

**LANGUAGES:** The Arix computers support the C language and several different versions of Cobol, Fortran, and Basic.

**COMMUNICATIONS:** The Arix computers are fluent in a number of different data communications languages, enabling them to communicate with a variety of computer systems. Available protocols and applications are:

- UNIX Asynchronous (i.e., uucp, uux, and cu)
- Remote File Sharing (RFS)
- Ethernet TCP/IP
- DDN ARPNET protocols and application set (e.g., TCP/IP, FTP, and Telenet)
- Berkeley rcp, rsh, and rlogin
- Network File System
- Yellow Pages (YP)
- Arix X.25 Networking
- BSC 3270
- BSC 2780/3780
- HASP II
- SNA 3270
- SNA 3770

Through these facilities, Arix' systems:

- Perform as systems on a local area network
- Operate as distributed processors within a hosted environment
- Function as cluster controllers within an SNA network
- Offer X.25 connectability to packet-switching public and private data networks

**UTILITIES:** Arix-OS and Arix/OS-90 contain UNIX System V.3 utilities for programming, professional support, and system administration.

**APPLICATIONS:** The Arix series has access to applications developed specifically for current Arix system platforms—such as the Arix 800, 825, 850, and 875—as well as older platforms—such as the Arix 1100, 1200, or 1600. The software applications currently running on older Arix platforms are upwardly compatible; however, they must undergo some modification to execute efficiently on the newer platforms.

The Arix systems also have access to application systems developed for the open system market. The Arix series accommodates applications written to run on computer systems with AT&T UNIX System V-based operating systems that conform to SVID. The open system applications must undergo some modification to execute effectively on the system.

The primary sources for applications are VARs and independent software houses. Authorized VARs develop and market applications specifically for the Arix computers. Independent software houses supply AT&T UNIX System V applications for the general marketplace.

Available applications cover data processing, accounting and business system automation, online transaction processing, office automation, and select online systems support and realtime processing. Major target markets include:

- Discrete manufacturing
- Financial services
- Telecommunications
- Government

Other specific target markets include:

- Health care
- Retail

### SUPPORT SERVICES

**MAINTENANCE:** VARs and OEMs provide on-site maintenance. Interlogic Trace (San Antonio, Texas) provides on-site maintenance for domestic end users buying from resellers that do not provide service. Interlogic Trace services over 230 locations nationwide.

**TECHNICAL SUPPORT:** Arix maintains a technical support organization with hot-line support for hardware and software problems.

**TRAINING/EDUCATION:** Arix offers customer training sessions on an ongoing basis at its San Jose, California facility.

**CONSULTING:** Arix supplies marketing, sales, and technical support to its resellers.

### PRICING

**POLICY:** Arix sells almost exclusively through resellers and does not carry an end-user list price. Instead, the company employs "tier pricing," in which several different price structures are derived from a formula based on customer volume. Arix, however, has supplied approximate ranges of suggested prices. These prices are listed under "Equipment Prices."

**Arix Corp. Arix Systems**



**EQUIPMENT PRICES**

	<b>Suggested List Price (\$)</b>
<b>PACKAGED SYSTEMS</b>	
<b>Arix 800</b>	
Arix 800 in a basic configuration; includes the Arix-OS operating system and C compiler	25,000
Fully configured Arix 800; includes system cabinet completely filled with standard components and expansion features and Arix-OS with C compiler	40,000
<b>Arix 825</b>	
Arix 825 in a basic configuration; includes the Arix-OS operating system and C compiler	32,000
Fully configured Arix 825; includes all the required system cabinetry completely filled with standard components and expansion features; also contains Arix-OS and the C compiler	75,000
<b>Arix 850</b>	
Arix 850 in a basic configuration; includes the Arix-OS operating system and C compiler	45,000
Fully configured Arix 850; includes all the required system cabinetry completely filled with standard components and expansion features; also contains Arix-OS and the C compiler	150,000
<b>Arix 875</b>	
Arix 875 in a basic configuration; includes the Arix-OS operating system and C compiler	50,000
Fully configured Arix 875; includes all the required system cabinetry completely filled with standard components and expansion features; also contains Arix-OS and the C compiler	150,000
<b>Arix System90 Model 40</b>	
System90 Model 40 in a basic configuration; includes the Arix-OS/90 and the C compiler	95,000
Fully configured System90 Model 40; includes all the required system cabinetry completely filled with standard components and expansion features; also contains Arix-OS/90 and the C compiler	250,000
<b>Arix System90 Model 80</b>	
System90 Model 80 in a basic configuration; includes the Arix-OS/90 and the C compiler	110,000
Fully configured System90 Model 80; includes all the required system cabinetry completely filled with standard components and expansion features; also contains Arix-OS/90 and the C compiler	500,000 ■