
Lantana Technology Local Area Network Products

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Product Summary**Editor's Note**

Lantana, a relative newcomer to the LAN market in the U.S., has quickly brought to market products in several LAN hardware categories, including adapter cards, hubs, and repeaters for all three major networking schemes—Ethernet, token-ring, and ARCnet.

Description

A line of networking hardware for ARCnet, Ethernet, and token-ring local area networks, including adapter cards, repeaters, hubs, and multistation access units (MAUs).

Strengths

Well-rounded offering of products for any network topology. Products incorporate many of the latest advances in each type, such as bus mastering on token-ring adapters.

Limitations

No major limitations.

Competition

IBM, Proteon, Western Digital, Standard Microsystems, Thomas-Conrad.

Vendor

Lantana Technology, Inc.
4393 Viewridge Avenue, Suite A
San Diego, CA 92123
(619)565-6400

Price

Interface card prices range from \$145 for the Aster1 8-bit ARCnet card to \$995 for the Cypress/2-16 16-bit, 16M bps token-ring card.

GSA Schedule

Yes.

—By *John H. Krick*
Associate Editor

Analysis

Product Strategy

One does not usually associate Mexico with high technology, but our neighbor to the south is one of several third world countries, like South Korea and Brazil, that are quickly becoming forces to be reckoned with in the industrial world. Computadoras Micron S.A. de C.V., based in Mexico and the companion company of Lantana Technology, is a 10-year-old firm that is the largest distributor of Novell products in Latin America, as well as the only manufacturer of LAN adapters and hubs in that part of the world.

Its U.S. sibling markets a well-rounded line of adapters for each of the three major LAN hardware schemes—Ethernet, ARCnet, and token-ring—and for each of the IBM PC and PS/2 bus architectures—8-bit XT, 16-bit AT, and 32-bit Micro Channel. Lantana's line of Ethernet repeaters and fan-out hubs embrace both thick and thin coaxial cabling and fiber optic as well, but the company has so far released only one product, its Tamarix/3 AT bus adapter card, which supports 10BASE-T unshielded twisted-pair Ethernet. The company will be announcing new versions of the Tamarix/1 and Tamarix/2 cards at Fall Comdex that will feature a plug-in conversion module that will allow these cards to work with 10BASE-T networks as well. The optional module will also be available separately for current users of Tamarix cards. Lantana needs to place more emphasis on this important new standard by releasing hubs and other products for unshielded twisted pair.

Lantana has embraced the philosophy that network users should be able to obtain all their hardware needs from a single source, and, in line with that philosophy, has concentrated on making its offerings in each category of networking complete and comprehensive. Since any networking scheme requires more than simply adapter cards,

Lantana has tried to offer all the necessary components for each type. In the Ethernet line, transceivers, repeaters, a multiplexer, and a bridge are available. For ARCnet, both active and passive hubs are offered, the active hubs in a form that can be installed in a PC, as well as in a standalone box which accommodates five hub cards. Token-ring products include multistation access units (MAUs), repeaters, and local and remote bridges.

Competitive Position

Lantana's line of network hardware products is more comprehensive than most and is offered at prices that are comparable, though not significantly lower, than other vendors. The all-embracing character of Lantana's product line means that it faces competition from many established vendors. In the ARCnet segment of its line, it competes with Standard Microsystems and Thomas-Conrad, among others; in the token-ring segment, with IBM, Proteon, and Madge, among others; in Ethernet, with Western Digital, among many, many others.

Decision Points

When Lantana introduced what it claims were the first bus mastering token-ring adapters in late 1988, IBM named the company an IBM Business Partner and displayed Lantana's cards in the IBM booth at Comdex/Fall in that year and again at Comdex/Fall in 1989. Indeed, IBM ran a demonstration program in its booth that showed Lantana's Cypress/2 board outperforming IBM's own token-ring products. For IBM to give such broad approbation to another manufacturer says something about its regard for this independent manufacturer.

Characteristics

Model: Aster line of ARCnet products; Tamarix line of Ethernet products; Cypress line of token-ring products.

Date of Announcement: Aster/1, Tamarix/1, Cypress/1: August 1988 Cypress/2-16: June 1990.

Date First Installed: Aster/1, Tamarix/1, Cypress/1: August 1988 Cypress/2-16: June 1990.

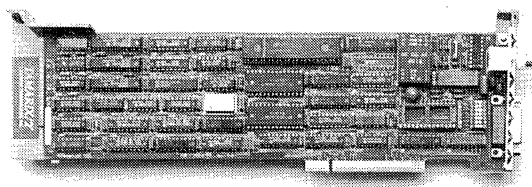
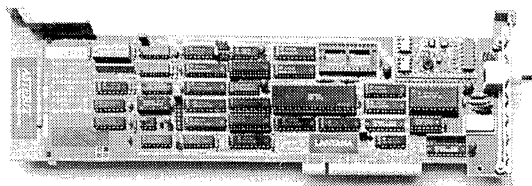
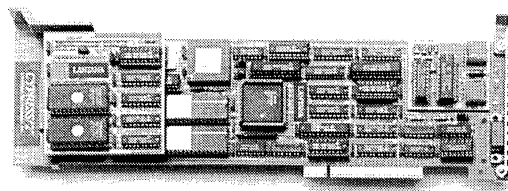
Number Installed: Information not available from vendor.

Distribution: Value-added resellers and distributors worldwide.

Architecture

Lantana manufactures products for all three of the major network hardware schemes—Ethernet, token-ring, and ARCnet. Ethernet is a Carrier Sense Multiple Access network, meaning that to gain access to the network media for data transmission, a workstation must “listen” to the line and sense the presence of its carrier signal. If there is traffic on the line, the workstation waits for a random period of time before attempting to retransmit. Since two workstations could detect carrier and initiate a transmission at exactly the same time, collisions can occur. In this case, each workstation waits for a random time period before attempting to resend the transmission. Ethernet’s transmission speed is 10M bps, and it can run on a variety of cable types, including thick coaxial cable, thin coaxial cable, unshielded twisted-pair telephone wire, and fiber optic cable. Ethernet specifications have been standardized by the IEEE under its 802.3 specification. Subsections of the 802.3 standard specify characteristics for each type of media commonly in use. The 10BASE-T subsection describes Ethernet implementation using unshielded twisted pair and a hub-based star topology; subsections 10BASE-2 and 10BASE-5 describe coaxial cable bus networks.

Token-ring is a 4M or 16M bps network based on a token-passing protocol. Token-ring is IBM’s major networking scheme and has been standardized under the IEEE 802.5 specification. Workstations are connected to a device called a multistation access unit (MAU). The ring is formed within the MAU or by a group of MAUs connected together in a physical ring. The token is a special data structure that circulates around the ring of workstations. In order to initiate transmission, a



Lantana produces interface cards for all of the three major network hardware schemes—token-ring, ARCnet, and Ethernet. Shown here are Lantana’s cards for the IBM Micro Channel Architecture used in the PS/2 Model 50 and above. From top: Cypress/2 token-ring card; Aster/2 ARCnet card; Tamarix/2 Ethernet card.

workstation must be in possession of the token. After transmission is completed, the workstation releases the token and it passes on to the next station on the ring. Token-ring networks may run on shielded or unshielded twisted-pair wire. IBM has not endorsed 16M bps operation on unshielded twisted pair, but several other manufacturers have brought 16M bps products for unshielded twisted pair to market in recent months. ARCnet, like token-ring, is a token-passing protocol. ARCnet was developed by Datapoint Corp. in the late 1970s, and Datapoint continues to enforce the standard to which manufacturers of ARCnet hardware must adhere to be licensed. This scheme has worked well, and no IEEE standard has ever been created for ARCnet. ARCnet runs at 2.5M bps and can be arranged in hub-based star or bus topologies, using coaxial or fiber optic cable, or in hub-based star or daisy-chained topologies with unshielded twisted pair.

Hardware

Ethernet Hardware

Tamarix/1 is an Ethernet adapter card for the 8-bit IBM PC XT bus which uses thick or thin coaxial cable and is equipped with AUI and BNC connectors. It features an 8K-byte on-board RAM buffer and a ROM socket to support remote booting.

Tamarix/2 is an Ethernet adapter card for the IBM Micro Channel Architecture used in the PS/2 Models 50 through 80. It features 64K bytes of on-board RAM and a socket for 8K, 16K, 32K, or 64K-byte EPROMs to configure diskless workstations for remote program load. Its Window Manager software uses only 16K bytes of the host's address space to address the 64K-byte on-board buffer, and the card takes advantage of the software configuration capabilities of the Micro Channel bus to allow memory base and EPROM addressing to be selected in 16K-byte increments from C000:0H to DC000:0H.

Tamarix/3 is an Ethernet adapter card for the IBM AT 16-bit bus. It features 64K bytes of on-board RAM and built-in connectors for three types of Ethernet cabling—an AUI connector for attachment to a transceiver, a BNC connector for thin coaxial cable, and an RJ45 connector for 10BASE-T unshielded twisted-pair wiring. Memory addressing and other configuration are accomplished with a software setup utility.

Tamarix/T1114 Transceiver transmits and receives data from an Ethernet bus cable, detects collisions on the network, and protects the network from "jabber"—the transmission of data packets which are too long. It connects workstations to a thick or thin Ethernet coaxial cable using 15-pin male D-type AUI connector and interchangeable cable-piercing, N-series, or BNC connector taps. An SQE "heartbeat" test is user selectable, and a "power on" LED is included. The Tamarix/T1114 is available in three models for different cabling arrangements. T1114-1 has an RG11 connector and a cable-piercing tap to connect to a thick Ethernet bus cable. T1114-2 has an RG11 and a BNC connector for thin Ethernet connection. T1114-3 has an RG58 and a BNC connector.

Tamarix/T1120 Repeater connects up to five Ethernet network segments together to permit a total length of up to 3 kilometers. It supports all types of Ethernet cabling, including twisted pair and fiber optic. The 1120 Repeater is equipped with two 15-pin D-type AUI connectors, and all types of cabling require the use of a transceiver without its own SQE test capability. Front-panel LEDs monitor partitioning on ports 1 and 2, packet activity, and power.

Tamarix/R1125 Multiport Repeater features six thin Ethernet BNC connectors and two AUI connectors. Used as a standalone device, it can form the hub of a star topology and can also connect up to six full-length Ethernet segments to a backbone cable. The 1125 performs all repeater functions including preamble regeneration, fragment extension, and signal retiming. Automatic and manual partitioning and reconnection of faulty segments protects the network from total failure in the event of malfunctions.

Tamarix/TM1131 Fan-Out Unit connects up to eight devices to a single Ethernet transceiver to provide easy expansion of existing network installations. The 1130 can also function as a standalone concentrator, allowing network connections of stations up to 50 meters away. In the standalone mode, the 1130 performs the functions of a transceiver itself and provides the SQE "heartbeat" test. Fan-Out units may be connected in series for a total of up to 64 nodes on each transceiver. The 1130 features eight male 15-pin D-type connectors and one female 15-pin D for connection of the transceiver. Front-panel LEDs monitor internal and transceiver power, packet activity, and loopback status.

Tamarix/R1150 Fiber Optic Repeater allows the connection of copper Ethernet cable segments to a duplex fiber optic backbone for links of up to 2 kilometers between repeaters. The fiber optic ports use SMA-type connectors, and the copper network segment connects to a 15-pin female D-type AUI connector through a transceiver. The transceiver must be of a type without the SQE "heartbeat" test. The 1150 performs all functions associated with an 802.3 repeater, such as preamble reconstitution, fragment extension, data retiming, and automatic partitioning in case of network failures. In addition, the 1150 performs fiber optic transceiver functions, including loopback, jabber protection, collision detection, idle signal modulation, and loss of light detection and indication.

Tamarix/T1180 Fiber Optic Transceiver connects PCs or terminals to a 10M bps CSMA/CD fiber optic LAN. It features an AUI port for connection to the workstation and two SMA fiber optic connections, one for transmit and one for receive. The T1180 can use 50/125, 62.5/125, 85/125, or 100/140 fiber optic media and can detect fiber breaks (loss of light) or low light conditions. A selectable SQE "heartbeat" test is included, as well as standard 802.3 functions, such as loopback, jabber protection, collision detection, and idle signal modulation.

Tamarix/B1400 Primary Bridge connects two local 802.3 or Ethernet networks and provides two AUI ports. Used with the proper transceivers, this device can link network segments running on standard Ethernet coaxial cable, thin Ethernet coax, fiber optic media, or any combination of the three. The B1400 features dynamic address learning and filters packets based on their destination at a rate of 17,100 packets per second. It

forwards 13,000 packets per second. No user configuration or setup is required. The B1400 can span distances of up to 4 km. between LANs using low-loss fiber cable.

Token-Ring Hardware

Cypress/1 is an 8-bit token-ring adapter card for the IBM PC XT bus. Economically priced, the Cypress/1 nonetheless incorporates selectable 4M or 16M bps operation and a 128K-byte on-board buffer memory. It can optionally support 802.2 Logical Link Control (LLC) operation for compatibility with a broad range of token-ring-attached IBM computers.

Cypress/2-16 is a 16M bps token-ring adapter card for the IBM Micro Channel Architecture used in the PS/2 Models 50 through 80. It is compatible with the IEEE 802.5 token-ring standard and the 802.3 Logical Link Control (LLC) standard. It includes a 128K-byte buffer memory. The Cypress/2-16 features high-speed DMA bus master operation, which means that it can take control of the system bus for two-way data transfer between memory and the network, freeing the CPU for other tasks. All optional features including memory base addressing are under software control through the Micro Channel bus.

Cypress/2-4 is similar to the Cypress/2-16 described above but operates at the lower 4M bps speed and has only 2.8K-bytes of on-board memory. A version with 802.2 LLC compatibility is also offered, called the Cypress/2-4 + LLC module. The LLC version comes with 16K bytes of memory and is expandable up to 64K bytes.

Cypress/3-16 is a 16M bps 802.5-compliant token-ring adapter card for the IBM PC AT and compatibles. It comes with 128K bytes of on-board buffer. The Cypress/3 features high-speed DMA bus master operation and supports the 802.2 Logical Link Control (LLC) protocols for compatibility with all types of token-ring-attached IBM computers. Both 9-pin D-type and RJ-11 connectors are provided, allowing connections to unshielded twisted pair or the IBM Cabling System.

Cypress/3-4 is similar to the Cypress/3-16 described above but operates at the lower 4M bps speed and has 16K bytes of on-board memory, expandable to 64K bytes. 802.2 LLC compatibility is provided by an optional plug-in module.

Cypress/M8228 MAU is an eight-port passive Multistation Access Unit (MAU) with RJ11/45 connectors for use with IBM Cabling System Type 3 unshielded twisted pair. It supports token-ring speeds of 4M bps or 16M bps. A diagnostic LED for each port is included. The M8228 features automatic port initialization, so no setup tools are required.

Cypress/M8228D MAU is similar to the M8228 described above but features IBM Data Connector ports for use with IBM Type 1 shielded twisted-pair cabling.

Cypress/R8218 Repeater is a 4M bps device that can span a distance of 1,200 feet between a pair of repeaters. It is supplied with RJ11/45 connectors for use with IBM Cabling System Type 3 unshielded twisted pair.

Cypress/R8218D Repeater is similar to the R8218 described above but features IBM Data Connector ports for use with IBM Type 1 shielded twisted-pair cabling. It can span distances of 2,400 feet between repeaters.

Cypress/B7404 Local Bridge is a source-routing device for connecting two 4M bps token-ring networks together. It works with shielded or unshielded twisted-pair networks and is equipped with a DB9 connector for network connection and a DB25 serial connector for a control port. It includes an LCD display and three LED error indicators.

Cypress/B7412 Remote Bridge is similar to the local bridge described above but is used for connecting two geographically separate 4M bps token-ring networks. A DB37 connector is provided for the remote connection.

ARCnet Hardware

Aster/1 is an 8-bit ARCnet adapter card for the IBM PC XT bus that is based on the Standard Microsystems 90C65 ARCnet controller chip and communicates at the standard ARCnet speed of 2.5M bps. The Aster/1 features both BNC and RJ-11 connectors so that either coaxial cable or unshielded twisted-pair wiring can be used. It features a 2K-byte on-board memory buffer and switch-selectable I/O port, memory address, and node number settings. The Aster/1 includes a socket for an optional remote load PROM.

Aster/2 is an ARCnet adapter card for the IBM PS/2 Models 50 through 80 that use the Micro Channel Architecture bus. It includes most of the features of the Aster/1 described above, except that configuration of addressing information is accomplished through the Micro Channel bus' software configuration facility. The card has a single BNC connector for RG-62/U coaxial cable and an RJ-11 connector for unshielded twisted pair.

Aster/3 is an ARCnet adapter card for the IBM PC AT 16-bit bus which is based on the NCR 90C98 ARCnet controller chip. It features 4K bytes of 16-bit dual-ported memory on-board. Dual-port memory allows faster operation during data transfer. The card supports buffer chaining to send multiple packets with a single transmit command. It has both BNC and RJ-11 connectors.

Aster/H4P Passive Hub is an external ARCnet passive hub that connects four ARCnet workstations in a star

configuration. Passive hubs support relatively short cabling distances. Three workstations can also be connected to a larger star with this unit. It includes four BNC connectors for coaxial connection.

Aster/H4A Active Hub is an internal hub for the IBM PC XT or AT buses that supports four coaxial or unshielded twisted-pair connections.

Aster/H8A Active Hub is an eight-port external unit which comes equipped with two of the H4A cards described above. Three more cards can be installed in the H8A's expansion slots for a total of 20 ARCnet connections. The H8A features its own power supply.

Support

Telephone Support

Lantana offers unlimited telephone technical support. A BBS system is kept online as well, which features technical tips, driver updates, and new software releases. The company also publishes a technical newsletter for users.

Warranty

Lantana provides a two-year warranty dating from the time of end-user installation.

Maintenance

Lantana guarantees 72-hour turnaround on products returned for repair.

Equipment Prices

	Purch. Price (\$)
ARCnet Hardware	
Aster/1 (8 bit)	145
Aster/1B (8 bit, high impedance for ARCnet bus topology)	155
Aster/2 (Micro Channel Architecture)	445
Aster/2B (Micro Channel Architecture, high impedance for ARCnet bus topology)	455
Aster/3 (16 bit AT)	445
RPL (Remote Program Load) Boot PROM	25
Aster/H4P (4-port passive external hub)	45
Aster/H4A (4-port active internal hub)	195
Aster/H8A (8-port active external hub. Up to 3 additional H4A hub cards can be added to chassis for a total of 20 ports.)	595
Token-Ring Hardware	
Cypress/1-4 (8 bit, 4M bps)	895
Cypress/1-16 (8 bit, 16M bps)	895
Cypress/2-4 (Micro Channel Architecture, 4M bps)	695
Cypress/2-4 with Logical Link Control (LLC) module	895
Cypress/2-16 (Micro Channel Architecture, 16M bps)	995
Cypress/3-4 (16 bit AT, 4M bps)	695
Cypress/3-16 (16 bit AT, 16M bps)	995
Logical Link Control (LLC) EPROMs (for Cypress/1, 2-16, 3-4, 3-16)	100
Remote Program Load (RPL) PROM (for Cypress/1, 2-16, 3-4, 3-16)	25
Cypress/M8228 MAU (8 port, RJ45 connectors, 4/16M bps)	595
Cypress/M8228D MAU (8 port, IBM Cabling System connectors, 4/16M bps)	695
Cypress/R8218 Repeater (RJ45 connectors, 4M bps)	795
Cypress/R8218D Repeater (IBM Cabling System connectors, 4M bps)	845
Cypress/B7404 local bridge (4M bps to 4M bps)	4,995
Cypress/B7412 remote bridge (4M bps to 4M bps)	5,995
Ethernet Hardware	
Tamarix/1 (8 bit)	275
Tamarix/2 (Micro Channel Architecture)	495
Tamarix/3 (16-bit AT)	595
Remote Program Load (RPL) Boot PROM	25
Tamarix/R1120 Repeater	1,250
Tamarix/R1125 Multiport Repeater	2,695
Tamarix/R1150 Fiber Optic Repeater	1,995
Tamarix/TM1131 Fan Out Unit (transceiver multiplexer)	995
Tamarix/B1400 Primary Bridge	3,695
Tamarix/T1114 Transceiver (Available in cable-piercing tap, RG11-to-BNC, and RG58-to-BNC configurations)	239
Tamarix/T1180 Fiber Optic Transceiver	3,695

Madge Networks Token-Ring Network Products

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Product Summary

Editor's Note

Madge has been at the center of much controversy lately and has led the way in the resolution of two serious problems confronting the token-ring vendor community. The company at this time appears to have successfully done battle with Olof Soderblom over his token-ring patents. At the same time, Madge went public with recent problems with its latest adapter cards and as a result has forced a reevaluation of the way some aspects of 802.5 adherence are tested and called attention to a problem with the Texas Instruments token-ring chip set that resulted from these testing difficulties.

Description

A line of local area network products for token-ring networks including adapter cards, hubs, repeaters, and network management software.

Strengths

A complete line of products for token-ring implementation, demonstrating the highest performance figures. Madge's token-ring adapter cards have been repeatedly shown to be the fastest such cards available.

Limitations

Madge cards are the highest priced in the industry, topping even IBM.

Competition

IBM, Proteon, Western Digital, and others.

Vendor

Madge Networks, Inc.
1580 Oakland Road
C-206
San Jose, CA 95131
(408) 441-1300

Price

Madge token-ring adapter card prices range from \$550 for the 8-bit ISA Ringnode to \$1,495 for the Smart 16/4 EISA Ringnode.

GSA Schedule

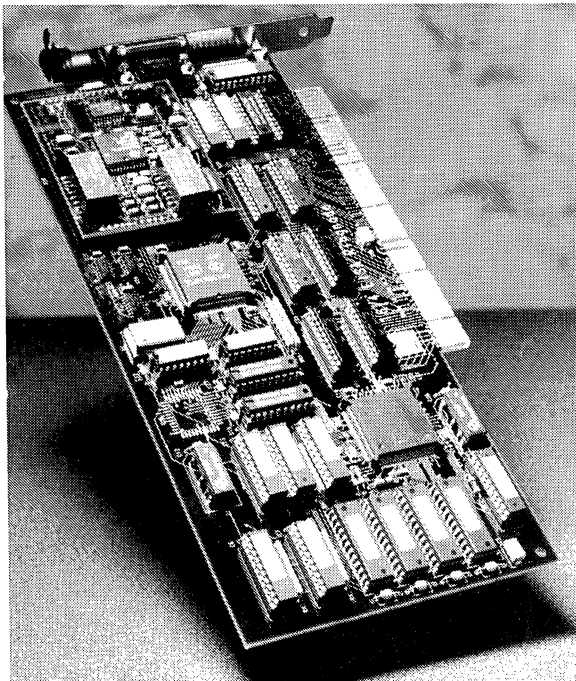
Yes.

—By *John H. Krick*
Associate Editor

Analysis

Product Strategy

Madge Networks, a British firm which has been among the first vendors to ship third-party cards and MAUs for the IBM-endorsed 802.5 token-ring networking scheme, has been traversing a rather bumpy road in recent months. Some of the obstacles the company has encountered included a patent infringement lawsuit brought by Olof Soderblom and a recall of two thousand 16M bps token-ring adapters. The good news for Madge, and by extension, for all vendors and users of token-ring hardware, is that the court in Great Britain and the U.S. Patent Office have both taken a stand against



This photo of Madge's Smart 16/4 EISA Ring-node clearly shows the two-tier design of the bus connector, which allows the EISA bus to accept standard IBM PC and PC AT cards, as well as new cards like this one, designed specifically for it. Madge believes this card, which is capable of bus transfer speeds of up to 33M bytes per second, "is the fastest PC network interface card ever made."

Soderblom and that the problems Madge experienced with its 16M bps cards forced the IEEE to take a closer look at portions of the 802.5 standard for token-ring operability.

The Soderblom Patent Issue

As we reported in the September issue of *Communications Perspective*, the Chief Patent Justice of the High Court of England of the Royal Courts of Justice has decided that 802.5-compliant token-ring networks differ substantially from Olof Soderblom's original 1967 patent developed for the Bank of Sweden. 802.5 token-ring stations communicate as peers, while Soderblom's implementation is based on a hierarchical, master-slave scheme. In a parallel development, the U.S. Patent Office, in the process of examining the Soderblom issue, has stated that his patent is not applicable to 802.5 technology. Madge claims that its technology is covered by a 1969 AT&T Bell Laboratories patent that has since entered the public domain. Madge has also filed suit in U.S. District Court in San Francisco, hoping for a definitive ruling that the Soderblom patent does not apply to 802.5.

802.5 Standard Issues

Perhaps more serious for the token-ring vendor community than the litigation with Soderblom were Madge's difficulties with the IEEE 802.5 standard and the Texas Instruments token-ring chip set. After Madge was forced to recall its initial shipments of 16M bps token-ring adapters, the company charged that the problem was inherent in the 802.5 specification itself and, as a result, was built into the Texas Instruments token-ring interface chip Madge and most other token-ring vendors use. The cards reportedly had problems in networks with more than 20 nodes that use cards from vendors other than Madge. Madge engineers were able to set up very large networks using only Madge cards, but when IBM cards were added at some nodes there was no interoperability. Madge was able to intercept its shipments of cards and recovered all but six before they reached the end users. However, the token-ring vendor community was alarmed enough by the implications of the problem to take quick action to rectify it.

The problem involved what is called "jitter." Jitter is distortion of the network signal that has a cumulative effect as data is passed between nodes. In a large network it can become bad enough to corrupt the data being transmitted. Proteon has

been shipping 16M bps token-ring cards which are not based on the TI interface chip but use a TI communications controller chip. It had not experienced problems with its cards, and its representatives initially expressed doubts that a problem existed with the 802.5 guidelines, but Proteon engineers later took an active part in the task force that investigated the problem. Texas Instruments has released a new version of the chip set which is designed to rectify the jitter problem.

The IEEE set up a task force to investigate the validity of Madge's claims. Madge engineers suggested a reevaluation of the ways in which vendors measure compliance with the section of the standard dealing with jitter tolerance. Engineers from several companies, including TI and NCR, are currently discussing new approaches to jitter testing.

Competitive Position

Madge competes in a growing market that is attracting more and more small vendors. Madge has not been able to keep its prices as low as most other competitors, and its AT card is even slightly higher priced than IBM's. However, all token-ring cards are relatively high priced, compared to cards for Ethernet or ARCnet. The cheapest token-ring cards cost \$500 to \$600. Competing with strong and well-regarded vendors, such as Western Digital and Proteon, whose cards are all priced lower than the corresponding Madge cards, could give the company good reason to reevaluate its pricing needs. Madge's reply to this line of reasoning is that for its customers, IBM compatibility, network protocol support, performance, ease of use, and reliability are more important than price and that the company has been very successful selling the cards at their current price level. Based solely on the outstanding performance of its products, that probably is true, but Madge does not have a guaranteed corner on any of those characteristics, which brings price back to the fore. On the plus side, Madge includes almost 2M bytes of LAN support software with its cards, which other vendors, including IBM, sell separately.

Decision Points

Despite all the controversy surrounding Madge in recent months, the company has been very active in the development of hardware and software to

Company Profile

Madge Networks, Inc.

Corporate Headquarters

1580 Oakland Road
San Jose, CA 95131
(408)-441-1300

Officers

President: Robert Madge
Director of North American Operations: Edward Murray
VP Sales and Marketing: Julian Brookes

Company Background

Year Founded: 1986
No. Employees: 10 in U.S.; 92 in the U.K.
Installed Base: Approximately 80,000 interface cards.

Business Overview

Madge develops, manufactures, and markets local area network products compatible with the IBM Token-Ring standard. Based in England, the company initially concentrated its marketing efforts in the United Kingdom and Western Europe. In August 1987 Madge established its North American branch, Madge Networks, Inc.

Financial Profile

Madge is a privately held company that has shown impressive growth since its inception. Sales figures have climbed steadily—\$3 million in 1987, \$6 million in 1988, \$14 million in 1989, and a projected \$24 million for 1990.

Management Statement

In a recent communication regarding this report, Madge Director of North American operations Ed Murray outlined the company's direction:

"Madge Networks was founded on the belief that four things were necessary to be successful in the \$1.2 billion token-ring market:

- A complete focus on token-ring.
- Complete control over all aspects of the technology, including the software.
- Offering a complete token-ring solution.
- Offering complete IBM compatibility.

This focused approach has meant taking on some peripheral issues, such as the Soderblom patent question and a highly visible role on questions such as controlling jitter at 16M bps. With these issues behind us now, we are moving ahead to add a whole range of advanced token-ring network system products, to further expand our network management capabilities, and to broaden the already wide range of network software support we provide customers."

support token-ring and has been the first of the third-party vendors to market many of the necessary components. Tests conducted by several industry publications, including that of Datapro Research Group's National Software Testing Laboratories (NSTL), have shown that Madge cards consistently achieve the highest performance among token-ring adapter cards.

Cross-References

The NSTL report can be found in Volume 3 of *Datapro Reports on PC & LAN Communications*, under the LAN Hardware Evaluations (800) tab.



Characteristics

Model: Smart Ringnode line of token-ring interface cards.

Date of Announcement: Smart AT Ringnode: April 1987; Smart 16/4MC Ringnode: September 1990.

Date First Installed: Smart AT Ringnode: April 1987; Smart 16/4MC Ringnode: October 1990.

Number Installed: Approximately 80,000 interface cards.

Distribution: Value-added resellers and distributors.

Architecture

Madge makes hardware and software for the IEEE 802.5 token-ring networking scheme exclusively. Based on IBM's Token-Ring Network, the IEEE standard describes a 4M bps or 16M bps network using a token-passing access method. In token-passing networks, a unique data structure called the token passes from station to station. Only a station that is in possession of the token can transmit data. The transmitting station holds the token until it receives notification from the receiving station that the transmission was successful. The transmitting station then places the token back on the network. Stations that do not have data to transmit pass the token along to the next device in line. Token-ring

networks are arranged in a ring topology that is formed internally in a multistation access unit (MAU) or by a group of interconnected MAUs. The performance of token-passing networks can be described as deterministic, since it can be predicted based on the number of stations attached. Performance of large networks based on token-passing technology should, at least in theory, remain consistent, as opposed to that of collision avoidance networks like Ethernet, which can bog down under heavy loads.

Hardware

Madge's token-ring interface adapters feature a unique design that runs the network protocols, such as 802.2 Logical Link Control and NETBIOS, on the Texas Instruments chip set that the cards are based on. This results in excellent performance and very little usage of the machine's base memory, since the cards feature 128K of on-board RAM. According to Madge, its cards require only 3K bytes of main memory, while the average card from another vendor requires 80K. This design feature allows Madge 4M bps cards to outperform IBM's 16M bps cards. All of Madge's cards are shipped with several items of software, including the smart and standard LAN Support Programs, smart IPX/SPX protocols, smart and standard NetWare workstation drivers, smart server software for NetWare, smart and standard 802.2 and Netbeui protocols, DLC and NETBIOS interface support, OS/2 LAN Manager NDIS drivers, diagnostics, and installation tools.

Smart AT Ringnode is a token-ring adapter for the IBM AT and compatibles, including 386-based machines based on the 16-bit AT bus. Madge has just begun shipping a new version of this card, which is a half-size card, as opposed to the older full-size version. The new version now supports the 8-bit PC bus as well as the 16-bit AT bus. The Smart AT Ringnode is a bus-master design, meaning that the card can take over control of the system bus for data transfers, leaving the PC's main CPU free for other activities. The new version of the card also supports memory-mapped I/O for machines which cannot support bus mastering. The Smart AT Ringnode is compatible with all NETBIOS-based LANs as well as Novell NetWare and all versions of Microsoft's OS/2 LAN Manager (IBM OS/2 LAN Server, 3Com 3+ Open, etc.). The Smart AT Ringnode includes 128K bytes of on-board RAM for buffering and the NETBIOS and data transfer protocols. Recently Madge has added on-board support for unshielded twisted-pair wiring.

Smart MC Ringnode is similar in all respects to the Smart AT Ringnode described above, but it is designed for the Micro Channel bus architecture used in the IBM PS/2 Series Models 50 through 80.

Smart ISA Ringnode is a token-ring adapter for the 8-bit IBM PC bus, sometimes referred to as the Industry Standard Architecture (ISA). It features 128K of onboard memory which stores the NETBIOS and data transfer protocols and provides buffer space, allowing DOS memory to be used for memory-intensive applications. Unlike the two cards described above, the ISA Ringnode is not a bus mastering card.

Smart 16/4 AT Ringnode features selectable speed settings to work with either 4M or 16M bps token-ring networks. It can also be configured to work in either 8-bit or 16-bit bus architectures. When 16-bit operation is selected, the user can also enable the bus mastering mode. Like Madge's other cards, the Smart 16/4 AT Ringnode comes with 128K of on-board memory to allow protocol processing to be done on the card, and it is supplied with network driver and support software.

Smart 16/4 MC Ringnode is Madge's most recently announced card. It is for the IBM PS/2 Micro Channel Architecture and has features that are similar in all respects to the Smart 16/4 AT card described above, except that the MC card provides 32-bit memory addressing.

Smart 16/4 EISA Ringnode is a bus master card that operates at either 4M or 16M bps in the Extended Industry Standard Bus (EISA). The EISA bus has a double tier of contacts which allows it to accept both 16-bit cards designed for the AT bus, as well as new 32-bit cards designed for the EISA bus. No switch setting or jumper repositioning is necessary, as all card settings are software controlled. Like the other Madge boards, it features 128K of on-board memory, so that network protocols can be processed by the TI TMS380C16 processor. It also includes LAN support software—a Smart NetWare workstation driver program that provides a DLC interface—does not need linking, and saves 30K of DOS memory compared to standard software; and a SMARTLSP program which requires 80K less memory than the usual NETBIOS support software. Smart NetWare Server Software handles many workstation requests at once using multiprocessing techniques.

8-Station Ringhub is a multistation access unit (MAU) similar to the IBM 8228 MAU. It allows up to eight computers to be connected to an IEEE 802.5 token-ring network. Ringnodes can be connected together to form a larger ring when additional stations are needed. The Ringnode uses the standard IBM Cabling System connectors. A passive unit, the Ringhub requires no power supply. One feature that differentiates the Madge product is its reset button for the port relays. The IBM MAU requires the use of a reset tool, which must be inserted in the port to reset it.

Local Ringhub is a passive hub designed to allow the expansion of token-ring networks without running new cable or reconfiguring existing cabling. A Local Ringhub attaches to a MAU to provide four additional nodes on a single MAU port. Local Ringhubs can be chained together up to three layers deep, since a single MAU port can support up to 10 nodes. As a standalone unit, the Local Ringhub can form the basis of a small token-ring network with up to four users. The Local Ringhub has four 9-pin D-type male connectors for its stations and a single female 9-pin D connector for attachment to the MAU.

Ring Repeater is a device that can extend the length of a token-ring cable between MAUs by 385 meters. Where backup rings are implemented, the Madge repeater supports both the main and the backup ring, replacing two IBM 8218 repeaters. The Madge Ring Repeater has a battery backup system good for two hours in the event of a power failure. If a power failure does occur or batteries are running low, the repeater gives off audible and visible warning signals. LEDs indicate repeater operability cable breaks and primary and secondary ring activity. Two standard IBM Cabling System ports for Ring In and Ring Out connections are provided.

Software

Ring Manager is a network management tool for token-ring networks that is based on a user-friendly graphical interface in a windowed environment. Ring Manager is compatible with IBM's System Applications Architecture (SAA) and can be controlled using either a mouse or the keyboard. A dedicated workstation is not necessary, as the Ring Manager software can run as a background task. Madge claims Ring Manager is the first Terminate-and-Stay-Resident (TSR) network management tool to reach the market. By reading and logging Media Access Control (MAC)-layer frames already present on all 802.5-compliant LANs and using user-defined filters to separate out relevant information, Ring Manager provides realtime fault management data to LAN administrators. Error count data for each workstation allows preventative maintenance to be carried out before faults occur. Managers can also use Ring Manager to monitor workstation use, remove workstations from the ring, and control access of each workstation to particular network resources. A built-in user information database can be edited while the system is in use. All network event data including logs can be saved to disk for later review or printed in realtime and, optionally, filtered to highlight key management information. Ring Manager runs on any IBM PC or PC-compatible platform, including 8088-based machines.

Support

Telephone Support

Madge provides users with unlimited telephone technical support, eight hours daily, through its 800-TR-MADGE line. A BBS system for Madge users is also maintained.

Maintenance

Madge provides same-day turnaround of hardware returned for service.

Warranty

Madge offers a five-year warranty on all of its products.

Equipment Prices

		Purchase Price \$
52-02	Smart ISA Ringnode	550
52-01	Smart AT Ringnode	750
54-05	Smart MC Ringnode	750
52-04	Smart 16/4 AT Ringnode	995
52-08	Smart 16/4 MC Ringnode	995
54-06	Smart 16/4 EISA Ringnode	1,495
55-00	8-Station Ringhub (MAU)	715
56-00	Local Ringhub	450
57-00	Ring Repeater (4M bps)	1,695
84-00	Ring Manager	1,295

Micro-Integration Communications Products

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Note: Since our last report, Micro-Integration has combined the identities of its Bluelynx and Micro-Integration divisions. The Bluelynx product line remains the same; however, its product names have been revamped to replace the Bluelynx name.

Micro-Integration (MI) manufactures communications products for linking PCs and PS/2s to IBM midrange and mainframe systems. The company's 5250 midrange products connect PCs to IBM System/3X and AS/400 minicomputers; its 3270 mainframe products connect PCs to IBM 30XX, 43XX, or compatibles.

Strengths

- Provides multiple gateway support for 5250 local gateways
- Provides a comprehensive and varied product line for 5250 and 3270 connectivity
- Supports DOS, Windows, and OS/2 platforms
- Provides excellent product support

Limitations

- Lacks product support for Macintosh and UNIX systems

Competition

IDEAssociates' standalone and local gateway products, AST Research's local/remote standalone and gateway products, Eicon Technology's remote gateway products, and DCA's mainframe connectivity products.

Vendor

Micro-Integration Corp.
215 Paca Street
Cumberland, MD 21502
(800) 832-4526
(301) 777-3313

In Canada:

Contact vendor's U.S. office.

Price

For midrange and mainframe connectivity, prices range from \$595 to \$1,995. **GSA**

Schedule: Yes.

—By *Donna Horsley*
Staff Writer

Product Analysis

MI has long maintained a comprehensive line of connectivity products that link PCs to IBM mainframe or mini-computer host systems in local, remote, standalone, and gateway options. Its products are fully IBM compliant and operate in DOS, Windows, or OS/2 operating systems.

Since 1990, MI has worked to build one of the strongest lines of midrange connectivity products available and has worked to enhance its gateway products in both midrange and mainframe connectivity.

In November 1990, MI introduced multiple gateway support; IBM AS/400 PC Support for Twinax and SDLC 5250 LAN Gateways; and enhanced session support for 5250 Remote Gateway. In March 1991, MI introduced 5250 Local Twinax Adapter, the first adapter board to support DOS, Windows, and OS/2 platforms.

MI's new twinax adapter bundles 5250 Local with software for either DOS, Windows, or OS/2, and allows the user to move from one platform to another, eliminating concern about midrange connections when switching to a new operating system. MI also enhanced its twinax boards to support speeds among the fastest in the industry.

Twinax 5250 LAN Gateway allows midrange users to run up to four gateways in a single computer, thus reducing hardware costs and streamlining operations.

MI has made IBM AS/400 PC Support on the nodes a standard feature on its Twinax and SDLC 5250 LAN Gateways by packaging Node Adapter Handlers with each kit. Both the Twinax and SDLC Node Adapter Handlers allow up to seven node workstations to run AS/400 PC Support.

MI's enhanced 5250 Remote Gateway directs information for up to 16 PCs across NETBIOS-compatible LANs to IBM System/3X and AS/400 environments. Before, each gateway server emulating an IBM 5294 control unit supported only eight logical sessions.

"The 16-session gateway slashes connectivity cost almost in half," Bill Shomo, vice president of product development, said. "It is a reflection of our continued commitment to enhancing our gateway capabilities."

MI products are full featured and easy to install and configure. They have an extensive on-line, context-sensitive help facility, complete configuration options, and offer virtual printer support and clear error trapping messages. The products maintain a consistent user interface across the entire product line, and support virtual disk, file transfer, and IBM's Application Program Interface (API) functions. MI products also support the Hayes Autosync feature, thus allowing IBM PCs and compatibles and laptops to run synchronously without an adapter card, which is often expensive and hard to install.

Overview

Midrange Connectivity Products

Model	5250 Local	5250 Local Gateway	5250 Remote	5250 Remote Gateway
System	IBM S/3X or AS/400	IBM S/3X or AS/400	IBM S/3X or AS/400	IBM S/3X or AS/400
Date Announced	1984	1988	1985	1987
Date Released	1984	1988	1985	1987
No. Installed	Information not available	Information not available	Information not available	Information not available
Base Price	\$895	\$1,995	\$795	\$1,995
Operating Environment	DOS, Windows, OS/2	DOS	DOS	DOS
Drives	At least 1 hard disk	At least 1 hard disk	At least 1 hard disk	At least 1 hard disk
Memory	110KB typical available memory	102KB for 1 gateway; 226KB available for 4	180KB available memory for one display	113KB minimum available memory for gateway; 161KB available memory for PC node with one display

Mainframe Connectivity

Model	3270 Local	3270 Remote	3270 Remote Gateway	3270 Remote AutoSync
System	IBM Mainframe 30XX, 43XX, or compatible	IBM Mainframe 30XX, 43XX, or compatible	IBM Mainframe 30XX, 43XX, or compatible	IBM Mainframe 30XX, 43XX, or compatible
Date Announced	1986	1983	1988	1988
Date Released	1986	1983	1988	1988
No. Installed	Information not available	Information not available	Information not available	Information not available
Base Price	\$895	\$895	\$1,995	\$595
Operating Environment	DOS	DOS	DOS	DOS
Drives	At least 1 hard drive	At least 1 hard drive	At least 1 hard drive	At least 1 hard drive
Memory	99KB typical available memory	229KB typical available memory for one display	173KB typical available memory for gateway server with 14 sessions	Not applicable

Decision Points

MI 5250 Connectivity Products

Requirements

Multiple platform support
Multiple gateway support
Hayes AutoSync capability

IBM AS/400 PC Support

Performance

Supports DOS, Windows, and OS/2 operating systems.

Provides support for up to four gateways in a single computer.

Provides 5250 emulation packages that support Hayes AutoSync, the Hayes modem feature that lets IBM PCs and compatibles and laptops run synchronously without an adapter card.

Provides the capability to mix terminal emulation and PC Support sessions on the same gateway. Full support for AS/400 PC Support for each gateway session allows users to access functions such as shared folders, PC Organizer, message function, workstation function, virtual printer, and transfer function.

Target Applications

MI targets medium-size companies interested in general business applications, such as time billing and accounting functions, and legal case management work. MI services are cross industry; clients include government agencies, banks, health care organizations, food retailers, and national law firms.

Strengths

For more than a decade, MI has maintained its position as a leader in the crowded marketplace for PC-to-host communications. The company has a comprehensive and varied product line that is easy to use, supports multiple platforms, and provides excellent support facilities.

MI's product line is fully IBM compliant and comprises standalone and gateway products that provide both local and remote access to IBM mainframe and midrange computers.

The company has one of the strongest lines of midrange connectivity products in the industry. Its twinax adapter bundles MI's 5250 Local with software for either DOS, Windows, or OS/2. Its twinax 5250 LAN Gateway allows users to run up to four gateways in a single computer. Both Twinax and SDLC 5250 LAN Gateways feature IBM AS/400 PC Support on the nodes.

MI products are backed by one of the most comprehensive technical support teams in the industry. The company employs a competent support staff comprising five full-time employees who were previously programmers. MI's entire product line is built in-house to give users the advantage of dealing directly with the people who create the product. Many of the dealers who sell MI's PC-to-host products have also been trained by MI to provide technical support to users. The company recently implemented an electronic bulletin board system called MI Line, which answers incoming calls 24 hours a day, 7 days a week.

Limitations

Although the MI product line is extensive, it lacks products designed to meet the needs of the growing number of Macintosh and UNIX users. Both systems, especially the Apple Macintosh, have made significant advances in the corporate environment. This being the case, MI would benefit if it joined the growing numbers of companies offering connectivity products in these areas.

Vendor Analysis

Product Strategy

When Micro-Integration merged the identities of its Bluelynx division and MI divisions in the U.S. and Europe in 1991, it meant the end of the Bluelynx name on the Bluelynx communications products. All MI divisions now use the Micro-Integration name and the acronym MI.

The formerly named Bluelynx line still remains, however, characteristically Bluelynx: a product line that works on the premise that PCs should be integrated into a company's information network, not kept isolated from it. MI terminal emulation products allow users to make full use of the standalone or local area network processing power of their PCs and to access information stored on the company's mainframe or minicomputer.

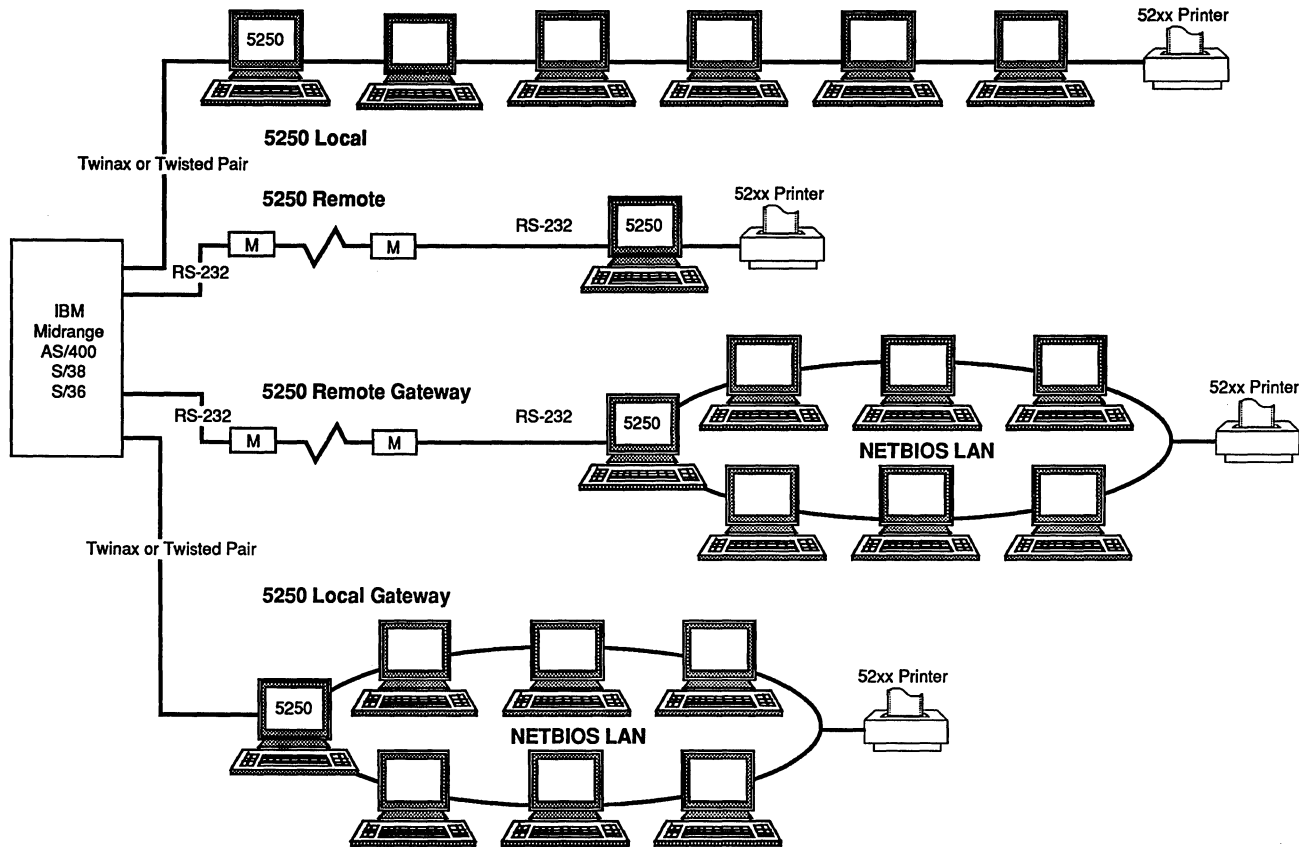
MI was one of the first companies to identify the need to connect PCs to IBM mainframes. It was founded in 1978 as a manufacturer of communications emulation products for IBM 5250 and 3270 local and remote environments. Today, 13 years later, MI has groomed a comprehensive product line, particularly in the area of 5250 emulation, and has established a strong presence in the PC-to-host marketplace.

Capturing about 25% of the market share for midrange gateway products, MI is committed to enhancing its gateway capabilities. In March, MI introduced several enhancements to its midrange gateway products. One such enhancement for its 5250 Remote Gateway provides routing of information for up to 256 PCs, allowing up to 16 gateway servers emulating IBM 5394 control units to operate on one LAN. Before, only four servers emulating IBM 5394 control units could operate on one LAN, each supporting just eight logical sessions.

MI, a privately held company, claims steady increases in annual sales and profits. In 1990, the company earned \$5.1 million in product sales. MI reports undisclosed net profits, of which a large portion is reinvested in the company in the guise of R&D and product support.

The company is headquartered in Cumberland, MD, with an international office in Belgium. It has approximately 45 employees.

Figure 1.
Midrange Connectivity



Micro-Integration's 5250 Communications Products.

Target Markets

MI targets medium-size companies interested in general business applications, such as time billing and accounting function, and legal case management work. MI services are cross industry: clients include government agencies, such as The U.S. Department of Treasury; banks, such as Municipal Trust; health care organizations, such as Blue Cross/Blue Shield of Idaho; food retailers, such as Universals Foods; regional construction companies; and national law firms, such as Sidley & Austin.

Competitive Analysis

Market Position

In the market for midrange connectivity, MI ranks among the top four 5250 communications vendors: IDEAssociates, AST Research, Eicon Technology, and IBM. It has captured 25% of the gateway market for midrange products; 5% of the standalone market.

In the market for mainframe connectivity, MI is a minor player. DCA's IRMA products and Attachmate's EXTRA! software dominate in this area; each has captured 25% of the mainframe market, respectively.

Major Competitors

MI attributes much of its success in the midrange connectivity market to its gateway products.

"Our gateways offer features that our competitors don't have," Janine Filion, vice president of sales, said.

"We have the ability to put more than one gateway in a machine. What that means is that our users don't have to dedicate as many PCs as there are gateways. AST Research doesn't do this. IDEAssociates can only do this when adapter handler software is added," she said.

Only MI has the capability to give nodes on the gateway the capacity to run PC Support sessions with terminal emulation. AST Research does not provide access to PC Support. IDEAssociates provides PC Support, but only as a separate product; it cannot mix terminal emulation and PC Support on the same gateway.

"With our products, customers aren't put in an 'either-or' situation," Filion said.

MI was the first, and until recently, the only vendor to support DOS, Windows, and OS/2 operating systems for 5250 local connectivity. In September, IDEAssociates introduced a Windows platform to add to its DOS and OS/2 operating systems options.

Among its competitors, IDEAssociates is the only vendor to provide support for Macintosh systems. MI will consider supporting Macintosh and UNIX platforms based on user demands.

Sales and Distribution Strategy

Sales

MI markets its products through VARs, leading resellers, and direct to its customers. The company has attributed

increased product sales and company profitability to its present distribution method.

Distribution

Originally, MI sold its products only to the OEM market, but in recent years it has shifted its focus to the dealer market and direct sales. MI intends to continue expanding this distribution network in the U.S. and international markets. MI has distributors throughout Europe, Canada, Australia, and Southeast Asia. The company's international office is in Belgium.

Support

MI provides comprehensive phone, warranty, and maintenance support.

Competitors' Programs

The communications programs that compete with MI's connectivity products provide comparable technical phone support, except for AST Research whose phone support is least accessible. The various vendors typically provide technical phone support from 8 a.m. to 7 p.m. EST weekdays, but AST Research's phone support is available only from 7:30 a.m. to 3:00 p.m. Pacific time.

Eicon Technology provides the most comprehensive training course among the competing vendors. For a fee, it provides a five-day training course—at either its Montreal headquarters or at the customer's site—for most of its Access series of communications gateway products.

Among its competitors, MI is the only vendor to provide a lifetime warranty on its software products and a 30-day money back guarantee for dissatisfied customers. MI's competing vendors typically provide a one-year warranty on software. MI and AST Research are the only vendors to offer a bulletin board service to customers.

Policies and Programs

Warranty

MI provides a one-year warranty for its hardware products and a lifetime warranty for its software products. MI provides a 30-day money back guarantee for dissatisfied customers.

Support Services

MI provides free presale consulting and connectivity support during the warranty period. After the warranty period, MI will replace or repair its products for a nominal fee.

Service Hours

Phone support is available to MI product users at (800) 642-5888 or (301) 746-5888, Monday through Friday, 8:30 a.m. to 6:00 p.m. EST. Users can also access MI's electronic bulletin board service at no charge; MI Line answers incoming calls 24 hours a day, 7 days a week. MI Line's comment facility allows for the exchange of messages with the system operator and all other subscribers. It has an MI product current version list, some network utilities, patches for specific problems or users, and text files and data screens with troubleshooting information.

Training/Education

MI has not established a standard training program for its products. Specific arrangements in the form of customer-site and vendor-site training, however, can and have been made to accommodate clients.

Documentation

MI provides a technical and user-oriented, printed manual that includes a reference section for information on IBM-related documents.

Upgrade Policies

New versions of MI software programs are available to MI users at a nominal fee. Board replacements for MI products cost approximately \$200.

Specifications

Enhancements

Feature	MI Midrange Connectivity Products
Improved performance	5250 Remote Gateway was enhanced in May 1991 to route information for up to 256 personal computers. Now up to 16 gateway servers emulating IBM 5394 control units can operate on one LAN, each supporting 16 logical sessions. Before, only four servers emulating IBM 5394 control units could operate on one LAN, each supporting eight logical sessions.
New feature	IBM AS/400 PC Support on the nodes was made available in May 1991 on both Twinax and SDLC 5250 LAN Gateways.
Improved feature	Twinax 5250 LAN Gateway was enhanced in March 1991 to accommodate multiple gateways (a maximum of four) in a single computer, thus streamlining operations and reducing equipment costs.
New Option	5250 Local Twinax Adapter, released in April 1991, is the first product to allow users to migrate from DOS to Windows or OS/2, and back again.

Features/Functions

Midrange Connectivity Products

Model	5250 Local	5250 Local Gateway	5250 Remote	5250 Remote Gateway
Minimum Memory (K bytes)	88KB	65KB gateway; 104K per node	182KB	90KB gateway; 160K per node
Maximum Transmission Speed (bps)	1M	1M	9600	9600
Maximum Number of Sessions	7	7	9	16
Physical Connection	Twinax	Twinax	RS-232-C	RS-232-C
Terminals Emulated	IBM 5251, 5291/92, 3180, 3196	IBM 5251, 5291/92, 3180, 3196	IBM 5251, 5291/92, 3180, 3196	IBM 5251, 5291/92, 3180, 3196
File Transfer	Text, binary	Text, binary	Text, binary	Text, binary
Media Supported	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation

Mainframe Connectivity Products

Model	3270 Local	3270 Remote	3270 Remote Gateway	3270 Remote AutoSync
Minimum Memory	225KB	229KB	173KB	276KB
Maximum Transmission Speed (bps)	Dependent on controller speed	9600	9600	9600
Maximum Number of Sessions	5	8	32	8
Physical Connection	Coax	RS-232-C	RS-232-C	RS-232-C
Terminals Emulated	IBM 3278/79	3278/79	3278/79	3278/79
File Transfer	Text, binary	Text, binary	Text, binary	Text, binary
Media Supported	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation	Full-size adapter board, a 5.25-in. or 3.5-in. emulation program diskette, and documentation

Equipment Prices

	Purchase Price (\$)		Purchase Price (\$)
5250 Series		3270 Series	
5250 Local for DOS, Windows, or OS/2	895	3270 Local	895
5250 Local for DOS, Windows, or OS/2 Update	299	3270 Local DFT	1,095
5250 Local Gateway	1,995	3270 Remote	895
5250 Local Adapter Handler	695	3270 Remote Gateway	1,995
5250 Remote	795	3270 Remote AutoSync	595
5250 Remote Gateway	1,995	3270 Remote Bisync	895
5250 Remote Adapter Handler	595	Transfer 3270 PC Component	195
5250 Remote AutoSync	595	Transfer 3270 Host Component	295
5250 Remote AutoSync Adapter Handler	395		
DecisionLink A Enhanced file transfer	295	Batch Series	
Additional PCs	195	3780 RJE Remote	895

Microcom Communications Products

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Product Summary

Editor's Note

Since our last report, Microcom has revamped its Carbon Copy and RELAY product lines with new versions specifically designed for Windows and local area network applications.

Description

Microcom develops, manufactures, and distributes multiplatform connectivity and utility products that provide integrated communications functions. Its asynchronous communications products include Carbon Copy Plus and RELAY Gold. Carbon Copy Plus provides remote control capabilities; RELAY Gold provides PC users with connectivity to other PCs, information services, mainframes, and minicomputers.

Strengths

RELAY Gold and Carbon Copy Plus are versatile and dependable packages that remain a value purchase choice for users in both corporate and small business environments.

Limitations

In the crowded asynchronous communications market, the RELAY

package is one of the more difficult programs to learn and use.

Competition

Attachmate's EXTRA!, DCA's IRMA, Walldata's Rumba, and Futuresoft's Dynacomm.

Vendor

Microcom, Inc.
55 Federal Road
Danbury, CT 06810
(203) 798-3800, (800) 847-3529
In Canada:
Signatel, Ltd.
195 Riviera Drive
Markham, ON L3R 5J6
(416) 477-9977

Price

RELAY Gold for DOS: \$299; Carbon Copy Plus: \$199.

GSA Schedule

No; however, Microcom does use government resellers.

—By Donna Horsley
Staff Writer

Analysis

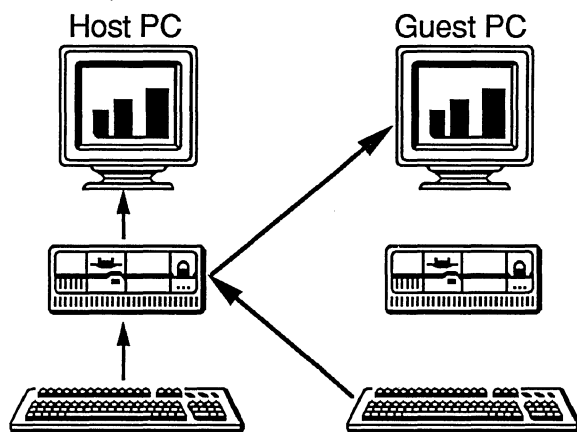
Product Strategy

Microcom maintains moderate success in the asynchronous communications market; its Carbon Copy Plus and RELAY Gold product lines have sold more than 750,000 and 330,000 packages, respectively.

Within the past year, the company has introduced new products and new versions of the Carbon Copy and RELAY product lines, and has rebuilt the Carbon Copy software development team to focus on Carbon Copy products that are specifically designed for Windows and LAN applications. The move is part of Microcom's reevaluation of its business strategies due to the company's net loss of more than \$28 million in fiscal year 1991.

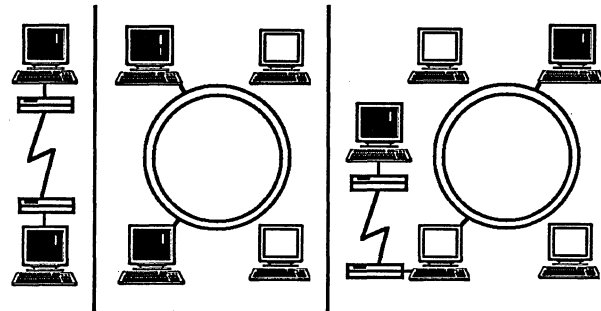
In April, Microcom introduced RELAY Gold 5.0 for DOS and RELAY Gold 5.0 for Windows, and in June Carbon Copy Plus 6.0 was launched.

Figure 1.
Carbon Copy Plus



A key pressed on the guest PC keyboard is transmitted to the screen of the host PC as if it were typed on the host PC keyboard. The screen changes resulting from the keystroke are displayed on the host PC screen and transmitted back to and displayed on the guest PC screen.

Figure 2.
PC Control



Carbon Copy Plus lets you control a PC over a modem connection (1) or a LAN connection (2). Using the two components together, stand-alone and LAN-attached PCs can communicate (3).

Another new product, Carbon Copy for Windows, is slated for introduction in late fall.

James M. Dow, Microcom president and CEO, said the company's software business is well positioned to grow.

"We are particularly excited about the prospect for Carbon Copy for Windows since it fills a market need that has not yet been addressed by our competition," Dow said. "[Carbon Copy for Windows] opens an important new market for Microcom. The growth of Windows-based software is well documented by IDC, an independently held market research firm, projecting calendar 1991 worldwide Windows 3.0 revenue to grow 155 percent from the previous years."

Sold primarily to *Fortune* 2000 companies, Microcom's asynchronous communications products are used by small businesses, such as doctor's offices and consulting firms; and large corporations, including American Airlines, Citicorp, AT&T, and Union Carbide.

RELAY Gold

Microcom began producing connectivity software in 1982, when the company released RELAY, a PC-to-PC, PC-to-mainframe, and PC-to-minicomputer communications package. In 1985, RELAY was upgraded to RELAY Gold, which included a sophisticated script language and the capability to run other programs while transferring files. In 1991, RELAY Gold was further enhanced and restructured with the RELAY Gold for DOS and RELAY Gold for Windows versions, which are both available for shipping.

RELAY Gold connects PCs to minicomputers and mainframes, bulletin boards, information

Company Profile Microcom, Inc.

Corporate Headquarters

500 River Ridge Drive
Norwood, MA 02062
(617) 551-1000

In Canada

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Officers

President and CEO:
James M. Dow
*Executive Vice President
and CFO:* Peter J. Minihane

Company Background

Year Founded: 1980
No. Employees: 386

A leader in the multiplatform connectivity and utility market, Microcom was the first company to offer error correction and data compression in modems, and was the first to deliver remote token-ring LAN bridge software. Microcom also developed the Microcom Networking Protocol (MNP), the de facto standard for error-correction over dial-up telephone lines and cellular links. MNP 10, Microcom's newest version, has been included in Rockwell/Digital Communication's latest modem chip set, significantly broadening the technology's reach in the modem marketplace.

Microcom's principal product lines include high speed desktop and port-

able modems; dial-up modem network management systems; remote access/file transfer software; micro-to-mainframe software; antivirus and utility software; and LAN bridging and routing products supporting both Ethernet and token-ring.

Fiscal year 1991 was disappointing for Microcom. The company had its first loss as a publicly held company: net income dropped from \$9 million in fiscal year 1990 to a net loss of \$28 million in fiscal year 1991. Company sales also declined, dropping from \$71 million in fiscal year 1990 to \$55 million in fiscal year 1991. Microcom has attributed the decreases in net sales and net profits to prior overstocking by its key domestic software and hardware distributors, tightened credit policies of the company, and the maintenance by distributors of lower than average inventory levels.

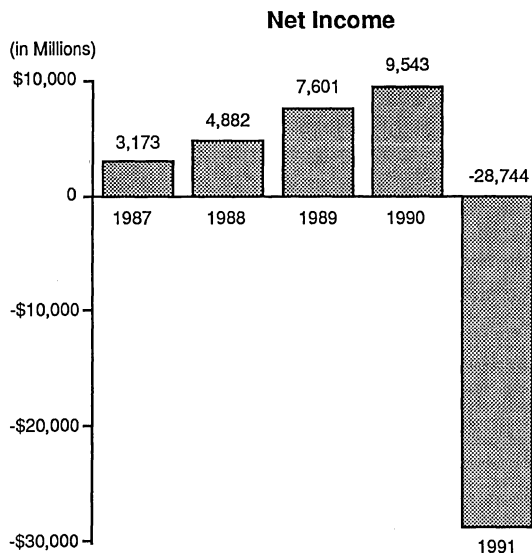
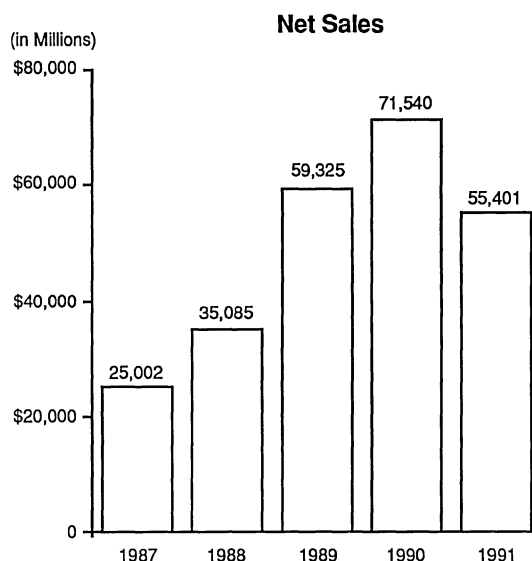
At the start of fiscal year 1992, Microcom's recovery strategy for its products includes strengthening of distribution channels, updating the product lines, and more focused marketing efforts. At present, the company is operating with average distributor inventories, lower manufacturing costs, and decreased

operating costs. Microcom has also introduced new Carbon Copy, RELAY, and Virex software products; new Microcom LAN bridge and routing features; and a new modem entry that is directed at the rapidly growing portable computer market. The company's sales and marketing team has become increasingly distribution oriented and more experienced in bringing products to market in a timely fashion.

The company foresees excellent growth opportunities in the Windows software and internet-networking markets.

Targeting *Fortune* 2000 companies, Microcom has sales offices throughout the U.S. and in Asia and Europe. The company's export sales represented 28% of net sales in fiscal year 1991, an increase from 24% of net sales in 1990.

Financial Results Fiscal Years 1987-1991



services, and other PCs. The products provide basic terminal emulation and file transfer to support virtually all connections. The new versions of RELAY Gold have added support for additional file transfer protocols, and have expanded terminal emulation offerings and connection support. RELAY Gold now offers full integration of the former RELAY Gold Toolbox, including panel management and libraries to streamline communications tasks such as login and file transfer.

In terms of IBM 3270 emulation, Microcom provides 3270 emulation links and file transfer with an IBM host through the use of additional RELAY/3270 mainframe software, which is sold separately. 3270 connections can also be established, without the mainframe software, through conventional means such as emulation boards, token-ring TIC, and supported third-party LAN gateways.

The RELAY products work together to provide a PC-to-mainframe communications link. While RELAY Gold is installed in a PC, the other products in the RELAY family run on IBM mainframes.

RELAY/3270 emulation software runs on a mainframe and allows any number of PCs that have RELAY Gold installed to emulate 3270 terminals asynchronously. RELAY/3270 works in a variety of environments, with versions available for VM/CMS, VM/VTAM, and MVS/VTAM. Another RELAY package, RELAY/transfer, provides 100 percent error-free file transfer in addition to 3270 emulation when it is run on the mainframe with RELAY/3270. One copy of RELAY/transfer on the mainframe supports an unlimited number of PCs running RELAY Gold. RELAY/transfer is available in versions for VM/CMS, MVS/TSO, MVS/CICS, and VSE/CICS.

Carbon Copy Plus

Introduced in 1985, Carbon Copy Plus is Microcom's premiere offering, claiming an installed base of more than 750,000. The leader in remote control communications software, Carbon Copy Plus claims 50% of the remote control communications market. In June, Carbon Copy Plus was enhanced with the introduction of Version 6.0. A Windows version is slated for introduction later this year.

Carbon Copy Plus 6.0 allows an unlimited number of users on a single LAN to gain complete

control of a remote PC—that is on or off a LAN—via modems, high-speed bridges, and internal routers. With the package, users can remotely access any application or operation residing on the remote PC, including support for Windows 3.0 and access to local area networks, databases, and electronic mail. Carbon Copy Plus also permits connected computers to exchange information, thus allowing a user to collaborate on an application (such as a spreadsheet) with a distant colleague.

Besides remote computing capabilities, Carbon Copy Plus provides asynchronous terminal emulation; a script language; programmable function keys; support for xmodem, ymodem, and Kermit protocols; and file transfer capabilities. These features give users the added ability of accessing asynchronous hosts and on-line services, such as Dow Jones News/Retrieval, minicomputers, and bulletin boards.

Microcom introduced Carbon Copy Mac in 1990. It is a software package that allows Macintosh users to remotely control another Macintosh, transfer files, or manage an AppleTalk network. Carbon Copy Mac offers most of the same remote computing capabilities as Carbon Copy Plus but in a true Macintosh environment.

Competitive Position

The Carbon Copy Plus and RELAY Gold packages have earned Microcom billing as a company providing quality communications products. Carbon Copy Plus is the leader in remote control communications software, capturing 50% of the market with more than 750,000 installations worldwide. The RELAY Gold products provide high-performance and versatile communications software and have captured 5% of the DOS communications software market.

With Version 6.0 of Carbon Copy Plus, Microcom has strengthened its remote control and file transfer software's commanding lead over the competition, which includes DMA's PCAnywhere and DCA's Remote². Introduced in June, the new version incorporates asynchronous and LAN-based remote control capabilities in one easy-to-use package and provides users with a savings of up to \$2,000 over competitive packages. Version 6.0 also significantly simplifies the upgrade process, resulting in less downtime and a faster learning curve for new features.

RELAY Gold for DOS and RELAY Gold for Windows, the newest versions of RELAY Gold, have widened Microcom's micro-to-mainframe link and have improved the company's position in the crowded DOS communications software market, which includes Attachmate's EXTRA!, DCA's IRMA, Walldata's Rumba, and Futuresoft's Dynacomm.

"We deliver the broadest selection of connections, including coax, token-ring, PC-to-mainframe, PC-to-information services, as well as extensive file transfer, terminal emulation, and scripting currently available in a single package," said David Wilson, director of RELAY Product Group. "And we are the *only* communications package to provide true 3270 DFT terminal emulation from anywhere—direct from the workstation, locally or remotely through either synchronous or asynchronous connections."

With product support for the Macintosh and Windows 3.0, Microcom has enhanced the comprehensiveness of its asynchronous communications product line. Carbon Copy Mac provides quality support for the Apple Macintosh, which continues to make inroads in corporate America. Likewise, RELAY Gold for Windows and Carbon Copy Plus 6.0 provide Windows 3.0 functionality. Microcom is presently working on a Windows package for Carbon Copy that is slated for introduction late this year.

Decision Points

RELAY Gold

3270 Emulation: Unlike some of its competitors, RELAY Gold products provide the option of IBM 3270 terminal emulation without requiring any add-in emulation boards. RELAY Gold 5.0 for DOS, using its unique Async DFT technology, requires no boards for 3270 emulation, making it a perfect choice for portable computers as well as desktops. When used to perform total software 3270 emulation on a PC, RELAY Gold products compete with vendors of 3270 emulation boards and software, such as DCA, AST Research, and Novell. Like its competitors, RELAY offers CUT and DFT mode emulation, when used with 3270 emulation boards such as DCA's IRMA. RELAY

Gold, however, is the only communications package to provide true 3270 DFT terminal emulation from anywhere—direct from the workstation, locally or remotely through either synchronous or asynchronous connections.

RELAY's 3270 emulation products operate asynchronously, while competitors' operate synchronously. The advantage of asynchronous terminal emulation is that additional hardware is not needed at each PC. Users are not restricted to connecting only those PCs that are within cable distance. In addition, asynchronous communication—with its use of ordinary home lines—is often more economical than synchronous communication.

Applications: The RELAY family of products is versatile enough to fit most companies' communications needs. Within one software package, the user gains access to a host of applications and can easily upgrade the system to support mainframe communications and file transfer. In addition, since RELAY Gold is sold separately from the RELAY mainframe software options, users not requiring asynchronous mainframe connectivity are not forced to purchase extra functionality.

Carbon Copy Plus

Terminal Emulation: Unlike many of its competitors in the remote computing market, Carbon Copy Plus provides terminal emulation (of Digital VT52/100, IBM 3101, and TeleVideo 920 terminals), as well as support for the xmodem, ymodem, and Kermit file transfer protocols. In addition to the standard benefits available through remote control packages, these features allow users to access information services such as CompuServe, OAG, and NewsNet.

Applications: Carbon Copy Plus has proven to be excellent for allowing geographically dispersed users to easily share resources and applications. The new Version 6.0 supports unlimited users on a single LAN. The program is ideal for computer users who need to work at home, since it lets users dial in to and completely control a remote computer (in their office, for example). The product has also gained wide acceptance as a tool for remote diagnostics, training, and support.

Characteristics

Models: RELAY Gold, RELAY Gold for DOS, RELAY Gold for Windows, RELAY Gold LAN, RELAY/3270, RELAY/transfer, Carbon Copy Plus, and Carbon Copy Mac.

Date Announced: RELAY Gold—1985; RELAY Gold for DOS—1991; RELAY Gold for Windows—1991; RELAY Gold LAN—1986; RELAY/3270—1984; RELAY/transfer—1983; Carbon Copy Plus—1985; and Carbon Copy Mac—1989.

Date First Installed: RELAY Gold—1985; RELAY Gold for DOS, RELAY Gold for Windows—1991; RELAY Gold LAN—1986; RELAY/3270—1984; RELAY/transfer—1983; Carbon Copy Plus—1985; and Carbon Copy Mac—1990.

Numbers Installed: RELAY Gold for DOS—330,000; Carbon Copy Plus—750,000.

Environment

Computers Supported: RELAY Gold and Carbon Copy Plus offer support for IBM PC/XT/AT, PS/2, and compatible computers, including portables and laptops. In addition, packages are available on Apple Macintosh version: Carbon Copy Mac.

Minimum Configuration: RELAY Gold—192K bytes of RAM (can be as little as 128K bytes when used with EMS); Carbon Copy Plus—19K bytes of RAM when run without its menus and 45K bytes of RAM with its menus.

Operating Systems: Both packages support MS-DOS 2.0 and higher. Microsoft Windows 3.0 and higher is also supported with separate versions.

Media: RELAY Gold and Carbon Copy Plus are both available on 3.5-inch and 5.25-inch diskettes.

Communications

Addressable Ports: RELAY Gold—COM1 through COM8; Carbon Copy Plus—COM1 through COM4.

Transmission Speed: RELAY Gold—300 to 57.6K bps; Carbon Copy Plus—300 to 38.4K bps.

File Transfer: Both packages support the transfer of ASCII, binary, and graphic files.

Protocols: RELAY Gold—xmodem, ymodem, zmodem, Kermit, CompuServe B-Plus, IND\$FILE, and RELAY/transfer; Carbon Copy Plus—xmodem, Kermit, ASCII, and ymodem.

Terminal Emulation: RELAY Gold—TTY, ANSI, Digital VT52-240, IBM 3101 Models 10 and 20, TeleVideo 910, Hazeltine 1410, Adds 25, Lear Siegler ADM-5/38, Tymnet78, Prestel, Minitel/Teletel, Viatel Videotex Terminals, and IBM 3278/79; Carbon Copy Plus—TTY, Digital VT52/100, IBM 3101, and TeleVideo 210.

Modem Command Sets: Both programs support the Hayes AT command set and numerous non-Hayes modems. In addition, using RELAY Gold's script language, users can configure the program to support any modem.

Operation

User Interface: RELAY Gold for DOS and RELAY Gold for Windows can be either command or menu driven; they support multiple sessions and include an installation program and a context-sensitive help facility. An information on-disk tutorial is available for DOS version only. Carbon Copy Plus is strictly menu driven, including support for nested menus, and also includes an installation program and help facility.

Security: Both packages offer single-level passwords and transmission encryption. In addition, RELAY Gold offers multilevel passwords, and Carbon Copy Plus provides an auto callback feature.

Data Handling: Both packages allow data to be captured to either disk or printer, and both provide screen snapshot capabilities. RELAY Gold also provides a built-in text editor.

Programmability: RELAY Gold provides an English-like script language for automating repetitive tasks, including logons and unattended file transfers. The script language includes a learn mode that automatically writes a simplified script by copying a sequence of keystrokes as entered by the user. The script language can be used to automate sophisticated, lengthy procedures and to customize the user interface. Carbon Copy Plus supports programmable function keys and a command language for the creation of script files that can automate logon procedures and data exchange.

Capture Buffer Size: RELAY Gold—approximately 32K bytes worth of data; Carbon Copy Plus—dependent on available memory.

Operational Modes: Both packages feature auto answer, auto dial, auto redial, and unattended background operation.

Calling Facilities: RELAY Gold and Carbon Copy Plus both provide dialing directories for storing phone entries. The programs also allow users to define communications parameters, passwords, protocols, and port designations. Both packages can be used to access electronic bulletin boards such as FIDO and PCBoard, and information services such as CompuServe, Dow Jones, and DIALOG.

Software Prices

	Single- Unit List Price (\$)
RELAY Gold for DOS	299
RELAY Gold for Windows	399
RELAY Gold LAN	825
RELAY/3270	9,000-15,000
RELAY/transfer	8,000-15,000
Carbon Copy Plus	199
Carbon Copy Mac (single-user version)	99
Carbon Copy Mac (unlimited-user version)	299

Microsoft LAN Manager

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Product Summary**Editor's Note**

Microsoft has recently released Version 2.0 of its OS/2 LAN Manager network operating system. It has also recharted its marketing course and begun to sell the product under the Microsoft name, where it formerly left the marketing to its many OEMs.

Description

A network operating system based on the IBM/Microsoft OS/2 operating system, featuring strong emphasis on server-based application support and interprocess communication.

Strengths

Client/server architecture, broad base of support from major vendors, many server-based applications shipping or under development.

Limitations

Important "value adds" from 3Com, do not function with Version 2.0.

Competition

Novell NetWare, Banyan VINES.

Vendor

Microsoft Corp.
One Microsoft Way
Redmond, WA 98052-6399
(206) 882-8080

Price

LAN Manager 2.0 5-user Server Pak—\$995; each additional 10 users—\$995; Unlimited User Pak—\$5,495.

GSA Schedule

Yes.

—By *John Krick*
Associate Editor

Analysis

Product Strategy

The surprising news from NetWorld '91 Boston—that IBM will now market Novell NetWare as well as its own OS/2 LAN Server network operating system and that Novell is launching development of a version of NetWare that will run under OS/2—was taken by many to represent another pair of nails in the coffin of Microsoft OS/2 LAN Manager, which IBM's LAN Server is based on. In a related story, 3Com, once considered the most important of LAN Manager's many OEMs, has abandoned the network operating system business entirely. Many in the industry firmly believe that OS/2 LAN Manager is now a dead issue.

Certainly, Microsoft's original strategy for marketing OS/2 LAN Manager—acting as the developmental center of a group of OEMs while remaining detached from actually getting the product out to a customer base—died quite a while ago. That was surprising because it was exactly the

strategy that worked so well with Microsoft MS-Net. If you do not recall MS-Net, that is because it made its name under several aliases—as IBM's PC LAN Program, 3Com's 3+, and Hewlett-Packard's OfficeShare, among others. When MS-Net hit the streets, however, Novell NetWare was in its infancy. OS/2 LAN Manager was rolled out to face a NetWare that had become the dominant force among local area network operating systems with, some say, at least a 60 percent share of the market.

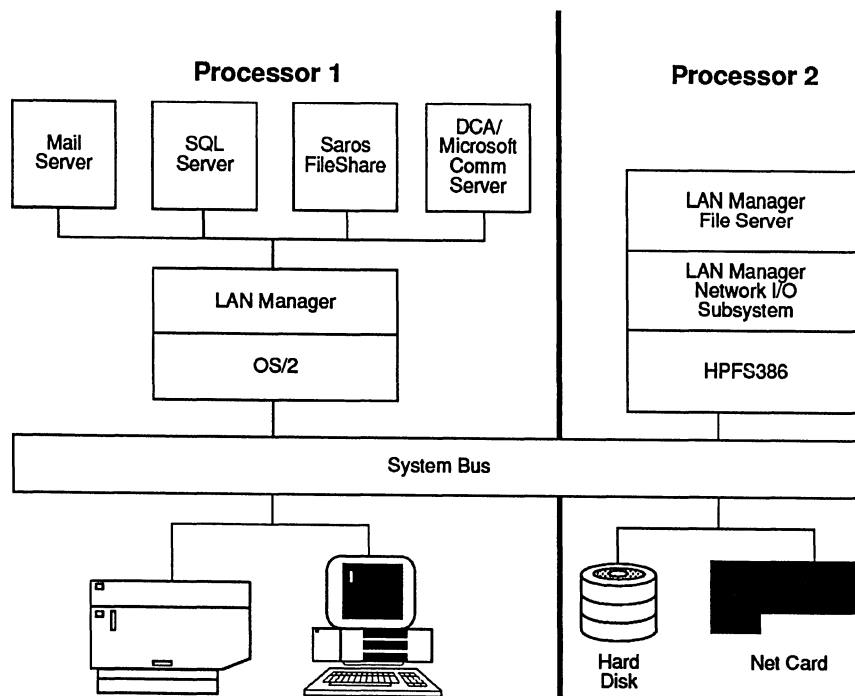
LAN Manager's initial failure was perhaps even more surprising because the list of LAN Manager OEMs included IBM, 3Com, and HP, as well as AT&T, Digital, Unisys, and NCR. At the high point of what came to seem like a frenzy of OEM'ing, Microsoft had enlisted over 40 companies to try to move LAN Manager. Many of these vendors added significant value to the base product, but none had very much success in selling their LAN Manager-based products. Most of the OEMs seemingly should have had an advantage over Microsoft in that they were also selling hardware for LAN Manager to run on.

Now Microsoft has taken a new route and is marketing OS/2 LAN Manager Version 2.0 itself. Whether that will work any better remains to be seen.

Why OS/2 LAN Manager has not gotten started in the market is a question that could have several answers. That the OS/2 operating system it

Figure 1.
Multiprocessor Server

LAN Manager running on a dual CPU "superserver" divides tasks among the processors for faster and more efficient operation. Available now for the dual processor Compaq Systempro, Microsoft will soon release versions of the Multiprocessor Server Pak for several other popular multiprocessor machines, including those from Parallax and Tricord.



is based on, also from Microsoft by way of IBM, has not taken off either is certainly a factor. However, OS/2 is only required on servers, not on workstations, which can run under DOS or Windows. LAN Manager also runs under UNIX in OEM versions, from AT&T, Hewlett-Packard, and the Santa Cruz Organization and the UNIX server will also support DOS and Windows workstations.

But the real factor here could be that OS/2 LAN Manager and the OS/2 operating system as well are solutions that have arrived for a problem that has not. The broad functionality of the two systems, which includes multitasking and sophisticated interprocess communication (IPC), simply is not a requirement for most LAN users yet. Coupled with the fact that this broad functionality requires lots of memory—at least 5M bytes in a server and 3M bytes in an OS/2 workstation—it is easy to see why there is an acceptance gap. Until recently, the price of semiconductor memory was astoundingly high. Most users are plugging right along using the same software they have been using for years now—Lotus, some form of database management system, and word processing, all of which run fine on a single-task-at-a-time DOS machine, in 640K bytes of memory. Among most LAN users, which is to say those with small LANs, there is not a clearly perceived need for the ability to have three or four applications running at once in their own windows while data is shuffled back and forth between them. It could be that a lot of time will go by before such functionality gains wide acceptance. The advantages, for the small-to-medium-sized business, of such things as client/server computing and SQL relational databases will have to become a great deal more apparent before they will be in wide demand.

Many of the enhancements provided by the OEMs have been rendered useless by the changes inherent in LAN Manager Version 2.0. 3Com developed a Macintosh interface for LAN Manager 1.1 that no longer works with Version 2.0, and now Microsoft is hurriedly trying to rework the software tools for the increasingly important Mac connection. Other important software developed by 3Com, including its 3+ Open Connection for NetWare, runs under LAN Manager 2.0 but is still not generally available as an off-the-shelf product to non-3Com customers.

Company Profile Microsoft Corp.

Corporate Headquarters

One Microsoft Way
Redmond, WA 98052-6399
(206) 882-8080, (800) 426-9400

International offices in 17 countries in North America, South America, Europe, Asia, and Australia.

Officers

Chairman of the Board & CEO: William H. Gates
President & COO: Michael R. Hallman
General Manager of Network Business: Mike Murray

Company Background

Revenues in Fiscal 1990: \$1.18 billion

Microsoft Corp. was founded by Bill Gates in 1975. Its first product, an interpreter for the Basic programming language, was written for the Altair computer, one of the first PCs. In 1981, IBM selected Microsoft's MS-DOS and Basic as the operating system and language of choice for the IBM PC, thus guaranteeing Microsoft's future.

While still directing efforts toward its system software success, the company's applications business has grown since its first application in 1982; today, 42 percent of Microsoft's revenues are from its applications products.

At the end of fiscal year 1990, Microsoft became the first microcomputer software company to exceed \$1 billion in sales in one year.

Management Statement

"As we look to the 1990s, our intention is clear—we intend to be the leader in graphics-based applications products. On the Macintosh side, we already are. We were the first to bring key Macintosh applications to market, and we continue to lead the Macintosh in the word processing, spreadsheet, presentation graphics, and integrated products categories, despite increasing competition. We intend to be among the first to deliver graphics-based products on the PC side as well . . . building on our experience in both systems and applications products to create advanced state-of-the-art programs."

—Microsoft Corp.
1989 Annual Report

Competitive Position

After all of the above history has been duly recited, what remains to be said is that Microsoft OS/2 LAN Manager is a product that can only grow in acceptance as the 1990s progress. A recent report from Gartner Group of Stamford, CT, predicted that LAN Manager would take over the lead from NetWare by about 1995, leaving Novell with a 40 percent market share, compared with its current 60 percent. While opinion in the industry is sharply divided on whether such a scenario will take shape, there are many reasons to believe that it will.

The combined backing of IBM and Microsoft is one such reason. The two companies are the undisputed giants of the computer industry—IBM's influence, of course, extends to all segments of the industry, while Microsoft is the largest developer of PC software. Another compelling argument could be built around the fact that LAN Manager has been embraced by two other vastly important segments of the industry—nearly every large manufacturer of networking hardware and nearly every manufacturer of large-scale computing equipment other than IBM. 3Com, Ungermann-Bass, AT&T, Hewlett-Packard, NCR, and Digital Equipment are some of the names that fit into one or both of these categories. Indeed, it seems that everyone has an integrated office solution that rides on the back of LAN Manager today. HP's NewWave Office, NCR's Cooperation, Digital Equipment's PathWorks, and AT&T's Rhapsody all deliver their services using LAN Manager as a vehicle.

Clearly, users with a strong connection to one of the larger OEMs, Digital, NCR, or Hewlett-Packard, for example, will most likely go with the offering of their vendor of choice. IBM shops will choose LAN Server, following their usual buying patterns. What does that leave Microsoft? Two groups of users—those with shops large enough to have a very heterogeneous mix of computing equipment and their own, knowledgeable in-house staff to support it; and those small enough to get by with one of the entry-level LAN Manager packages, yet which believe in their own future growth strongly enough to think they need the functionality and potential for expansion of LAN Manager.

Decision Points

Choosing Microsoft OS/2 LAN Manager actually involves two choices—choosing LAN Manager

over NetWare and then choosing Microsoft's shrink-wrapped product over that of any of the many OEMs.

Users with a clear requirement to extend connectivity to IBM mainframe and midrange systems or to access large databases residing either on those large-scale resources or in a distributed, perhaps SQL-driven, client/server network environment, will want to give OS/2 LAN Manager the strongest consideration.

OS/2 LAN Manager is available in only a few configurations. In contrast to Novell's superstratified marketing policies for NetWare, every LAN Manager buyer gets the same functionality—and the same growth capabilities. For their initial investment, customers get a 5-user package. Only two alternatives for expansion are offered—adding 10-user increments, or buying the unlimited user version. Each 10-user increment costs as much as the initial 5-user package. Customers with more than a few workstations, or the possibility of much LAN growth, should go for the unlimited-user version. Compared with Novell's top-of-the-line NetWare v3.11, Microsoft's pricing policies on OS/2 LAN Manager are generous indeed. The unlimited-user package is offered for about \$500 less than the 100-user NetWare product, and Novell's prices go still higher as more users are added. The unlimited user version of LANMANAGER is nearly \$6000 less than the 250 user NetWare and 250 users is the upper limit for NetWare.



Characteristics

Model: Microsoft LAN Manager Version 2.0.

Date of Announcement: LAN Manager Version 1.0—April 1987; LAN Manager Version 2.0—November 1989.

Date First Installed: LAN Manager Version 1.0—June 1988; LAN Manager Version 2.0—August 1990.

Number Installed: Information not available.

Distribution: Resellers and OEMs.

Architecture

OS/2 LAN Manager Version 2.0 is a network operating system that runs under the Microsoft/IBM OS/2 operating system on its server and supports both OS/2-, MS-Windows, and MS-DOS-based workstations. OS/2 LAN Manager Version 2.0 requires at least an 80286-based IBM or IBM-compatible PC or an IBM PS/2 running the OS/2 Version 1.21 operating system for a server, and at least 5M bytes of memory. Microsoft recommends 6M bytes for best results. In addition, server machines based on an 80386 or higher processor can use the full functionality of LAN Manager including the HPFS-386 filing system and local security functions, as well as provide much better performance. OS/2 workstations must also be at least 80286-based machines but require only 3M bytes of memory and Version 1.1 of the OS/2 operating system. MS-DOS workstations can be any variety of IBM PC or PC-compatible machine, including those based on the 8088 processor. At least 512K bytes of memory are required and 640K bytes are recommended. MS-DOS must be Version 3.3 or higher.

Client/Server Computing

OS/2 LAN Manager is designed to support the emerging client/server computing paradigm. The server in a client/server architecture assumes a minicomputer-like functionality, instead of being a mere repository of files. The most commonly cited example of how client/server computing works is that of a database management system request sent from a network workstation to a server. In non-client/server networks, the server's response is to send the entire database over the network to the requesting workstation, which then does the processing locally. This is a grossly inefficient usage of network bandwidth. In the client/server model, the server does the work and sends the requesting workstation, "the client," only the results.

File Systems

The OS/2 operating system that LAN Manager runs under provides two file systems: the DOS-compatible File Allocation Table (FAT) system and OS/2's HPFS. HPFS filenames can be up to 254 characters long and can include spaces. Case sensitivity is optional. HPFS automatically caches directories, data, and file system structures to speed up access to large disk volumes. The file system uses a Least Recently Used (LRU) algorithm to determine which files should be retained in the memory cache to reduce the amount of disk access necessary. HPFS is backward compatible with the DOS FAT file system.

HPFS386 has been added to LAN Manager to take advantage of the 80386 and 80486's 32-bit architecture and speed access to large disk systems and directory structures, through the use of enhanced cache capabilities. HPFS386 also implements local security

features designed to restrict access to files on servers, and fault tolerant features discussed below, including disk mirroring and disk duplexing.

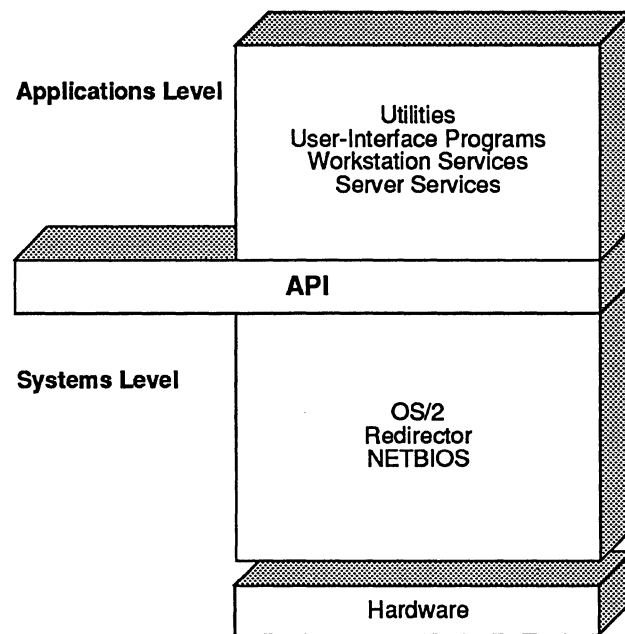
Application Programming Interfaces

The Application Programming Interface (API) is crucial to the architecture of OS/2 LAN Manager. The APIs provide a method of writing applications that is consistent, easy to use, and well documented. It resembles the structured approach to programming in which a library of subroutines is available for all repetitively performed tasks. APIs exist at a level of the operating system midway between the system software and the applications and user interface and provide a communication channel between these two levels. Various categories of APIs exist to address and extend the different aspects of network functionality.

Centralized Network Administration

OS/2 LAN Manager includes powerful network administration features that facilitate the management of large networks with many users.

Figure 2.
LAN Manager Architecture



This figure shows how the APIs, interface constructs similar to function calls in a programming language, sit between the application and system levels of the LAN Manager network operating system. Programmers, using the APIs, can easily write code that allows applications, utilities, user-interface programs (like Windows), and workstation and server services to access system services and data structures located at LAN Manager's core.

User Account Hierarchy: User accounts are organized as a hierarchy with an administrator account at the highest level. Below that, user accounts and their privileges are defined by the administrator. Guest accounts are also available and usually consist of a subset of normal user privileges. The administrator account system itself contains a further hierarchy in which five levels of operator privileges can be defined, allowing the administrator to delegate certain network management tasks to another person. Administration of user and group accounts; communications and print queues; server-based services; and directory, file, and resource sharing can all be handled by designated operators. An access control list records seven levels of permission for use of network resources such as directories, individual files, named pipes, comm queues or print queues.

Levels of permission are execute, read, write, create, delete, attribute, and permission. The final level—permission rights, allows selected users to modify access control lists themselves, extending the hierarchical network administration model discussed above.

Domain Servers: Groups of servers can be defined as a single entity called a domain, so that changes in account status such as permissions, passwords, and group membership can be implemented across all servers with a single operation. Users can access all server resources in their domain with a single password.

The LAN Manager Replicator service makes the distribution of software updates and new software a one-step process as well. Changes made to one server are automatically copied to other designated servers. Administrative tasks can be performed from any OS/2 workstation on the network.

Security

Account Control: This feature allows the administrator to set valid logon times, valid workstations, an account expiration date, and the maximum storage allowed.

Password Control: Passwords are encrypted using the Data Encryption Standard (DES) algorithm. Administrators can control password length, age, minimum age, and uniqueness.

Forced Logoff: System settings may be modified so that when users logged on to the system exceed their valid logon time they can be forced off the system immediately, be allowed a grace period, or be allowed to remain logged on indefinitely.

Incorrect Password: If an incorrect password is entered, system activity halts for up to three seconds to stop password-finding programs. Bad passwords are also entered in the audit log.

Audit Trails: Audit trails allow administrators to track usage of any network resource for security and performance quantification as well as charge-backs to departments. Directories, queues, files, and pipes may all be monitored. Audit information is saved in text files that can be fed to analysis programs.

Fault Tolerance

OS/2 LAN Manager provides several means to ensure the safety and integrity of stored data.

Hot Fixes: LAN Manager automatically transfers data from known bad sectors on any hard disk to good storage space.

Disk Mirroring: Each hard disk on the system can have its own backup disk that contains exactly the same information, backed up periodically. Both of these drives will be connected to the same disk controller hardware.

Disk Duplexing: Like disk mirroring, disk duplexing provides a backup for each drive but also gives an extra measure of physical protection since each drive is connected to its own controller hardware.

File Replication Service: The replicator service helps ensure the integrity of data systemwide by automatically updating all copies of a file that reside on servers or OS/2 workstations.

Syotos Plus File Backup Manager: Syotos Plus backup software from Sytron Corp. is included with each copy of LAN Manager 2.0. Syotos Plus is an OS/2 Presentation Manager-based application that works with most widely used backup devices and formats, including quarter-inch tape, data cassette, Digital Audio Tape (DAT), and 8-mm. helical scan. Devices with capacities of up to 2.3 gigabytes are supported.

Interprocess Communication

Named Pipes: A bidirectional interprocess communication facility that can connect processes running on different network nodes and is the most common method by which front-end workstations communicate with back-end server-based applications. Named pipes allows programmers to easily write distributed applications that can be accessed by any workstation on the network, no matter where the application resides. Both server and client processes can initiate or complete a message transfer by writing to or reading from a named pipe in much the same way that a process writes to or reads from a file. Named pipes were designed to aid software developers with little or no knowledge of the requirements of networked applications. Named pipes is a high-level protocol and does not require the programmer to have knowledge of procedures to establish or close network connections, handle network errors, or do any of the other low-level procedures required by such protocols as NETBIOS or IPX.

Mailslots: A one-way interprocess communication facility. Mailslots are created on the server for the purpose of receiving messages from clients. Two types of mailslots are implemented, first- and second-class. First-class mailslots exist only on LAN Manager servers and provide guaranteed delivery. First-class mailslots return an acknowledgment of successful reception or an error code to indicate a failed delivery. Second-class mailslots do not guarantee delivery. Receipt or failure of a message sent to a second-class mailslot is not acknowledged. If a mailslot area of memory is full, the transmission fails without issuing an error message. Second-class mailslots can be implemented between workstations, however, and do not have to reside on a server. Broadcast messages can be sent using second-class mailslots as well.

Peer Services: Peer services allow any LAN Manager OS/2 workstation to function as a limited type of server so that applications servers can be created. A workstation running peer services can connect, as a server, to one client workstation at a time. The client workstation can use multiple files, named pipes, and mailslots but can only access one character device (such as a printer or a modem) and one print queue.

Multiprocessor Server Pak

Designed to take advantage of the emerging new class of "superservers" that are built around multiple CPUs, Multiprocessor Server Pak divides server tasks between two processors asymmetrically. Asymmetrical processing involves splitting the work load on a task-oriented basis. Each processor is assigned a particular function—one could be dedicated to file service while the other handled database management requests. A symmetrical processing scheme, by contrast, is work load-oriented. No processor ever sits idle, because portions of any task are assigned to each CPU as it becomes free.

The first release of Microsoft's Multiprocessor Server Pak runs on the Compaq Systempro dual-processor machine only, but the company has announced versions for the Tricord PowerFrame and Parallax Server 290.

LAN Manager Network Development Kit

The LAN Manager Network Development Kit (NDK) includes six components that allow software developers to write client/server applications for OS/2 LAN Manager Version 2.0. In addition to copies of LAN Manager Version 2.0 and the OS/2 Version 1.21 operating system, the NDK contains programmer's toolkits for both LAN Manager and OS/2, online support privileges, and a rebate coupon that allows development teams to purchase the five-user version of Microsoft SQL Server at a discount of \$200.

The Programmer's Toolkit that is the central component of the NDK includes a LAN Manager Programmer's Reference Guide; Microsoft QuickHelp software; Application Programming Interfaces (APIs) for DOS,

Windows, and OS/2; and source code examples for several client/server applications.

Programmer's Toolkit

Developers who already have most of the components of the Network Development Kit described above can purchase the Programmer's Toolkit separately.

SQL Server

SQL Server is a database server system that uses Structured Query Language (SQL, pronounced *sequel*). Developed jointly by Ashton-Tate and Microsoft, SQL Server is an important part of the OS/2 LAN Manager client/server environment.

SQL was developed by IBM for its DB2 mainframe database management system and has been standardized by ANSI. SQL, as its name implies, provides a means of communicating with a database management system. Perhaps the most important point about the SQL language is that it allows users to phrase questions to the database in ordinary English sentences.

Within the client/server computing framework, SQL Server speeds database transaction processing and eases network traffic loads by performing database operations at the server and returning only the results to the requesting client.

SQL Server can be driven by and provide data to any of several different "front ends" on the network simultaneously. Users who require information delivery to a database management system, a spreadsheet, a word processor or desktop publishing package, or a graphics application can request that data from SQL Server. Most manufacturers of database systems have released front ends for SQL Server, including Oracle, SyBase, Ingres, and over 50 others.

SQL Server provides several methods of enforcing both database integrity and business rules.

Communications Server

Communications Server, developed jointly by Digital Communications Associates (DCA) and Microsoft, is a client/server application that allows OS/2 and DOS client workstations to access IBM SNA networks for 3270 terminal emulation, IBM IND\$FILE file transfer, and Advanced Program-to-Program Communications (APPC). Unlike gateway applications that require the purchase of software packages for each workstation which requires mainframe access, Communications Server provides that access to all LAN users. Communications Server is available with licensing for 8, 32, or 64 users.

Communications Server requires OS/2 Version 1.21 or later and, at least, an Intel 80286-based IBM PC AT, AT-compatible, or IBM PS/2. The server machine must have 9M bytes of RAM minimum (6M bytes if the server is a LAN Manager peer server) and 10M bytes of free hard disk storage. Each server machine can support up to four DFT-capable adapter cards, such as the DCA IRMA 2 or IRMA 3, or IBM's 3278/79 Emulation

Adapter; up to four SDLC or X.25 synchronous adapters; and up to two token-ring adapters. Communications Server is not directly marketed by Microsoft. It can be purchased from DCA as the DCA Select Communications Server and from several of the LAN Manager OEMs.

Support

Purchasers of LAN Manager receive 30 days of free support. Microsoft offers several support plans. The Base Plan provides "incident-based" support in which the user is allowed 10 support incidents. An incident is a single question or problem that requires assistance to resolve. This assistance can be obtained by talking with a support engineer on the phone or through a modem transaction. Problems that require multiple calls to resolve count as one incident. The Base Plan also provides 10 hours of connect time with the Microsoft Knowledge Base, an electronic Bulletin Board that contains current product information. Additional 10-hour blocks of time can be purchased at any time. Microsoft also offers the Gold Plan, which provides unlimited support incidents and 48 hours of connect time.

Installation: Installation is provided by resellers or OEMs.

Training: Microsoft offers the following courses on OS/2 LAN Manager at Microsoft University at Microsoft headquarters and at 20 authorized training centers across the U.S.

- Programming Environment
- Systems Administration
- Applications Programming
- Integration and Operation

Warranty: OS/2 LAN Manager carries a 90 day warranty.

Maintenance: Maintenance is provided by resellers or OEMs.

Software Prices

	Purchase Price (\$)
LAN Manager Server Package (supports 5 users)	995
LAN Manager 10-User Pak (adds an additional 10 users to server)	995
LAN Manager Unlimited-User Pak (adds an unlimited number of users to server)	5,495
LAN Manager Multiprocessor Server Pak	2,495
LAN Manager Network Development Kit	1,495
LAN Manager Programmer's Toolkit	149

Motorola Altair Wireless LAN

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In February 1991, Motorola's Radio-Telephone Systems Group announced the Altair Wireless LAN, the first product based on the company's high-speed, wireless in-building network (WIN) technology. Drawing upon low-power 18GHz radio as the transmission medium, Altair either replaces or extends the span of wires and cables that connect data devices in a 10M bps Ethernet LAN.

Strengths

- Transparent operation with Ethernet architecture and network operating systems, such as Novell NetWare and Microsoft LAN Manager
- Simple installation
- High degree of security
- Flexible, cost-effective adaptation to changing business requirements

Limitations

- Licensing problems can arise when more than one frequency is required
- Proprietary directional antenna required to prevent signal fading

Competition

BICC InfraLAN, NCR WaveLAN.

Vendor

Motorola, Inc.
Radio-Telephone Systems Group
1501 W. Shure Drive
Arlington Heights, IL 60004
(708) 632-5000
In Canada:
Contact U.S. office.

Price

\$3,995 for the Control Module (CM) and \$995 for the User Module (UM).

—By Barbara Callahan
Associate Editor

Product Analysis

Motorola designed Altair with two types of modules: one Control Module and one or more User Modules. Connected to Ethernet servers and wired networks, the Control Module routes data among User Modules and to and from wired LANs. User Modules are connected to devices such as personal computers and printers. A single Altair microcell supports up to 32 Ethernet devices in an area of approximately 5,000 square feet. Each User Module can connect from one to six Ethernet devices. Through an Ethernet backbone, users can add Altair microcells to existing wired Ethernet networks, such as ThinNet (10BASE2). With a transceiver, users can add Altair microcells to ThickNet (10BASE5) cables.

An Altair microcell transmits and receives, requiring only one of two available frequencies. Users can add a second neighboring microcell through a second frequency. If users want to add more Altair microcells, they can take advantage of "frequency reuse," a technique that uses the same exact frequencies over and over again in a building.

Since Altair's transparent design ensures compatibility with any Ethernet 802.3 network, network managers can extend wired Ethernet LANs to accommodate new users. Altair's multimegabit transmission speeds prevent slowdowns in the response times of users' personal computers. The clear, licensed spectrum managed by Motorola protects the Altair user against interference from other equipment operating on the same frequency. Motorola has equipped Altair with multiple levels of security.

Target Applications

- Existing in-building Ethernet installations to extend reach
- New in-building, standalone wireless installations
- Workgroup realignments
- Short-term projects

Strengths

Flexibility: By installing Altair, users can achieve great flexibility in arranging offices or workgroups. Without the restrictions of wired cabling, users can easily change the composition of networks whenever necessary and not incur the expense and inconvenience of altering a wired network. Altair can also extend the range of an existing Ethernet network to accommodate new users and to interconnect workgroups.

Frequency Management: To coordinate the use of individual frequencies, Motorola has set up a centralized Altair Frequency Management Center (FMC), which ensures compliance with all FCC regulations. The FMC also maintains a central database that tracks the location and frequency of each Altair module in the United States to lessen the possibility of interference. These procedures are transparent to the user.

Security: Motorola has designed Altair to prevent reception by an outside receiver. In addition to the protection arising from its design, Altair features a second layer of security, based upon scrambling data sent between the Control Module and the User Module. A restricted access feature, incorporated into Altair's time-division multiplexing architecture, allows access only to UMs whose 12-digit IEEE 802.3 Ethernet addresses have been entered into a CM's registration table.

Ease of Installation: Installation for Altair involves connecting Altair modules to the LAN via ThinNet "T" connectors with terminators and subsequently plugging in each module's DC power supply to any standard 110-V outlet. Module initiation, self-check, and operation are all automatic, even after a power interruption or outage. Altair modules continuously monitor and maintain data during operation.

Limitations

Motorola has already resolved most of the limitations originally posed by microwave transmission. In the past, microwave radios required excessively large units that cost well over \$25,000. Through extensive research and development, Motorola has considerably pared down the size and the cost of microwave radio. In addition, by designing a six-sector intelligent directional antenna, the company has solved the problem of reflection caused by the dispersion of radio waves in several directions away from the receiver.

The limitation that might be more difficult to overcome is Altair's licensing requirement. Although Motorola handles FCC licensing matters for users, problems can arise if a user needs more frequencies than Motorola can provide and comes up against restrictions from FCC regulations. Five licenses are issued per specified 35-mile diameter. Each license has two frequencies. The FCC's Modified Digital Termination Service (DTS) Band requires one license for transmit and one for receive.

On the plus side of the licensing requirements, however, are the facts that FCC license requirements minimize the possibility of unauthorized use and lessen potential interference.

Overview

Product Name	Altair
Product Type	Wireless Ethernet LAN
Base Price	\$3,995 for Control Module (CM); \$995 for User Module (UM)
Date Announced	May 22, 1991

Decision Points

Altair	Requirements	Comments
	Interconnect to Ethernet LAN	Supports 10M bps operation
	Support communications between User Module and Control Module	Radio signals implement communications between these modules in each microcell
	Support multiple Ethernet devices	Supports up to 32 devices in a 5,000-sq.-ft. area
	Provide additional connectivity	Microcells can be added to existing wired ThinNet and ThickNet Ethernets
	Include security	Each module includes two built-in security features: scrambling and restricted access

Vendor Analysis

Product Strategy

As part of Motorola's General Systems Sector, the Radio-Telephone Group's development of wireless in-building network (WIN) technology for use in Altair represents a logical extension of the Sector's work. The General Systems Sector designs and manufactures computer-based cellular radiotelephone systems and mobile and portable radiotelephones. The Radio-Telephone Group undertook the task of developing WIN to combat the physical, logistical, and financial problems associated with hard-wired cabling.

With the introduction of Altair, Motorola is poised to take advantage of the explosive growth of computerized data communications in offices. Industry analysts assess the growth of LAN networks at approximately 180,000 per year. International Data Corp. predicts that the number of LAN nodes will reach 28.5 million by 1992. The cost of wiring these nodes is estimated at \$1,000 per node for copper and higher for coax and optical fiber.

Motorola plans to step in and alleviate the cabling situation with wireless. The company has gotten in on the ground floor of the wireless market with a product that is generating interest throughout the industry. Attendance at seminars on wireless technology is on the upswing, and media attention is also increasing. A definite market segment exists for the product Motorola is promoting.

The marketing approach taken by Motorola stresses the high speeds attained by Altair, its compact design, its transparency to the user, and its flexibility. Motorola also emphasizes quality, and its commitment to quality is reflected in the company's selection as recipient of the first annual Malcolm Baldrige National Quality Award. In addition, Motorola's marketing efforts received a considerable boost when *LAN Magazine* cited Altair as Technology of the Year.

Target Markets

Motorola is targeting the office or in-building environment for its wireless Ethernet LAN, which can complement, extend, or replace hard-wired communications. The company is also targeting future markets consisting of voice/data communications. To reach the in-building market,

Motorola made use of the 18GHz radio band, which is unsuitable for long-distance communications, but highly appropriate for cellular communications within buildings.

In addition, Motorola is directing its marketing efforts toward acquainting users with the high cost of adding and changing wired networks, which typically run about \$200 to \$1,000 per change. In addition to costs, Motorola is emphasizing the waiting times and downtimes that accrue from the planning stage of rewiring to its final implementation. The company is also targeting users in older buildings, which were not designed to accommodate the intricacies of today's electronic offices.

Competitive Analysis

Market Position

Motorola expects to witness and participate in a "wireless evolution" in personal and professional communications. The company predicts that new forms of wireless communications will free users from the "bonds" of wire. The company has already made a name for itself in the wireless market, a fact confirmed by the U.S. and international licensing of Motorola's wireless technology. Recently, the United States and Japan selected Motorola's speech coder technology as the official standard for the next generation of digital cellular equipment.

Bearing a name almost synonymous with radio technology, Motorola pioneered two-way radio communications over 50 years ago. Motorola developed the first automatic mobile phone, submitted the first recommendation on cellular technology to AT&T and the FCC, and went on to develop many firsts in the cellular market.

Major Competitors

Since the "wireless evolution" is in its early stages, it is difficult to estimate market acceptance. At the present time, Motorola's chief competitors in this field are NCR and BICC, each of which approaches wireless networking differently from Motorola and each other. NCR bases its WaveLAN wireless LAN on spread-spectrum technology, and BICC bases its InfraLAN on infrared light.

Product Comparisons

Vendor	Motorola	NCR	BICC
Product	Altair	WaveLAN	InfraLAN
Technology	Microwave	Spread spectrum	Infrared light
Frequencies Supported	18GHz	902-928MHz	Optical wavelength; 870 nanometers
Range/Site Coverage	5,000 square feet	800 feet—open environment; 250 feet—semiclosed environment	80 feet between nodes
Transmit Power	25 mW	250 mW	Not applicable
FCC License	Required	Not required	Not required

The major drawback to the use of spread-spectrum technology in networking is its reliance on a combination of small, narrow bands within the general range of the upper end of the UHF band. The total bandwidth for spread-spectrum systems that has been assigned by the FCC supports a data transmission rate of only 2M bps. In addition, the signal may interfere with other spread-spectrum devices. With its 10M bps data rate, Altair exceeds the transmission speed of NCR's WaveLAN. Motorola is also planning to increase the data rate supported by Altair.

BICC's InfraLAN, based on infrared light, travels in a line-of-sight path and cannot transmit through opaque objects, like walls or partitions. However, its signaling rate ranges from 4M to 16M bps. Unlike Altair and WaveLAN, which connect to or complement Ethernet networks, InfraLAN ties into token-ring networks. The InfraLAN system is also relatively expensive at \$2,995 per node.

Sales and Distribution Strategy

Sales

Motorola markets, sells, and services Altair through indirect channels, including resellers, distributors, value-added resellers (VARs), and computer systems integrators. Glen Kephart, national distribution manager for Altair Product Operations, explained Motorola's strategy: "The Altair wireless network is a LAN connectivity product that complements Ethernet as an overall network solution. So we think it's best understood, configured, and sold by people who deal with local area networks as their core business. For that reason, we've set up an indirect distribution channel for the Altair product. Customers will be able to buy our products from the people they normally consult with and buy from in meeting their specific data networking needs."

Distribution

Distributors for Altair include:

- Vitek Systems Distribution of Carlsbad, CA
- MicroAge Computer Centers of Tempe, AZ
- Tech Data of Clearwater, FL

Support

Motorola is building a field sales and technical support team that will operate out of regional offices in New York, Dallas, Chicago, and Los Angeles. The field will be responsible for reseller education and training, as well as for sales support to major end users. The company provides resellers with sales tools, such as cost-benefit analysis models, product presentations and demonstrations, and traditional marketing communications programs.

The clear, licensed spectrum managed by Motorola supports the Altair customer by eliminating potential interference that could be caused by other equipment operating on the same frequency.

The Frequency Management Center operates 7 days per week, 24 hours per day. It manages compliance with FCC regulations, coordinates frequency use, maintains a central database of all Altair installations, and provides technical assistance.

Competitors' Programs

BICC

Installation is provided by resellers and distributors. BICC warrants its products for one year. Extended warranty plans are available. Maintenance of BICC equipment is provided by resellers and distributors. BICC maintains a toll-free technical support line for use by end users.

NCR

NCR sells WaveLAN through its direct sales force, value-added resellers, distributors, and OEMs.

Specifications

Features/Functions

Features	Description
Application Protocols Supported Configuration	Wireless networking of PCs (with Ethernet cards), printers, terminals, and other Ethernet devices Transparent to all protocols running over IEEE 802.3 10M bps Ethernet One Control Module per microcell; up to 32 users per microcell; up to 6 users per User Module; per-site microcells serve multiple 32-user workgroups; 5,000-square-foot coverage area
Data Speeds	Signaling rate—15M bps; compatibility—10M bps Ethernet

Configuration

Altair Microcell	Modules
	An Altair microcell consists of an elevated, centrally located Control Module (CM), connected to an Ethernet-addressable data device or to an Ethernet LAN backbone by ThinNet Cable. The rest of the microcell consists of User Modules (UMs), each connected by ThinNet to between 1 and 6 Ethernet-compatible data devices, with a maximum of 32 of those devices in one microcell; the UM is located on a desktop, cabinet, or cubicle separator.
Six-Sector Intelligent Antenna	Properties Six equal 60 degree directional antennas used for transmit and receive. Signal sampling and selection protocol enables the 6 individual sector antennas in transmit/receive modules to act as a single system and identify the best signal relationship for every data transmission. System performs continuously, ensuring that only the best signal link is received and processed at any time.

Physical Environment

Physical Specifications

Dimensions (WxDxH)	8 in. x 11.5 in. x 3 in.
Weight (lb.)	5
Physical Connectors	UM—10BASE2; CM—10BASE2, AUI

Electrical Requirements

Supply Input Voltage	115 V, 60Hz
Supply Output Voltage	8.5 V DC
Operating Frequency	18.820-18.870GHz; 19.160-19.210 GHz
Transmit Power	25 mW
Transmission Type	Multilevel FM
Emission Type	10MOF7W
UL File Number	E123421

Options

Additional Technology Component

Component	Functions
RF Digital Processor	Implemented in CMOS, this VLSI ASIC chip synchronizes and performs 4-level FSK modulation and demodulation to encode and decode digital data on the 18GHz carrier; helps system use its 10MHz channels effectively; maintains low bit error rate; supports parity checking scheme.
GaAs MMIC Module	Employ monolithic microwave integrated circuit (MMIC) technology; system module the size of a deck of cards contains 5 GaAs integrated circuits that transmit and receive the system's 18GHz RF energy.
Switching Architecture	Three-level architecture (circuit switching, fast-packet switching, and true-packet switching) is integrated into the CMOS gate array; switching technology is completely internal to Altair.

