EXHIBIT V

THE NEWSWEEKLY OF INFORMATION SYSTEMS MANAGEMENT
November 27, 1989 · Vol. XXIII · No. 48 · 122 Pages · $2/Copy · $48/Year

COMPUTERWORLD

INSIDE

D&B unites software rivals

BY NELL MARGOLIS and AMY CORTESE
CW STAFF

NEW YORK — Management Science America, Inc., the Atlanta-based mainframe applications company that last year rejected a $191 million buyout offer, said yes last week to a $333 million bid by The Dun & Bradstreet Corp.

MSA, which turned down the lower bid by Computer Associates International, Inc., will be merged with its longtime competitor in the applications software arena, D&B division McCormack & Dodge.

If the deal is accepted by MSA stockholders, the two archrivals will be melded into Dun & Bradstreet Software Services. MSA Chairman and Chief Executive Officer John P. Imlay Jr. will then head the approximately $200 million D&B unit, which could command an estimated 80% of the mainframe business applications market.

"This marriage makes a lot more sense than many," said Jan Crotty, director of financial services at The Travelers Corp. and a longtime M&D customer. "Both parties have something to brag to the table." Specifically, M&D has the stronger product line while MSA has a more customer-oriented approach to sales and support, Crotty said.

While details on how the product lines would be merged, if

Continued on page 113

Dun deal
Dun & Bradstreet's recent acquisition adds to its arsenal of services

The Dun & Bradstreet Corp.
Chairman: Charles W. Mueller
1988 revenue: $4.3 billion
Employees: 70,000
Lines of business: Business information databases, software and services, publishing, market research and services

Management Science America, Inc.
Chairman: John P. Imlay Jr.
1988 revenue: $250 million
Employees: 2,300
Software applications: Financial/accounting, human resources, manufacturing and education

'OS/2 lite' pledge may fall flat

BY CHARLES VON SIMSON
CW STAFF

REDMOND, Wash. — Corporate planners skeptical of Microsoft Corp.'s ability to develop a low-end version of OS/2 will not find much optimism coming from the company's senior executives. The plan to develop a "lite" version of the operating system appears to have been hastily assembled for Comdex/Fall '89, and it is a plan to which Microsoft executives refuse to commit.

"We are trying to squeeze [OS/2] down, but right now we cannot commit to a 2M-byte version," said Peter M. Neupert, a senior general manager for OS/2 at Microsoft.

"Can we make 2 meg? I don't know," said Steve Ballmer, Microsoft's vice-president of systems software. "This thing is not without compromises."

Both Neupert and Ballmer maintained that the "loosely written" announcement was simply a statement that the 2M-byte version of OS/2 was not the best the company could do and that it reflected a recognition that the high memory requirements of DOS were a

Continued on page 10

LAN strategies: Don't junk that old mainframe just yet

BY ELISABETH HORWITT
CW STAFF

Although an increasing number of corporations are either moving or preparing to move strategic applications off their mainframes and onto local-area networks, few expect to relegate their big hosts to the scrap heap in the foreseeable future.

Instead, mainframes are being set up as centralized data repositories that provide the fresh, consistent data and applications that LAN servers then make available to local users.

Even while they were enthusiastic about bringing applications and data closer to the user via LAN servers, information systems managers cited strong reasons for not abandoning the corporate mainframes.

The city of New York, for example, hopes to eventually place "whatever [data and applications] a work group needs locally on a LAN" to cut down the number of user queries directed at the city's various data centers, according to Joseph Giannotti, commissioner for the city's Computer and Data Communications Services Agency.

The data centers are not going to go away, Giannotti emphasized. "We have 250,000 people on payroll. We process three million parking tickets. How do we put all that data on micros?" he asked. Instead, the city will try for a balance between "volumes of data that need to be

Continued on page 8

Systems give Gillette the razor's edge

BY CLINTON WILDER
CW STAFF

BOSTON — "The best a man can get" is about to get better — and information technology is a big reason why.

When Gillette Co. launches its ballyhooed Sensor razor in late January, its blockbuster Super Bowl ad probably will not feature computer-aided design workstations or a completely new production line running on Management Science America, Inc.'s AMAPS software. But Sensor, Gillette's first new razor product line in more than 10 years, could not be making its debut in two months without them.

"No one would think of doing engineering in this company without CAD; any more than you'd being in a secretary without a word processor," said Peter Valorz, manager of blade and razor engineering computer-aided design and manufacturing systems.

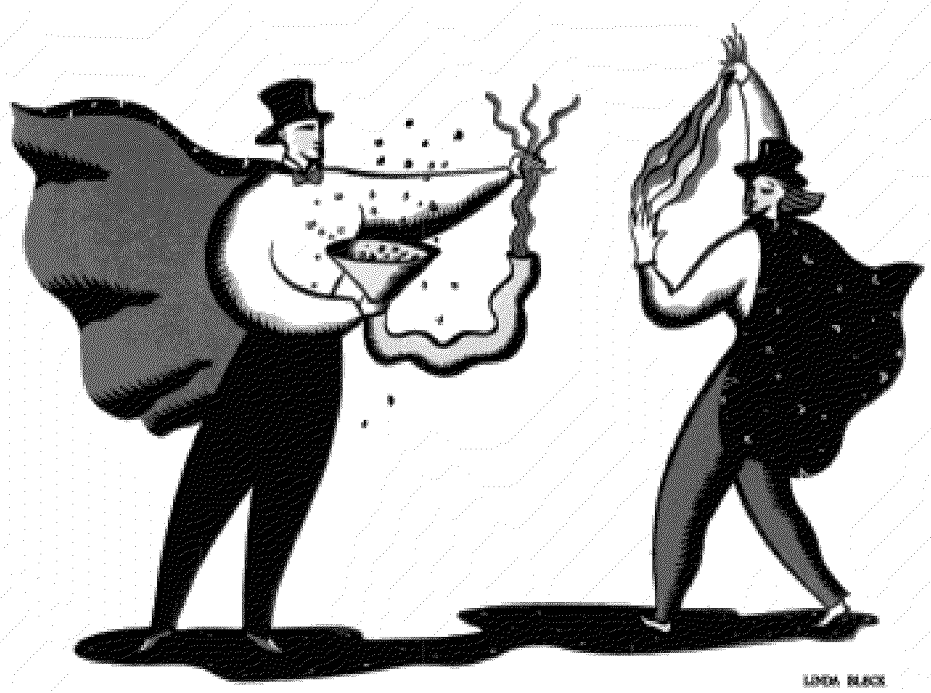
Time to market can mean life or death in the consumer products industry, and the Sensor designers found themselves staring down a gun barrel 18 months ago when Gillette management ordered them to completely redesign the razor — and still meet deadlines for the January 1990 launch date.

"We had to start from scratch; the reaction was disbelief," Valorz recalled. "It was strictly a marketing decision. [The original] had an octagonal black plastic handle; it was not as high-tech or attractive as the style we're using."

Using Prime Computer, Inc.'s Calma three-dimensional CAD software running on Digital Equipment Corp. workstations linked to a VAX-11/785 host, Gillette's 10 product designers went back to their electronic drawing boards. While

Continued on page 113

Speed and dexterity take top billing



LINDA BLACK

MODEMS

BY BRUCE PAGE

There's a lot of talk these days about the demise of the analog modem; it is not all idle chatter. Digital networks are already being used by both large and medium-size businesses to achieve lower costs and higher data transmission speeds. When Integrated Services Digital Network (ISDN) achieves wide-scale availability in the 1990s, ordinary personal computer users will be able to avail themselves of more point-to-point transmission capacity than today's most advanced corporate networks, using high-speed digital interfaces instead of modems.

That said, however, it will still be a long time before analog modems disappear entirely.

A survey of 18,000 medium and large U.S. companies by Computer Intelligence in La Jolla, Calif., shows that higher speed modems are becoming increasingly popular. According to the firm's research, some 11% of all dial-up modems today support transmission speeds of 9.6K bit/sec. and greater, up from 7% just one year ago. On leased lines, 70% of all modems now transmit at 9.6K bit/sec. and greater, up from 62% a year ago.

As for the future, International Data Corp., a market research

Continued on next page

Page is president of Magnetic Press, Inc., a New York-based research firm specializing in communications technologies.

MULTIPLEXERS

BY SANFORD BINGHAM

In recent years, network building has become a major corporate activity. Large and even not-so-large companies can create their own networks out of transmission facilities bought, rented or leased piecemeal from the common carriers. In the interest of both economy and self-determination, many are doing just that.

In this world of do-it-yourself construction and management, the multiplexer occupies a key spot. With this equipment, companies can concentrate their telecommunications traffic onto a minimum of long-haul lines and manage their own facilities rather than leasing or buying that service from the carrier.

Choosing the right piece of multiplexer equipment to handle those jobs can be tricky, however. The purchasing landscape is marked by few domestic and even fewer international standards for transmission or performance management. The standards that do exist are frequently altered and augmented by individual multiplexer manufacturers, creating a world of proprietary hardware.

What this means in practice is that a network manager must purchase all multiplexing equipment from one vendor or be prepared to tackle tasks such as

Continued on page 64

Bingham is editor of "The Bit," a Magnetic Press journal on communications.

INSIDE

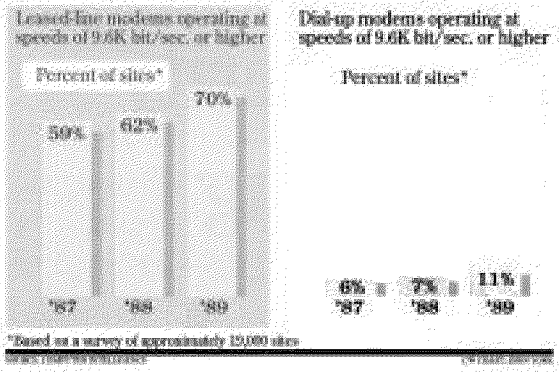
Modems

FROM PREVIOUS PAGE

firm in Framingham, Mass., forecasts that, while total sales of analog modems will decline slightly for each of the next five years, that same time period will see increased use of dial-up and higher speed modems, particularly 9.6K bit/sec. modems that incorporate the CCITT V.32 standard.

Speed dialing

High speed is a strengthening norm for leased-line modems at corporate sites. A newer phenomenon that is expected to grow considerably over the next few years is the high-speed dial-up modem



*Based on a survey of approximately 129,000 sites

V.32 on fire

V.32-standard modems are the hottest products in today's high-speed modem market, and that is a trend that is likely to continue for some time. IDC, for example, forecasts strong growth in the V.32 market segment through 1993, with cumulative annual growth rates in the 44% range.

There are a number of reasons for the explosion of interest. Price is one of them. Prices on V.32 modems running at 9.6K bit/sec. have now fallen below $1,000 from a starting high of $3,495 in January 1986, according to IDC.

An even more important consideration for many buyers, however, is the fact that V.32 provides a standard for interworking among 9.6K bit/sec. modems made by competing vendors.

With this technology, users may choose V.32 modems from a variety of manufacturers with full confidence that they may all work together. Care should be taken, however, that all of the modem manufacturers in a specific network have implemented V.32 fully; several companies offer subsets of the technology that compromise their modems' interoperability with those of other manufacturers.

Second, when V.32 support of 9.6K bit/sec. transmission was extended from leased lines to dial-up in 1988, new and useful combinations started to appear. For example, many V.32 modems that are used in the leased-line environment now have "automatic dial backup" capabilities, which allow the modem to automatically switch into dial-up mode if line quality on the leased circuit drops below a defined threshold.

V.32 is being used extensively in the dial-up market. In that arena, 9.6K bit/sec. provides four times the throughput of the next fastest modem standard for personal computer users: the CCITT V.22bis standard for 2,400 bit/sec. transmission. With the growing importance of data communications and users' needs for higher speeds to transmit desktop publishing and graphics files, V.32 fits the bill perfectly.

In fact, because 9.6K bit/sec. modems are now widely available for dial-up use, some former leased-line users whose transmission needs depend more on speed than on constant communication are finding that dial-up communications can take care of their networking needs quite handily.

Such a switchover makes a great deal of economic sense, says Frank Daubeck of Communications Network Architects, a consulting firm in Washington, D.C. "The cost of private-line networks is exorbitant today, largely because of local-loop installation charges," Daubeck says. "The installation cost of a local leased line can approach $1,400, and this installation expense must be incurred on each end of a point-to-point link."

Between two points where dial-up charges are not likely to be prohibitive — within a city or state, say — dial-up 9.6K bit/sec. communications is quite likely a better economic choice today than a leased line. Of course, if you were communicating long-distance, charges would rack up quickly. But in local calling areas, you can pay $50 per month and be on-line most of the time, compared with paying that amount per day on leased lines. Dial-up is also more cost-efficient when data transfer requirements are sporadic.

Technology trends

Aside from V.32, today's high-speed modems incorporate other important features and technologies, including network management functions, error correction and data compression.

Modems that support network management are connected to a central network management site by means of a special signaling side channel (or, in the case of IBM's Netview, an in-band signaling method).

Once the link has been made, network managers can access the modem, monitor the traffic moving through it, diagnose problems that may have occurred and even change the configuration of a given modem remotely. To facilitate network analysis, many network-managed modems also routinely collect data about their own operations and dump it periodically to the central management site for analysis.

Network management may be done on either leased-line or dial-up modems. Today, it is most common on leased lines, but by next year, most dial-up modem manufacturers should be including network management capabilities as a standard feature on their modems.

Six vendors currently offer network management software designed to be used with their dial-up modem products.

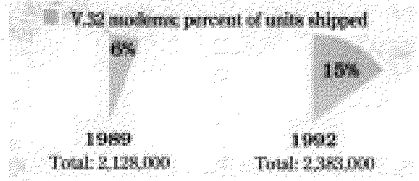
One of the most ambitious implementations is Globalview from Universal Data Systems, Inc., a network diagnostic and control system that provides a Microsoft Corp. Windows graphical interface for monitoring, diagnosing and reconfiguring up to 512 remote devices from a single management workstation.

Considerable strides have also been made in the provision of built-in error correction for high-speed modems. Unlike software-oriented error-correction protocols, which typically act only in file-transfer operations, error-correcting modems verify all elements of a terminal session, even keyboard input. With built-in error correction, users may be assured that what they send is received exactly the same way.

The V.42 error-correction protocol, standardized last year by the CCITT, brings a much-needed standard to modem-based error correction. V.42 may be used in modems of any speed, and some analysts say it will eventually be included in almost all asynchronous modems.

Influence building

V.32 modems are expected to more than double their current market standing over the next three years



V.42 contains two principal protocols: the LAP-M protocol and Classes 2, 3 and 4 of the Microcom Networking Protocol (MNP). LAP-M is similar in style to the error-correction scheme used in highly reliable packet-switched networks; it is the de fault error-correction method used when two V.42 modems connect.

If both modems support LAP-M, they begin a data transfer based on LAP-M. If not, they fall back to MNP error correction, an older and more widely implemented error-correction standard already built into thousands of modems.

Either way, users with V.42 modems on both sides of any communications link are assured that their communications will be received with no slipped bits.

Data compression is also gaining favor among modem users and manufacturers to get more communications bang for the buck. Using modem-based data compression, the data in a file is automatically recoded into a more compact representation as it passes through the modem, and the modem on the other side decompresses the file to its original form.

Various methods of data compression exist, including a new CCITT data compression standard called V.42bis. Based on the highly efficient Lempel-Ziv compression algorithm, V.42bis provides a standard compression technology that will be adopted by the majority of the world's modem manufacturers. Today, however, most modem-based compression is performed with MNP Class 5 or Class 7 coding.

Depending on the type of data being

transmitted, MNP Class 5 will compress data on the fly at anywhere from 1.3-to-1 to 2-to-1. With a 9.6K bit/sec. V.32 modem, therefore, MNP Class 5 can deliver effective data throughput rates of over 19K bit/sec. MNP Class 7 extends the real-time compression to 2.4-to-1, giving a 9.6K bit/sec. modem potential data throughput of over 20K bit/sec.

Data compression is not the only way to wring more data transmission capacity out of a telephone line. Another technique is called "continual line analysis," which divides a telephone circuit into several channels, each of which may be used to carry a part of the data to be transmitted.

Using this technique, the Trailblazer modem from Cupertino, Calif.-based Telebit Corp. achieves communication rates of 18K bit/sec. over dial-up telephone lines — almost as quickly as the fastest leased-line modems allow.

Both data compression and continual line analysis decrease transmission time. Whereas continual line analysis virtually increases bandwidth on a line, data compression reduces the size of the file. The better overall choice of the two techniques is a 9.6K bit/sec. modem with data compression, because continual line analysis can actually slow down transmission if the phone line is dirty. For instance, after splitting the line into 80 channels, the modem may find only 20 of those to be clean enough to use.

Although high speed seems to be the watchword for the next few years, that term is relative; the outlook is not nearly as rosy for very high speed modems as it is for those in the 9.6K-bit/sec. category. The highest speed modems today achieve rates of 14.4K and 19.2K bit/sec. Despite the obvious speed advantage, however, these modems are so costly and relatively inflexible that many users are looking very closely at their needs before buying one of these instead of considering a move to digital. For one thing, they are able to run only over leased lines.

Further, these modems are relatively unsupported by industry standards, and attention to creating any will likely be superseded by the growing interest in finalizing such digital standards as ISDN.

14.4K bit/sec. is the highest speed for which there is an industry standard — V.33, the highest existing bit-rate standard for transmitting over leased lines. Rates of 14.4K bit/sec. can be reached on dial-up lines; US Robotics, Inc. and BT Datacom have shown this with their modem offerings in this class, which run on leased or dial-up lines. But the protocol applied to this speed is V.32 Extended, which has not been approved by the CCITT.

End-user prices of 14.4K bit/sec. modems are in the $1,300 to $5,000 range. Most of the 14.4K bit/sec. modems shipped in 1988 offered built-in network management capability.

19.2K bit/sec. is the highest speed that analog networks can support without the use of data compression. Among 19.2K bit/sec. modems, end-user costs are in the $2,500 to $6,000 range.

The use of these high-speed modems will most likely be restricted to niche markets and to those users with huge analog networks who are unwilling to move to digital but have a dire need to add on transmission speed.

All in all, these high-speed modems are something of a waystation between 9.6K bit/sec. analog transmission and digital, at which few users will stop.

For the vast majority of users, the leading edge of modem technology is 9.6K bit/sec. V.32 modems, particularly those with built-in V.42 data compression. In all likelihood, this segment will own the frontier until the arrival of generally available digital service. At that point, today's leading edge will become tomorrow's commodity — and then all the maps will have to be redrawn. ●

ASK THE VENDOR

I am investigating the possibilities of ISDN. We are now using analog 14.4K bit/sec. modems from BT Datacom. When digital service is available, how can we use these in backup situations, as opposed to current on-line situations? Also, we now have dialing and call-out capabilities. Would we continue having these with ISDN?

Dave Hickman
Data Processing Manager
International Speedway Corp.
Daytona Beach, Fla.

BT DATACOM: The 4142TCX V.32/V.33 extended modems that International Speedway is already using allow full-duplex, single backup at 14.4K bit/sec. They are the highest speed dial backup modems available today and are ideal for backup to digital services. Therefore, they can be used in ISDN situations. In fact, BT Datacom presently has customers using the 4142TCX modems exclusively for backup to digital services.

The flexibility of the 4142TCX allows it to be used for a number of data communications applications, including transmission over international circuits. It provides extended V.32 and V.33 functionality using Trellis coded modulation. On single dial-up lines, it provides 4.8K, 7.2K, 9K, 12K and 14K bit/sec. data transmissions. On two- or four-wire leased lines, the 4142TCX transmits data at 4.8K, 7.2K, 9.6K, 12K and 14.4K bit/sec.

Multiplexers

FROM PAGE 61

reconciling incompatible code and juggling layers of network management. The job is further complicated by a continuous stream of new offerings at both ends of the bandwidth spectrum.

"Over the next several years, with frame relay, fast-packet switching and fiber, there will be a lot of new protocols," says Robert Follett, senior vice-president at The DMW Group, Inc., a telecommunications consulting firm in Ann Arbor, Mich.

Simply sorting out the many varieties of long-haul multiplexers is a challenge for the uninitiated. There are really only three basic types — frequency division multiplexers, time division multiplexers and statistical time division multiplexers — but these subdivide and multiply based on the type of transmission media and techniques for bandwidth optimization.

The oldest established multiplexing technology is frequency division multiplexing (FDM). This technique divides the 100-Mhz signal on a dual copper line into frequency bands and increases the frequency of each signal to fit a particular band.

Dwindling interest

The market for FDMs has just about dried up, according to Gerry Watkins, research manager for telecom office automation at market research firm Market Intelligence Research Co. in Mountain View, Calif. The carriers rarely use FDMs these days, except for long-haul microwave circuits. This is because the analog FDM signals require multiple wires at the receiving end and are a magnet for electrical interference, or noise.

The only type of FDM that corporate buyers still find useful, Watkins says, is the low-speed specialty area of data-over-voice (DOV) FDMs. "This is also an old market," he notes, "but it is one that has found new applications with the proliferation of personal computers in businesses" because DOV devices allow PC workstations that previously stood alone to come on-line.

In addition, there is "a new generation of digital DOV devices that is able to transmit faster with higher data rates," Watkins adds. "If there were only the old-style FDM boxes, there wouldn't be that strong a market. But with the ability to transmit at 64K bit/sec., the market is going to take off."

DOV multiplexers are essentially coder/decoders, which filter voice signals on a subchannel and pass low-speed data on the upper portion of the voice band. This allows simultaneous voice and data transmission, often without the need for a modem.

The disadvantage is that the DOV technology requires empty bandwidth, called a "guard band," between the voice and data signals. The guard band limits the number of signals that may be carried on the channel, consequently reducing the data speed. DOV multiplexers can support an aggregate data rate of up to 9.6K bit/sec., but speeds in the range of 1.8K bit/sec. are more common.

Technology displacement

The technology that displaced FDM is time division multiplexing (TDM). Instead of stacking the signals by frequency bands, TDM slices them by time, giving each of the 24 signals a precisely defined time slot for transmission.

TDM has become the MS-DOS of multiplexing. It drives the T1 services offered by carriers and is the main engine offered by the largest multiplexer manufacturers. TDM now comes in a variety of forms, one of which — statistical TDM — has become important enough to assume the dimensions of an entirely new category.

Statistical multiplexers, which dynamically allocate bandwidth so that only active devices receive a share, have effectively taken over the low-speed end of the TDM market (56K bit/sec. and lower).

At the same time, however, TDM is finding new applications in sub-T1 transmission, usually referred to as fractional T1.

Fractional T1 is a service offered by common carriers that allows users to buy bandwidth in increments greater than 56K bit/sec. but less than the 1.54M bit/sec. of full T1. The advantage of fractional T1 to the carriers is that they can cut up a T1 and sell the parts for more than the whole. The advantage to the user is that it "allows you to extend all these private digital networks down to smaller locations. Up to this point, you needed a full T1's worth of traffic to justify the thing; now you can justify it at smaller bit rates," says Michael Finneran, president of DBRN Associates, Inc., a telecommunications consulting firm in Hewlett Neck, N.Y.

Most of the manufacturers of T1 multiplexers either offer or plan to offer fractional T1 capability. But the task of retrofitting equipment to handle the new service is "some serious work," Finneran says.

"There's been a lag in [retrofitting] the hardware, but they'll all get there eventually. They should all have [fractional T1 capability] by the end of 1990," he says.

Nevertheless, he says, purchasers should still be on the lookout for a T1 multiplexer with fractional capability: "That's a general rule. Fractional T1 should be on the mandatory list."

T3 for me . . . and you

While fractional T1 has allowed smaller users to build networks and existing T1 users to extend theirs, there has been a push to develop hardware for larger signals — T3 transmission.

T3 is the term used by phone companies to describe their DS-3 rate of 44.74 bit/sec., which is equivalent to 28 T1 lines. Until recently, the demand for T3 outside of the phone companies themselves has been negligible. But with the ever-increasing use of telecommunications, a crossover to T3 is becoming a more realistic consideration for many T1 users, Follett says.

"Where do you as an end user need a lot of bandwidth? You may want to do videoconferencing, or you have a tremendous amount of voice traffic. Most T3 is justified for voice, but there are other ways to use the bandwidth," he says.

Finneran suggests that, given their current pace of expansion, local-area networks may soon present another argument in favor of private use of T3. "There aren't that many users with eight T1 facilities running in parallel between two locations right now," he says.

"But if you keep putting in bridging devices between LANs, or even terminals, that's going to need a full T1 to operate. A few of those, plus normal data traffic, and then you're getting close to a T3."

T3 can be provided for private network use over either digital microwave or fiber-optic circuits. However, carrier-provided circuits are predominantly fiber-based. Fiber circuits, with their low error rates and near-infinite capacity, are encouraging the development of higher speed packet-based multiplexing technologies.

As the phone companies discovered long ago, TDM transmits empty space when the device being polled is not active. This inefficiency, coupled with the development of the microprocessor, originally led the carriers to develop forms of statistical time division multiplexing. Statistical TDM was not really designed for the high-speed end of the market, however.

What multiplexer people call "statistical multiplexing" is generally low-speed packet switching, specifically that using the international X.25 protocol. While suitable for data transmission, it is impractical for voice communications because of the delays it introduces into the transmission. Since the speed of the transmission varies with the traffic on the line, packets get delayed when traffic is heavy.

As a consequence, for high-speed multiplexing — particularly involving voice as well as data — basic TDM and fixed allocation schemes have remained the norm. "End users want to build networks that integrate voice and data, and in this domain, high-speed time division multiplexers are more efficient than statistical multiplexers," Watkins explains. According to Finneran, however, that rule may soon change. "Now," he says, "we're seeing the potential of high-speed dynamic allocation systems, specifically fast packet."

Vocal advantage

Fast packet has two advantages over existing multiplexing technologies: It not only carries voice but also carries about twice as many conversations on the same circuit as TDM.

The most rudimentary T1 multiplexer — a channel bank — will carry 24 voice trunks on the T1 facility at 64K bit/sec. per voice channel. The most advanced versions, which use a compression technique called Adaptive Differential Pulse Code Modulation (ADPCM), sometimes carry twice that number. But fast packet can deliver up to 96 voice channels per T1.

The reason for this difference? Fast-packet technology knows that voice conversations are a half-duplex activity — usually only one person speaks at a time. TDM and other multiplexing schemes carry voice over full-duplex channels, wasting half the bandwidth. Statistical TDM systems, including packet switching, assign bandwidth in bursts. "Fast packet switches increase capacity because they allocate capacity when you talk and give it away when you shut up," Finneran says.

Another advantage of fast-packet switching is that it offers more transmission speed. Emerging fast-packet systems are taking advantage of a development known as Frame Relay,

Three-act performance

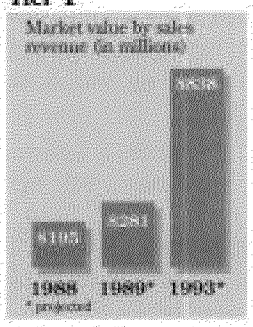
Market research firm Frost & Sullivan, Inc. in New York divides the fast-growing T1 multiplexer market into three categories, based on functionality. Market projections and sales forecasts for each of these tiers vary considerably, according to that firm.

What Frost & Sullivan refers to as the Tier 1 market consists of high-speed systems capable of handling both analog and digital voice interfaces, with a potential T1 line capacity of 256 links.

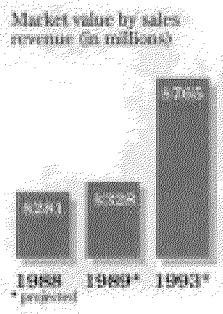
These systems offer the ability to manage a network in a way that permits essentially transparent transmission to voice, data and image devices connecting through the nodes.

Prices for these systems, which currently range from $40,000 to $250,000 — depending on configuration — are expected to decrease by 7% a year through 1993, largely because of changes in configuration.

Tier 1



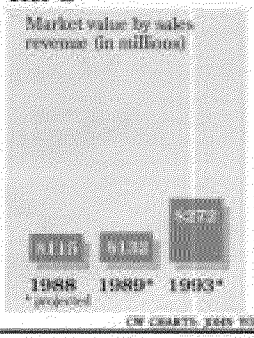
Tier 2



Tier 2 consists of T1 data networking multiplexers. This equipment has been around since the earliest days of the T1 market, gradually evolving to include some of the attributes of nodal processors and some voice capability, mostly on an individual channel basis.

No price change is expected in this group.

Tier 3



Tier 3 is made up of specialty equipment, such as drop and insert multiplexers.

Drop and insert multiplexers are 70% to 80% less expensive for low-density access to a T1 digital transmission system than the use of back-to-back conventional multiplexers. Prices are expected to remain stable in the next four years.

CW CHARTS: JOHN WORK

which was originally developed for use in large X.25 networks to reduce the error correction done in intermediate nodes.

Traditionally, an X.25 intermediate node has been required to buffer the incoming signal, perform an error correction known as cyclical redundancy check (CRC) and then pass the signal on.

However, Follett says, "The thought was that as networks become digital and we migrate toward fiber, we will have fewer transmission errors. So why do all that error checking in the middle of the network? Frame relay does the error checking only at the end nodes, so the intermediate nodes can pass data much faster."

The extra speed of frame relay, according to Finneran, creates the potential for "a dynamically allocatable, high-speed transmission service to interconnect geographically dispersed LANs. Instead of putting a great big pipe, such as a T1 bridge or router, between two LANs, you could provide a 1.5M bit/sec. connection to the fast-packet gadget. This way when I'm not transferring data between the LANs, I could use the pipe to transfer voice or data from other LANs."

Until recently, it was impractical to make a T1-rate dynamic-allocation device, but there are now two on the market: the Stratocom ITX and the AT&T Integrated Access and Cross Connect (IACS). The Stratocom ITX was available first and is beginning to cut a niche in the T1 multiplexing market. It remains unclear whether AT&T will sell the IACS outside of the phone companies.

No other vendors have announced product intentions.

Thus, users must face a choice between going with an established vendor offering that may soon be an outdated technology or an upstart vendor with a nonstandard box. "The question," Finneran says, "is whether it's worth the risk of using a vendor that's been around for under five years and has less than 5% market share."

Even the market leaders have built their domains on proprietary technologies. Indeed, there will always be proprietary architectures in the multiplexer market, Vertical Systems' Cochran says, because even if standards are developed, the vendors will want to add bells and whistles to their products.

"The hope is that there will be some common ground and some interoperability, but in reality that's a long time coming," he says. ■

ASK THE VENDOR

My company is using Network Courier, a LAN-based dial-up product from Consumers Software. How do I establish different post offices on a single file server, and how do the external personal computers place mail in the appropriate post office?

Del R. Guynes
Account Manager
Jones Lightwave Ltd.
Englewood, Colo.

CONSUMERS SOFTWARE, INC.: Any number of post offices can be installed in Network Courier Version 2.0 on a single file server. The Install procedure allows you to name the directory/path the post office database will be installed in.

In Network Courier Version 1.0, the Install program was in a fixed directory called Courier on the root of the file server.

For Novell users, this limited them to one post office per file server. For IBM networks in V1.0, multiple post office installations on a single file server were possible.

On a Novell network with Version 2.0, each post office is accessed via a different drive mapping. For IBM networks, drive mappings may be established as above, or access can be made driveless using the V2.0 advanced security option.