Frame Relay Hangs Tough

Joanie Wexler

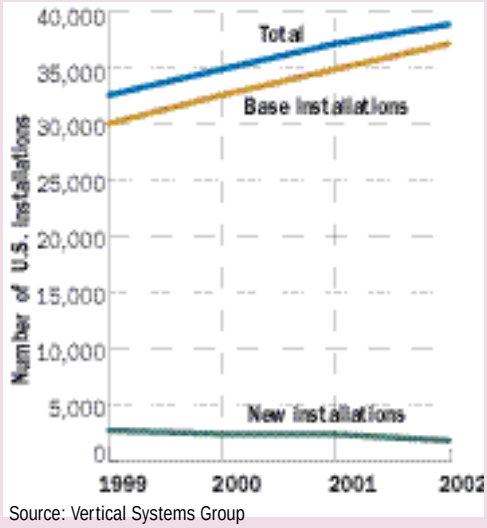
On its 10th anniversary, the WAN technology digs in its heels with new high-speed services and bandwidth management options.

Frame relay has staved off a number of would-be conquerors since it began life in 1991. To be sure, there are other successful, competing network services—including ATM, IP virtual private networks (IP VPNs), DSL, emerging Gigabit Ethernet metro-area services and transparent LAN services. There are even some pockets of Switched Multimegabit Data Service (SMDS) still registering a pulse.

However, overwhelmingly, frame relay remains today's enterprise WAN of choice. According to Vertical Systems Group, a Dedham, MA-based research firm, there were nearly 35,000 U.S. enterprises using frame relay service in 2000 (Figure 1); by comparison, there were only 1,637 using ATM services.

But frame relay is approaching a saturation point, and the increase in new installations is tapering off. Still, Vertical predicts 6 percent growth from 2000 to 2001 and another 5 percent from 2001 to 2002.

FIGURE 1 Enterprise Frame Relay Growth



Source: Vertical Systems Group

Why The Enduring Appeal?

Frame has persevered primarily because of its simplicity, widespread availability and its ability to adapt to evolving customer needs. Also, competition from IP VPNs has not become as fierce as expected—at least not yet—because foundation technologies such as Multiprotocol Label Switching (MPLS) and quality of service (QOS) are still developing.

"We're letting MPLS technology mature," said Larry DeNayer, Sprint group manager of frame relay product management. "We plan to continue to leverage our ATM backbone network for awhile."

Meanwhile, frequent enhancements to frame relay technology and service offerings are addressing new user needs. Among some recent developments are:

- The proliferation of services at greater-than-T1 speeds. These include incremental service offerings that enable customers to scale the speed of their ports and committed information rate (CIR) at each site between T1 and T3 speeds.
- Additional options for conserving bandwidth—including compression, prioritization and caching—that postpone new enterprise investments in additional bandwidth capacity.
- New DSL and dial access options to frame services, and frame access to other services.

IP VPNs: Still A Contender?

The hype surrounding IP VPNs as a simpler and less expensive way to provision meshed connections over a shared public network has become deafening. Last year, the cacophony was further heightened by the proliferation of low-cost, broadband access technologies, such as DSL, which can carry IP directly to a Layer 3 VPN service for about $50 a month. There was speculation that frame services running over these low-cost DSL circuits could emerge to replace comparatively pricey dedicated lines.

At this juncture, however, while IP VPN adoption is growing, it still looks like most enterprises will continue investigating IP VPNs, and that significant user deployment won't begin until 2002, at the earliest, particularly in the U.S.

"How soon the world goes pure IP is not clear to any of us," said David Natho, senior director of frame relay, ATM and CPE product marketing at WorldCom. "It might be 2003. It might be 2004."

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Meanwhile DSL access to frame is now available from some carriers, for example, AT&T. But, overall, the combination of DSL's limited availability and the weak financial condition of the competitive local exchange carriers (CLECs) has prevented this option from taking off.

The experience of Bill Hutchinson, manager of infrastructure and architecture deployment at Armstrong World Industries (Lancaster, PA), is illustrative. "We're not a risk-taking company, and we haven't yet seen the combination of business drivers and support tools to move to these other services. For us, there has not yet been an economically compelling story for convergence over IP."

During the past year, Armstrong has issued two RFPs to investigate alternative WAN technologies to accommodate growing needs for distance learning and streaming media. The company, which manufactures floor and ceiling materials, currently uses an AT&T frame relay network in the U.S. and frame services from Infonet Services Corp. in Europe and the Pacific Rim.

"But at the end of the day, we have remained a frame relay customer," Hutchinson said. One reason is that the company still runs some older protocols, such as Novell IPX, which can't be accommodated by IP-only networks. In addition, Hutchinson said that Armstrong is dabbling with an Internet-based, remote access IP VPN for mobile customers. "We like it, but it is a big support struggle," he said.

Hutchinson doesn't believe, however, that the company's network won't evolve. He expects that by Armstrong's next RFP cycle, coming in two years, "IP VPNs will likely have matured enough that we might ease into some hybrid networking."

Analysts such as The Burton Group's Bill Flanagan also expect that IP VPNs and hybrid frame/IP VPN networks will soon become more commonplace. "The two things that motivate people are cost savings and security," said Flanagan, program director at the research and consulting firm. He said that the security of emerging MPLS-based IP VPNs is about the same as frame's virtual circuit-oriented technology.

This observation was borne out by recent tests conducted by independent network testing firm Mier Communications. In evaluating the baseline security of MPLS compared with frame relay (and ATM) on a limited-size Cisco router infrastructure, Miercom found that the technologies were equivalent in their resistance to outside attacks. (For the full report, see www.mier.com/reports/cisco/MPLS-VPNs.pdf).

On the cost side, "The economies of scale associated with setting up routes with Layer 3 protocols instead of virtual circuit identifiers should be huge, bringing the cost per bit way down," said Flanagan.

AT&T—long an ATM proponent—now offers high-speed frame

Pedal Hits The Metal

Frame relay was conceived primarily as a packet data service that would satisfy customer requirements up to T1 speeds. The plan was that when higher speeds were needed for carrying a mix of data, voice, and video on a converged multimedia network, fixed-cell-length ATM, with its inherent classes of service (COS), would grab the WAN service reins.

Frame has done its part, achieving a ubiquitous embedded base, but other technologies have found tougher going. ATM has succeeded in carrier backbones for aggregating a mix of voice and data traffic, for example, but is complex and expensive for deployment on the customer side of the demarc—for both WAN access links and campus LAN backbones.

Meanwhile, carrier frame relay offerings have moved up in speed. First, the carriers made the leap to T3 (45 Mbps) port speeds. Even AT&T, which stuck to its guns for nearly a decade in recommending frame for T1-and-below WAN requirements and ATM for above-T1-speed network connections, relented late last year. The carrier added DS3 Frame to its frame relay tariff, noted Tim Halpin, product director for frame and ATM services at AT&T. "Our customers had

TABLE 1 High-speed Carrier Frame Offerings
(access speeds greater than 1.5 Mbps)

AT&T	Full T3/E3 service.
BellSouth	Full T3 service. Subrate T3 CIR in 3-Mbps increments, from 3 to 45 Mbps.
Equant	Full T3/E3 service. Subrate T3/E3 to 25 Mbps globally. *N*-by-T1/E1 inverse multiplexing in some regions globally. Fractional E3 in some parts of Europe.
Infonet	Full T3/E3 service. *N*-by-T1/E1 in 1.5/2.0-Mbps increments to 6 Mbps.
Intermedia	Full T3 service. Multilink frame relay service in 1.5-Mbps increments to 12 Mbps (using FRF.16-compliant equipment).
Qwest	Full T3/E3 service.
Sprint	Full T3/E3 service. *N*-by-T1/E1 inverse multiplexing in 3-Mbps increments to 12 Mbps.
WorldCom	Full T3/E3 service. *N*-by-T1/E1 services in 1.5-Mbps increments up to 12 Mbps. Subrate T3/E3 services at speeds of 6, 10 and 19.8 Mbps.

become comfortable with frame," Halpin acknowledged.

Many enterprises, though, are not ready for the full jump—and costs—associated with T3 services. So incremental-speed services have emerged, first through the use of proprietary T1 inverse multiplexing technologies, then in the form of subrate or "incremental T3" services (Table 1). BellSouth, for example, launched its Subrate T3 service this spring. From a price perspective, looking at BellSouth tariffs for T1 and T3 services, the Subrate T3 service begins to pay off at 6 Mbps, compared with purchasing multiple T1s.

In addition, an industry-standard inverse multiplexing technique called Multilink Frame Relay (MFR) is finally creeping into service provider portfolios. Specified in the Frame Relay Forum's FRF.15 and FRF.16 implementation agreements, MFR services are currently offered by one carrier, Intermedia Communications, in 1.5-Mbps speed increments to 12 Mbps.

> Enterprises are opting for bandwidth management gear over the recurring costs of faster links

Several service providers say they haven't yet gone the MFR route because of a lack of MFR-compliant equipment available. However, the Frame Relay Forum is overseeing MFR-enabled equipment interoperability testing that will begin late this month. As of late May, seven equipment vendors had signed on for compliance testing with FRF.15 and FRF.16—and for interoperability with other vendors' MFR implementations.

A number of service providers have participated in planning the tests. Because of the equipment flexibility afforded by standards and interoperability testing, several are likely to deploy MFR offerings starting late this year and early next, predicted Josh Sakov, leader of the Frame Relay Forum's test plan development team and vice president of technology for Tiara Networks.

Bandwidth Management Pays Off

Given the current tight economic climate, enterprise managers are becoming more creative, and finding ways to milk their existing bandwidth to avoid upgrades and steeper monthly costs. So the performance monitoring and prioritization capabilities in routers and in specialized traffic shaping devices from ADC Kentrox, NetReality, Packeteer, Sitara Networks and other vendors are becoming more mainstream.

Bill Hutchinson, for example, said the response time of Armstrong's European frame network improved by an order of magnitude by using the priority queuing capabilities in its Cisco routers to COS-enable the network. "Outside the U.S., services cost four to eight times what they do in the U.S. and it is too expensive to upgrade," he explained.

The project came about because of a disgruntled internal customer in the Netherlands, he said. "We did some testing, and created high, medium and low COSs—one for SAP R3 [enterprise resources planning] traffic, one for printing and miscellaneous and one for Web browsing. Our international customers are delighted."

Comau Pico, a subsidiary of Fiat, headquartered in Southfield, MI, recently used the network performance monitoring capabilities of the NetReality WiseWAN bandwidth manager to discover that a clog on a U.S.-to-UK link was being caused by unnecessary NetBIOS sessions. The company had been poised to upgrade the link by 256 kbps, which would have increased monthly costs by $4,000.

Instead, a simple reconfiguration solved the problem and saved the company the $48,000 per year in new recurring charges, said Don Barry, network architect. Since the company spends $45,000 per month on its frame network, the savings were analogous to ripping up more than one month's service bill.

"We're not looking to install frivolous technologies; we'd rather do more with less," Barry said. The company spent less than $10,000 on the WiseWAN, so it recouped that investment in just over two months, Barry added.

In addition, caching is now spilling over from pure Internet applications to enhance the performance of frame relay and other corporate WAN traffic. The Accelerator product line from Expand Networks, combines caching, compression technologies and basic traffic prioritization to boost frame (or other WAN) access performance by up to 400 percent, depending on application, said Pedro Colaco, Expand's vice president of marketing. The Accelerator 2700, which accommodates 56- to 512-kbps links, costs $4,500; the Accelerator 4000, which handles T1/E1 links, costs $11,000, said Colaco.

Tucker Anthony Sutro Inc., a New York-based investment firm, has completed installation of Accelerator products in 20 sites as part of a 103-city rollout. According to Keith McCullough, senior vice president of information systems, the company is saving $75,000 to $100,000 per month with the devices by not having to upgrade the speed of its frame connections.

"It all comes down to money," said McCullough, who added that a one-time purchase of the equipment is a much better deal than paying increased recurring monthly service charges across his company's network.

New compression capabilities are also playing a role in enabling efficient transport of voice over IP (VOIP) over frame relay. For vanilla voice calls, introducing IP to the mix adds a substantial 40 bytes of overhead per packet to the transmission, but little, if any, functional benefit. However, as IP-based voice applications—IP call centers and unified messaging, for example—begin to catch on, enterprises are likely to get more interested in running VOIP on their frame networks. To alleviate the substantial VOIP overhead hit, the Frame Relay Forum is in the final ballot stage with an implementation agreement that specifies a common way for frame relay equipment to compress IP headers in VOIP-over-frame relay transmissions.

The Draft Frame Relay IP Header Compression Implementation Agreement is likely to be ratified at the next board meeting, according to Forum members. When implemented in vendor equipment, the technology would reduce the amount of bandwidth required to run voice over IP over frame relay by more than 50 percent when using G.729 frame relay compression, by reducing the 40-byte IP header to 2 bytes.

> Carriers are offering frame relay access to IP networks—and IP access to frame networks

Hybrid Networking

Mixing and matching frame services with other core WAN services—as well as new kinds of access to frame services—is also breathing new life into frame while helping users migrate to new technologies. In January, for example, WorldCom launched Private IP, a frame-to-IP VPN service aimed at allowing customers to experiment with partial mesh networks, said David Natho.

Sprint said that frame access to an IP VPN is also on its futures list. Both services are similar in concept to AT&T's IP-enabled Frame Relay (IPFR) service, which provides frame access to an MPLS-based IP VPN. Each site needs only a single PVC to access the IP VPN "cloud," where the Layer 3 benefits of any-to-any connectivity (and disaster recovery) kick in.

Sprint also offers interoperability between its frame services and the Internet, IP dial network services and private IP network services, as well as the Sprint Integrated On-demand Networking (ION) multimedia service. The opposite concept is also coming from Sprint, said Larry DeNayer—IP access to frame—"so that customers can avoid forklift upgrades to IP VPNs," he said. "The Internet gives you a strong remote access solution to a frame relay WAN."

AT&T declined to provide customer installation numbers of its IPFR service, which was launched in January 1999. But Halpin said that about one-third of new frame port installations are IP-enabled.

Last month, AT&T launched three COSs for its IPFR service—bursty high-speed data, bursty low-speed data, and best effort—in conjunction with global services partner Concert and with AT&T Canada. Halpin claims that a real-time COS will come later, but in the meantime, AT&T has also rolled out dial access to frame and IPFR using a local number or 800 number as a domestic service.

Conclusion

The majority of enterprises still feel comfortable enough with frame relay to resist migrating—at least on a large scale—to other emerging WAN alternatives. Even those who are testing the IP VPN waters for remote access as well as for transport of non-mission-critical traffic (a more common practice in Europe and Asia than in the U.S.), are sticking with their bread-and-butter frame services to support their corporate applications.

Ultimately, Bill Flanagan thinks MPLS-based IP VPN networks will succeed, but he noted, "frame isn't really disappearing—it's just being reinvented under another name. MPLS VPNs are essentially the same service, but with the ability to scale to gigabit-speed routers."□

Companies Mentioned In This Article

ADC Kentrox (www.adc.com)
Armstrong World Industries (www.armstrong.com)
AT&T (www.att.com)
BellSouth (www.bellsouth.com)
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