The Economics of Deploying Videoconferencing

S. Ann Earon

More effective network design rather than new technology may move video into the mainstream.

Videoconferencing promises increased productivity and efficiency, improved communications, enhanced business opportunities and reduced travel expenses. Yet most enterprises have balked at investing in the technology, and a major reason is that it's difficult to clearly understand videoconferencing's cost of ownership until after installation.

As the cost of codecs and other end user equipment has fallen, network access has grown to represent by far the largest portion of operational costs. Therefore, the best way to control total cost of ownership for videoconferencing is by controlling network access charges through intelligent network design and optimization.

The context for the first part of our discussion will be ISDN, which is probably the best-known transport for videoconferencing. ISDN has succeeded for conference-room implementations, but the cost justification is less certain as implementations spread to the desktop. BRI carries an average installation cost of $200, plus monthly charges of $30 to $50 per line, which users pay even if they never make a video call. Furthermore, in some (though not all) locations, ISDN calls draw a usage fee for both local and long distance.

One option we will note but not discuss in great detail is the possibility of videoconferencing over T1 lines. Since a videoconference stream requires only 56 kbps (although most systems run at 128 or 384 kbps), some organizations can take advantage of underutilized T1s to carry video at no additional cost. This will likely require an ISDN-compatible PBX or an ISDN switch that can convert 56-kbps T1 channels to 64-kbps ISDN channels.

Usage Cases

This article presents scenarios with different transport options for serving multiple locations. In the scenarios, the user has three sites: a San Jose headquarters, a Chicago manufacturing site and a New Jersey regional office. Videoconferencing supports departmental applications, including executive meetings, product design and development and training.

The San Jose site has 10 videoconferencing endpoints. There's also an assortment of room/group systems in larger conference rooms and desktop systems in cubicles or smaller meeting facilities. These endpoints run at 384 kbps, and each averages approximately two hours per day of videoconferencing.

The Chicago site has only one room/group system for large meetings and two smaller (desktop) systems near the manufacturing plant. These endpoints are also at 384 kbps and average approximately one-half hour per day.

The New Jersey site has six desktop systems

S. Ann Earon, Ph.D., is president of Telemanagement Resources International, Inc. She can be reached via email at annearon@aol.com.

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Network access is the largest cost

and a single room/group system for remote customer meetings, sales conferences and training. These endpoints are also at 384 kbps, and each averages approximately 1.5 hours per day of use.

Network Options

To connect these users, we have developed three networking options:

- **Total BRI:** This option uses BRI access from each desktop directly to the WAN (see Figure 1). Table 1 shows the cost based on the basic monthly rate plus usage charges for the long distance component and compares this configuration's cost among the major long distance carriers. Remember that actual rates will vary depending on unique usage requirements, usage patterns and tariff charges.
- **IXC PRI/Private Lines:** With this configuration, PRI lines are pulled to each location, connected to an ISDN switch, with BRI lines distributed by the end user to each codec (see Figure 2), as opposed to LEC-provided BRI to the codec. By bringing in PRI lines from the IXC, a private network is deployed between sites; note that instead of the PRI line, the enterprise could use a T1/E1. Table 2 shows the rates for this implementation, and the total cost.

The downside of going strictly with an IXC and a private network is that your calls may be restricted to those on the IXC's network, negating the any-to-any benefits of switched ISDN. However, for an enterprise such as the one we posit, which only seeks to connect its own sites point-to-point, this is not a concern.

- **LEC PRI:** A variation of the second implementation uses PRI lines from the LEC instead of an IXC (see Figure 3, p. 46), with service "picked" to a particular IXC, with whom the company would contract. Again, the PRI could

FIGURE 1 BRI Solution from Local Exchange Carrier

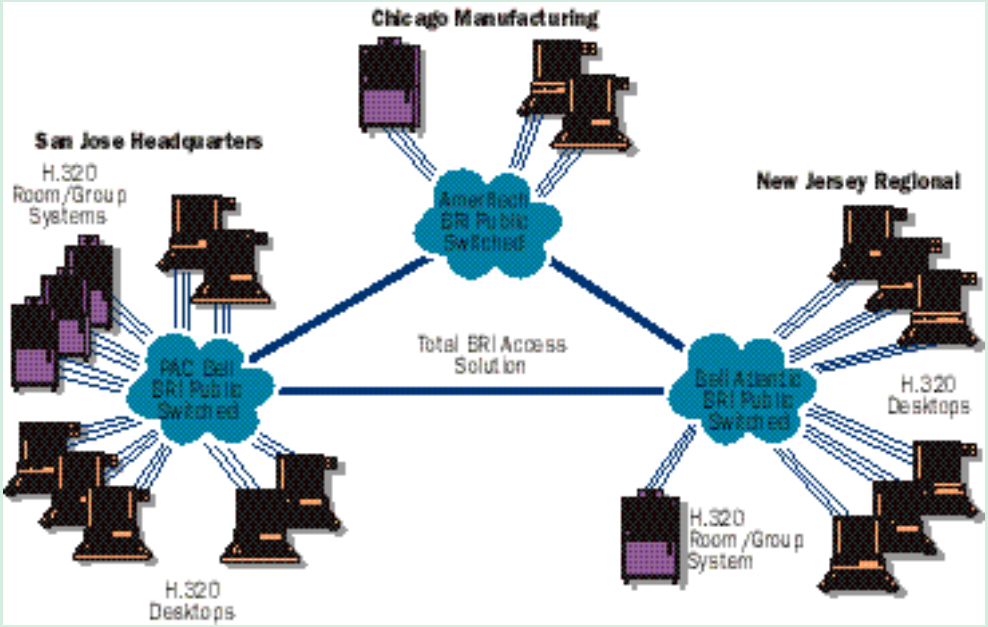


TABLE 1 BRI Distribution and Cost Summary

	LEC BRI Service (Monthly per Line)	Long Distance Usage per Minute			Monthly Usage (in Minutes)	Total Monthly Cost (LEC Access + IXC Usage)		
		AT&T	MCI	Sprint		AT&T	MCI	Sprint
San Jose (30 BRI Lines 10 Endpoints, Pac Bell)	$34.49	$.35	$.20	$.17	144,000	$51,434.70	$29,834.70	$25,514.70
Chicago (9 BRI Lines, 3 Endpoints, Ameritech)	$42.98	$.35	$.20	$.17	10,800	$4,166.82	$2,546.82	$2,222.82
New Jersey (27 BRI Lines, 9 Endpoints, Bell Atlantic)	$37.78	$.35	$.20	$.17	97,200	$35,040.06	$20,460.06	$17,544.06
Grand Total (All Three Locations)						**$90,641.58**	**$52,841.58**	**$45,281.58**

Note: All three locations run at 384 kbps.

be replaced in this scenario with T1/E1. Rates and total costs for this configuration are shown in Table 3 (p. 46).

Transport Cost Factors

In comparing these three scenarios, the first consideration is the rates charged by the individual providers. This is because the greatest expense often is the transport rate or cost per minute, not monthly access, installation or one-time, initial equipment investment. This cost per minute varies based on carrier and on the type of terminating and originating access.

Typically, local access can be provided via the LEC or IXC. Using our three locations as an example, AT&T's rates are discounted greatly when it provides the entire PRI private network end-to-end, directly to the terminating and originating endpoints (see Table 4, p. 47). By contrast, when AT&T's network is accessed through the LEC—either with BRI or PRI—the cost is significantly higher. This is not the case with MCI and Sprint, for whom the charges for all three configurations are relatively close (see Table 5, p. 47).

One factor to keep in mind is that few enterprises negotiate contracts for videoconferencing networks in a vacuum; discounts are available depending on the size of the overall voice, video and data traffic that the user is willing to commit to a given carrier.

Discount rates for video can be negotiated

Access Type: LEC BRI vs. LEC PRI vs. IXC PRI

Besides deciding among carriers, the other major issue is in choosing between BRI and PRI connections. In the past, the conventional wisdom held that a single PRI was more economical than multiple BRIs month-to-month. As BRI access rates have fallen, it's become more likely that, at least for smaller sites with just a few BRIs, *total* monthly access charges can be very competitive

FIGURE 2 Private Network Using PRI

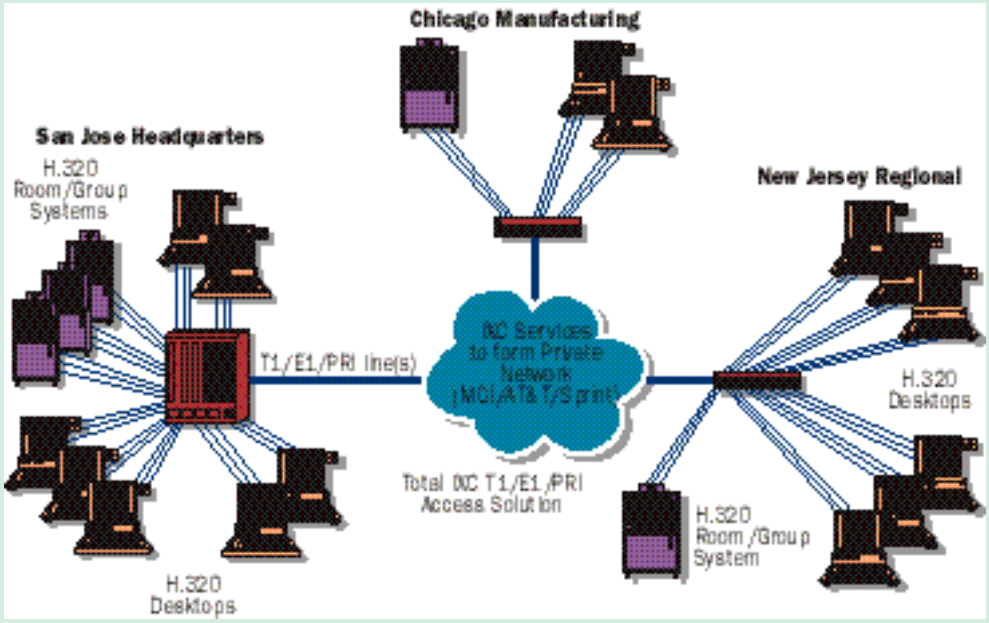


TABLE 2 PRI Distribution and Cost Summary

	Access			Usage per Minute			Monthly Usage (in Minutes)	Total Monthly Cost (Access + Usage)		
	AT&T	MCI	Sprint	AT&T	MCI	Sprint		AT&T	MCI	Sprint
San Jose (2 PRI Lines, 10 Endpoints)	$1,063	$820	$696	$.21	$.20	$.17	144,000	$32,366.00	$30,440.00	$25,872.00
Chicago (1 PRI Line, 3 Endpoints)	$1,084	$983.62	$837.55	$.21	$.20	$.17	10,800	$3,352.00	$3,143.62	$2,673.55
New Jersey (1 PRI Line, 9 Endpoints)	$1,483	$1,207.41	$1,049.40	$.21	$.20	$.17	97,200	$21,895.00	$20,647.40	$17,573.40
Grand Total (All Three Locations)								**$57,613.00**	**$54,231.03**	**$46,589.02**

Note: All three locations run at 384 kbps.

With equipment prices dropping, the key is effective network design

with *total* PRI access network charges. Table 5 shows the near parity in rates for at least two of the three major IXCs.

Furthermore, the real savings associated with PRI come not from the rate structure but from features that are offered only with PRI, not BRI. These features include:

- Multirate services.
- Non-Facilities Associated Signaling (NFAS).
- Dialed Number Identification Services (DNIS).
- Originating line information.
- User-to-User signaling.
- Call-by-Call service.
- Trunk Group partitioning.

Several of these features have a direct impact on the bottom line. For example, NFAS lets a single D-channel handle signaling for multiple PRI connections, saving the $400+ monthly charge per D-channel. Also, multirate services let the carrier establish, terminate, bill and maintain a contiguous, high-capacity call within the network more efficiently, passing the savings along to users (compare the costs in Table 6 with the regular MCI rates shown in Table 5).

Another source of savings stems from the carriers' increasing desire to market ISDN more effectively—for example, keep an eye out for promotions offering reduced or waived installation costs. For our three sites, total installation costs vary from $10,394.10 for LEC BRI to $12,828 for LEC PRI. For IXC PRI, AT&T sites come out at $17,749; MCI's total $14,220, not counting promotional discounts.

Other Videoconferencing Options

Of course, there are solutions for videoconferencing that avoid ISDN altogether, most notably packet-based video systems. The major disadvantage of these solutions is that, unlike ISDN, bandwidth is not guaranteed and therefore video quali-

FIGURE 3 PRI Distribution to Form Public/Private Network

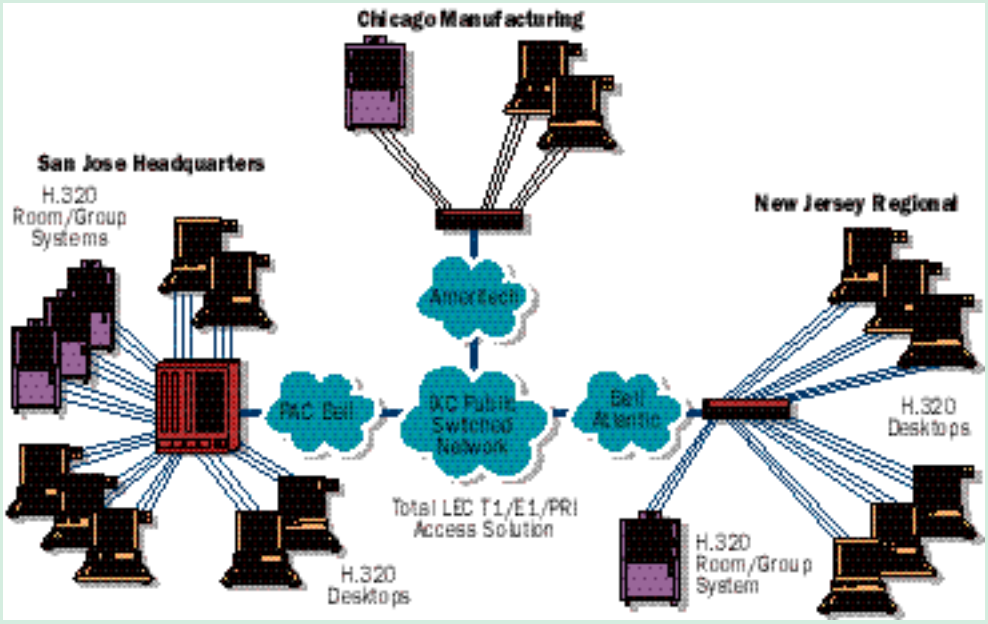


TABLE 3 PRI Distribution to Form Public/Private Network

	LEC PRI +T1 Service (Monthly per Line)	Long Distance Usage per Minute			Monthly Usage (in Minutes)	Total Monthly Cost (LEC Access + IXC Usage)		
		AT&T	MCI	Sprint		AT&T	MCI	Sprint
San Jose (2 PRI Lines, 10 Endpoints, Pac Bell)	$596.25	$.35	$.20	$.17	144,000	$51,592.50	$29,992.50	$38,508.75
Chicago (1 PRI Line, 3 Endpoints, Ameritech)	$702.00	$.35	$.20	$.17	10,800	$4,482.00	$2,862.00	$2,583.00
New Jersey (2 PRI Lines, 9 Endpoints, Bell Atlantic)	$1,483.00	$.35	$.20	$.17	97,200	$35,503.00	$20,923.00	$18,007.00
Grand Total (All Three Locations)						**$91,577.50**	**$53,777.75**	**$59,053.75**

Note: All three locations run at 384 kbps.

ty is much more uncertain. The advantage of packet-based video is that it can be much more economical than ISDN.

Packet-video products are based on the ITU's H.323 standard, which addresses interfaces between LANs and other networks and provides a foundation for audio, data and video communications across IP networks, including the Internet.

Some H.323 video codecs are being offered free over the Internet, but remember that if you choose such a product, you'll likely get what you paid for: bare-bones implementation of the H.323 specifications. Network managers who have already deployed older, standards-based videoconferencing systems should make sure that new codecs can play with these systems—not everybody can.

To ensure interoperability, many products need an H.323 gateway to interwork between ISDN-based and packet-based systems (see Figure 4, p. 48). In addition to the gateways, there are other "hidden" expenses of IP videoconferencing, including modems, video capture cards (if you're using analog cameras) and dialup Internet accounts. Furthermore, network managers will want to keep a close watch on videoconferencing traffic to make sure that it doesn't gobble up all their bandwidth.

A final expense comes in the nature of the WAN transport that may be required in hybrid circuit-switched (ISDN)/packet-switched (IP) video networks. Since high-speed LAN switches are nearly a commodity, you may be able to run packet video over your local network with no problem, but once you get out on the WAN, a packet network will likely have a level of latency that's unacceptable for video. That means you'll need circuit-switched WAN services, such as ISDN or T1, which are much more expensive than wide-area packet networking.

Managing Wide Area Costs

Though we've discussed videoconferencing implementations as separate from the rest of the enterprise network, in reality most users will consider these implementations in the context of their full corporate networking needs. We touched on this fact in our discussion of tariffing and rates, and it also holds true in the fundamental choice of networking technology.

To start, even within the videoconferencing implementation, there is likely to be demand for multiple access types. Most companies require a mix of videoconferencing systems, from high-end boardroom systems to midrange rollabout systems to low-cost desktop systems. Such enterprises need a broad range of wide area network connections that can be directed to multiple locations at different bandwidths on a call-by-call basis.

Meanwhile, enterprises are exploring various ways to connect small or low-usage sites to the network economically. There is a great deal of interest in hybrid network arrangements composed of private digital facilities and virtual private networks (VPNs) to connect corporate locations. These hybrids are economical because they provide overflow from dedicated lines to usage-sensitive networks to handle load peaks. They also make it possible to bring small or remote locations onto the corporate network via the VPN instead of using costly dedicated lines.

Furthermore, bandwidth-on-demand products are becoming available from vendors such as Ascend, Madge and Promptus to provide overflow bandwidth during peak hours, occasional bandwidth to remote sites, and dial backup recovery bandwidth for failed dedicated connections.

Some H.323 codecs are free over the Internet—but you'll get what you paid for

TABLE 4 Private vs. Public: AT&T Transport Case—BRI vs. PRI

	LEC BRI Picked to AT&T	LEC PRI Picked to AT&T	AT&T PRI Private Network
San Jose	$51,434.70	$51,592.50	$32,366.00
Chicago	$4,166.82	$4,482.00	$3,352.00
New Jersey	$35,040.06	$35,503.00	$21,895.00
Total	**$90,641.58**	**$91,577.50**	**$57,613.00**

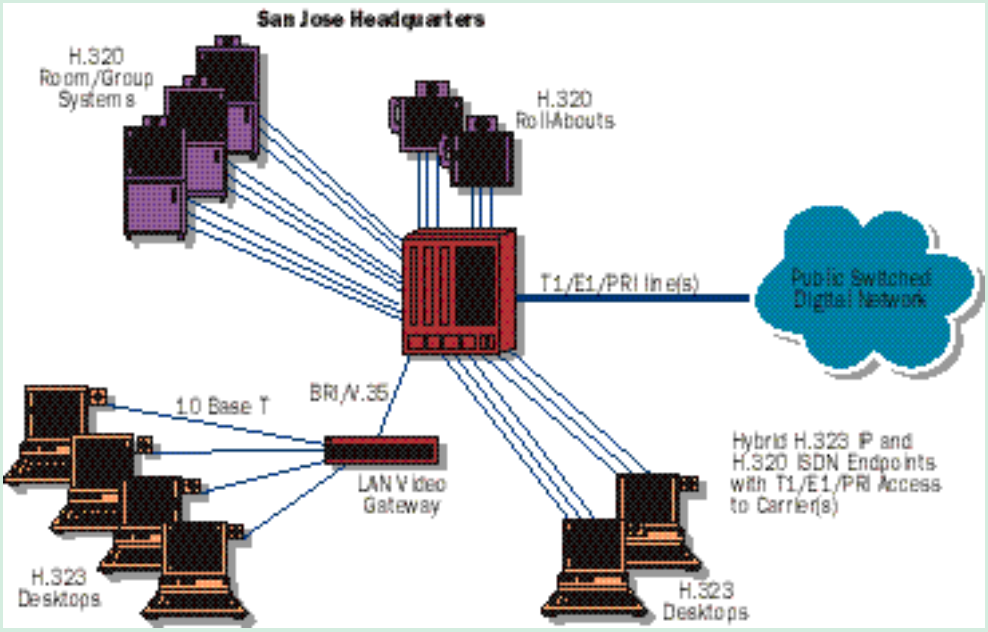
TABLE 6 Multirate Case—MCI

	LEC BRI Picked to MCI
San Jose	$19,786.00
Chicago	$2,263.41
New Jersey	$13,420.82
Total	**$35,470.23**

TABLE 5 Private vs. Public: MCI and Sprint Access Type Case—BRI vs. PRI

	LEC BRI Picked to MCI	LEC PRI Picked to MCI	MCI PRI Private Network	LEC BRI Picked to Sprint	LEC PRI Picked to Sprint	Sprint PRI Private Network
San Jose	$29,834.70	$29,992.50	$30,440.00	$25,514.70	$38,508.75	$25,872.00
Chicago	$2,546.82	$2,862.00	$3,143.62	$2,222.82	$2,538.00	$3,143.62
New Jersey	$20,460.06	$20,923.00	$20,647.41	$17,544.06	$18,007.00	$17,573.40
Total	**$52,841.58**	**$53,777.75**	**$54,231.03**	**$45,281.58**	**$59,053.75**	**$46,589.02**

FIGURE 4 H.323 Videoconferencing Deployment



Finally, economies may be gained if voice traffic is integrated with video and data. Products and services that support ISDN call-by-call service selection provide this functionality, which is known as dynamic access switching. Access lines can be shared by different applications at varying times, avoiding the need to have separate, dedicated, underutilized access capacity for each application. Be aware, however, that while most of the larger carriers provide this capacity, only a few equipment vendors support it.

Dedicated and switched network access allows the use of the same T1 access line for fractional T1, frame relay or dedicated service on some channels, while using the rest for switched traffic. Eliminating the need for separate access lines means lower access costs and increased network flexibility.

Video can no longer be viewed as a standalone resource

Conclusion

Users have the opportunity to integrate videoconferencing with voice and data capabilities; indeed, video can no longer be viewed as a standalone resource. Devices including ISDN switches and H.323/H.324 gateways provide dial plan support, allow users to take advantage of competitive tariffs from multiple carriers and enable users to access the least expensive type of bandwidth as it is needed.

A few points to consider as a result of the above findings:

- Deploy switching into your video networking infrastructure for least cost routing.
- Deploy equipment that supports new ISDN services such as multirate, NFAS, etc.
- Understand costs of deploying wiring to the desktop/conference rooms
- Select appropriate carrier(s).
- If you have larger locations, consider consolidating multiple BRI connections into a single PRI. This facilitates the bundling of voice, video and data services and permits deployment of the aforementioned ISDN-specific value-added features.
- Take advantage of unused T1 bandwidth, if available.
- Use premises switching to avoid access charges for "intercom" calls—i.e., those calls in which both users are at the same location.
- Use dial plan capabilities of premises switching for least cost routing.
- Keep abreast of the latest trends in discounting and promotions, especially for ISDN.

Videoconferencing is not only economical to deploy but can be economical to use as well, because smart, cost-effective network switching devices exist. To optimize the costs of videoconferencing, it is time for users to design intelligent networks that will reduce their overall costs□