Planning and Migration Strategies for
IP Telephony

By Network World Editors

Table of Contents

A simple fact: Enterprises can't run without telephones, one of an organization's most mission-critical elements. Without a lifeline between you and your customers — not to mention your staff, business partners and vendors — your operation grinds to a halt.

For years, making this fact a reality has been hardly simple or cheap. Providing a company with its mission-critical data and communications systems has been an expensive proposition as each runs on its own network, each with its own separate set of hardware, software, expenses and staff. Until the past few years, IT executives have had little choice but to pay the bills and ensure each network offers the greatest percentage of uptime possible. Yet today there is a technology that allows IT executives to improve and integrate their telephone networks with their infrastructure, drastically increasing productivity and costs savings.

Enter IP telephony. IP telephony allows you to marry your voice and data networks, eliminating duplicate costs, headaches and hassle, not to mention traditional PBX leases, per-minute toll charges and more. What until just a few years ago was a cutting-edge technology geared toward early adopters with deep pockets, IP telephony is now spreading through enterprises large and small, bringing with it unprecedented opportunity for cost savings and ROI.

IP telephony offers several key advantages to today's business leader:

- **Ease of use:** IP phones look and perform just like traditional handsets, nearly eliminating the learning curve for employees. Yet unlike traditional handsets, plug-and-play IP phones offer many features, such as unified messaging, find-me/follow-me services, easy conferencing and much more.

- **Management:** IP telephony systems pride themselves on their ease of management. Gone are the hassles of traditional PBX networks. For example, users can relocate from one office to another and take their handset and phone number with them. Getting them up and running is as simple as plugging the phone back in; the system recognizes the users and restores all their features.

- **Reliability:** Those considering IP telephony list reliability as a primary factor. Yet unlike traditional PBX voice systems, IP telephony's distributed architecture fundamentally supports fault-tolerance and disaster recovery. This allows you to build a packet-based system that's more reliable and scalable than its circuit-switched predecessor.

Considering IP telephony is a move many IT executives delay because it seems too large to tackle. Yet this year more than 50% of all PBX systems are IP PBXs. IP telephony is not a blue-sky technology, but rather a real-world project that yields cost savings, increased productivity and easier management. It's a technology more business leaders are deploying every day to give their enterprises the edge they need.

With this special report, we'll help you lay the ground work for identifying the savings potential in your network, as well as the ROI a new IP telephony system would yield. Armed with our information, you can begin to examine your infrastructure and make the move toward one converged network.

ShoreTel

Making the case for VoIP

An opportunity analysis reveals the savings potential of an infrastructure investment

BY LYNN DENOIA AND TOM RANDALL

As companies seek to justify IT projects in an era of cost-consciousness, infrastructure initiatives often get short shrift because it's difficult to show value. Companies group budgets into opportunity categories of regulatory initiatives, operational enhancements, revenue generation and infrastructure, generally prioritizing in that order.

Convergence is a strategy that many organizations want to pursue today. VoIP rollouts can generate savings and help streamline processes, organizations and management tools. These are all good things, yet they lack the glamour of an operational improvement or revenue-generating initiative. For a VoIP initiative to compete with these other projects for resources and funding, you must create a strong business case, ROI and budget.

Making a budget and budget case for an IT project requires a five-step process of opportunity analysis, infrastructure analysis, process/organization analysis, tool analysis and project analysis. While each step merits attention, let's drill down into opportunity analysis. Determining the cost, savings and resulting ROI for the VoIP initiative provides the data you need to sell the project. What follows is a guideline of cost elements to consider.

Long-distance

This analysis examines domestic and international long-distance billing by physical location. Pick an analysis period that is representative of the norm and look at "on-net" calling (location to location on the company WAN) and "off-net" calling (to the nearest logical node on the company WAN in order to hop off from there).

Domestically, with long-distance rates in the sub-penny-per-minute realm, the potential savings will be small. For multinational organizations, however, the potential for savings can still be great…for a while. Companies that need the long-distance savings to fund hardware requirements and project

implementation to facilitate a convergence strategy likely have, at most, three years to execute before the fall of international long-distance rates bears resemblance to the domestic U.S. market.

Figuring your costs lets you see what you'd save by reducing long-distance billing. A representative example is 1,000 minutes of international long-distance at a public switched telephone network rate of 53 cents per minute, totaling $530 per month in current international toll charges. Using VoIP, the rate would be, on average, 2 cents per minute or $20 with a service provider, and potentially less over customer-owned infrastructure. At this traffic volume, there likely would be no increase in bandwidth required. Therefore, from a business-case perspective, the savings that could be achieved from this single site example is $510 per month or more.

Conference calling

Organizations today generally use an external conference-calling service provider that provides immediate, unscheduled access to conferencing via a central number and individual pass codes. These services have enjoyed tremendous acceptance but are expensive, generally are based on toll-free numbers and offer little or no accommodation of international requirements beyond direct dial. Placing the conferencing service over VoIP likely will generate savings. The challenge will be planning for the unknown peaks.

Conferencing service rates range from 20 to 35 cents per minute, per user. Most of the popular conferencing services on the market provide significant bill detail. Take the overall cost of the conferencing service, minus the incremental bandwidth requirement, to derive the potential savings that accommodating conferencing via VoIP can achieve.

PBX avoidance

One of the biggest questions about VoIP is whether to convert the PBX environment to softswitch technology. The benefits can be many for organizations with multiple locations, but understand the attendant disaster recovery and other risks, and accept or mitigate them before taking advantage of the cost-savings opportunities. Your company also must include a sound plan for accommodating E-911 service for each site in the design phase of the project.

Organizations can install softswitch technology to connect multiple locations using the WAN. Opportunities for savings include actual replacement of site-specific PBX and peripherals (voice mail, auto attendant, ACD, voice response systems and the like) and the lease, amortization and maintenance agreements associated with each; the inclusion of the softswitch technology in the enterprise management system; and the ability to perform moves, adds and changes the PBX vendor traditionally performs.

With PBX and peripheral equipment for small locations costing $25,000 and up, the savings that softswitch technology offer can be substantial only if the incremental bandwidth, an ongoing monthly cost, has a run rate significantly below the PBX capital outlay over a three-year period.

Video/multimedia

Over the past several years, video largely has been accommodated via ISDN vs. the enterprise WAN. Current video requirements and costs associated with ISDN should be included in the analysis and known plans for expanding the capability of video and multimedia services. Video represents a significant challenge regarding bandwidth, and its use and utilization must be well understood before accommodating it via the WAN. Again, cost savings can be achieved if the ISDN costs for video today are above what the incremental WAN

JUSTIFYING AN IT INVESTMENT
Making the business case for new technology requires five steps:

1. **Opportunity analysis —** The determination of the cost, savings and resulting ROI for the VoIP initiative.

2. **Infrastructure analysis —** The determination of the current infrastructure's ability to accommodate VoIP; and a gap analysis that clearly outlines the incremental upgrades, additions and improvements that will be necessary to implement VoIP.

3. **Process/organization analysis —** A functional organizational overview of the current organization processes and structure to determine gaps, redundancies and the resulting plan for remediation.

4. **Tool analysis —** A review of the organization's WAN and LAN monitoring and management tools, and their ability to accommodate VoIP.

5. **Project analysis —** The determination of how to source the aforementioned steps; and deploy, document, train and institutionalize the ongoing management of VoIP within the corporation.

---

costs will be to incorporate video at no degradation to current data traffic.

We heartily recommend each step involving the transition of a current "non-WAN" service to a proposed VoIP environment be examined carefully via network modeling tools such as those from Opnet or Compuware. Network modeling will let you address and understand the network impact of the VoIP initiative on an element-by-element basis to make sound business decisions regarding what should be included in the converged environment. It also will let you understand and appreciate the interoperability considerations of introducing voice, video and multimedia to the data network and the resulting effect on the enterprise applications.

Pain-free VoIP

Timing the conversion carefully ensures a quick return

BY SCOTT BENNETT

Small businesses know switching to voice over IP will save them money. Trouble is, first they have to spend money swapping out existing phone systems – a notion that keeps

many away. But there's a trick to implementing VoIP that ensures a quick return on investment. It all comes down to good timing.

If you already have a high-quality data network, most of the cost will come from new telephone equipment, namely, devices that connect traditional phones to the Internet. But if your data network is already strained to capacity, you'll need to upgrade it first.

If your company times the conversion carefully, you can make the transition less painful and boost ROI.

Consider switching to VoIP only if:

- You currently use IP Centrex lines, which allow for phone and Internet service on the same network. These lines are extremely expensive, so moving to VoIP will immediately reduce costs.

- You're moving to a brand-new office building. Since no wiring will have been installed, it will be simple for your company to create the consolidated data and voice network you need.

- You're nearing the end of your PBX lease or service agreement, or your current phone system is becoming obsolete.

- Your company maintains offices in different area codes, or your employees place a large number of long-distance calls. A VoIP service will immediately eliminate toll charges for domestic calls.

If none of these circumstances apply, hold off, but start thinking ahead. Find out when your current PBX lease or service agreement will expire. Consider when your business might move to a new location or purchase an upgraded network. Time your VoIP switch to coincide with these plans, which will decrease the financial pain and make implementation easier.

If you find the time is right, now you need to thoroughly review your current network – everything from computing power and memory to routers and servers. Most importantly, you need to evaluate the amount of bandwidth available through your high-speed connection. It must have enough capacity to handle voice traffic without affecting call quality, losing calls, impeding e-mail or slowing Internet traffic.

To figure out the amount of unused bandwidth on your network, test it when it's under the greatest stress. Find a time when the maximum number of employees typically check voice mail and answer e-mail, say 9 a.m. on a Tuesday morning.

Now analyze the results of this test. If the additional capacity is not enough to handle voice traffic, discuss the results with your service provider. It can tell you how much additional bandwidth you need and the cost.

Next, decide whether your in-house IT staff should deploy and manage the system. Consider your staff's level of networking knowledge and availability to handle the project. If they can't handle it, consider choosing a managed service. This can include equipment and software, either installed on-site or hosted by a service provider.

ShoreTel brings high fidelity to VoIP

BY STEVE TAYLOR AND LARRY HETTICK

ShoreTel has introduced what we believe is the industry's first hi-fi telephony instrument for VoIP. This is especially significant in that it may move some of the discussion about VoIP from producing sound that is as good as (or almost as

good as) plain old telephony service using as little band-width as possible to using a bit more bandwidth and getting better sound.

Technically, what this means is that while traditional phones have a frequency response from 300 to 3,300 Hertz, the new ShoreTel phones have a frequency response of 100 to 7,000 Hertz. And while this is somewhat short of the tradition-al 20 to 20,000 Hertz frequency response as a starting point for "hi-fi" audio equipment, it certainly gives a big boost to the sound quality.

There actually are three different models of the phone with the usual feature differentiation as the price increases. All models, however, include an advanced acoustic design and the capability for hi-fi voice when communicating with other ShoreTel phones.

But this also points up yet another issue with IP PBXes and phones. At this point, if you want to take advantage of ShoreTel's hi-fi phones, you have to use them with ShoreTel's IP PBXes. In spite of many users' hopes that IP telephony in general, and SIP in particular, would bring about full plug-and-play interoperability among equip-ment from different vendors, this is not necessarily a real-istic expectation.

For years, phones and PBXes from different manufacturers have provided basic telephony features in a heterogeneous environment. And the same can be expected for IP phones. But in order for you to get the full feature set from your tradi-tional supplier, you had to have both the PBX and the phone come from the same provider. And again the same can be expected from IP phones.

Manufacturers will continue to offer a set of proprietary fea-tures that they feel will give them a competitive advantage when both the phone and the PBX come from the same provider. That's what an open, competitive market is all about, and it's also what provides the capital to fund advanc-ing the technology. At the same time, it doesn't make it any easier for the communications manager who's charged with integrating the IP phone systems from two disparate compa-nies when there's a corporate merger.

Vanguard tackles VoIP, apps performance management

BY TIM GREENE

Vanguard Managed Solutions says it now can install, moni-tor and manage IP telephony networks for businesses, freeing up staff time to perform more critical functions.

The company's new VanguardMS Careguard Managed IP Telephony Solution includes an assessment of customers' net-works, design, configuration, installation, management and monitoring of the network.

The provider is delivering the service in partnership with ShoreTel, which provides the phones and IP PBXs. If other network gear needs upgrading, Vanguard uses its own routers and HP-based LAN switches, or those of another vendor if the customer prefers.

Turning the monitoring and management of its ShoreTel gear over to Vanguard saves Larry Woodall about a half-hour per day, says the telecom analyst for National Commerce Financial in Durham, N.C. In most cases the trouble turns out to be that someone has unplugged an IP phone or turned off a power strip, he says.

In these cases, Vanguard contacts National Commerce's help desk, which can generally talk the end user through resolving the problem, Woodall says. "I don't have to come in in the morning and look at the stuff," he says.

In addition, Vanguard is monitoring CPU use of the ShoreTel telephony server, something National Commerce would not likely do on its own, Woodall says. The provider also monitors quality of service for voice traffic and bandwidth use, and provides a monthly performance report. It also conducts a quarterly review of the network to suggest changes to improve voice quality.

With Careguard Managed IP Telephony, customers buy the hardware and pay a monthly fee based on how many servic-es they opt for, the number of devices monitored and whether customers are using other Vanguard services.

Vanguard also is announcing Careguard for Application Performance, which monitors specified software applications and makes adjustments to ensure they are performing up to set standards. The provider draws performance data from network switches, routers and servers, and from its own probes to analyze traffic flows and bandwidth consumption.

The price of Careguard for Application Performance is based on the number of devices monitored and the number of applications managed.

This new service is part of a broader grouping from Vanguard called CareWorks that includes monitoring of transactions, servers and operating systems, traffic flow, quality of service and network security.

Vanguard sells its services directly to businesses and is the outsourced provider of some AT&T managed services. Vanguard specializes in serving retail and financial services companies and others that have large numbers of sites, but lack highly trained IT staff at each site.

VoIP requires wide range of planning

BY TIM GREENE

When network executives evaluate their networks to see if they are ready for VoIP, they must look beyond the factors that jump to mind immediately, say those who have been through the process.

Checking a corporate LAN to determine if it has enough bandwidth and can support quality of service (QoS), determining a source of power for phones and integrating an IP PBX with the traditional PBX are all a necessary part of the drill.

But evaluating WAN services, the role of wireless voice and ongoing funding for voice services are among the less obvious factors that should be considered, experienced users and experts say.

Potential VoIP users might decide that powering IP phones via an Ethernet cable feeding the phone – Power over Ethernet – is the way to go, says VoIP consultant Gary Audin, president of networking integrator Delphi. But other equip-

ment, such as videoconferencing gear, wireless access points and IP security cameras, someday might become part of the corporate plan and increase demand for powered lines. "Think longer term," Audin says. "You may need more [powered] switch ports than you think."

Similarly, adding wireless IP voice capabilities can rapidly increase the demand for wireless access points that previously handled only data, Audin says. "More access points means more ports on LAN switches, and that means more cabling."

Wireless VoIP phones also require a careful assessment of available wireless spectrum, says John Haltom, network director for technology management for Erlanger Health Systems in Chattanooga, Tenn., which runs hospitals. Wireless telemetry of patient vital signs and wireless control of medical devices such as ventilators must be studied to avoid bandwidth conflicts that could have dire consequences. Careful bandwidth management in areas where these sensitive devices are in operation is a must, he says.

Designing the layout of wireless access points also requires care to ensure reliability as doctors and nurses move around, Haltom says. One access point supports six to eight simultaneous calls, so if more calls are likely to come from a given area, more access points will be needed. To determine this demand, "I go people-watch," he says. That is, he stands in an
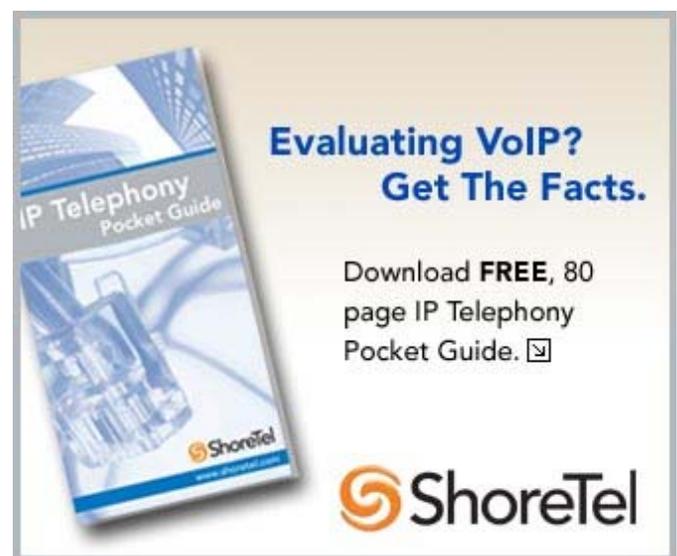
area to see how many people use the phones as part of a trial actually make calls at any given time.

QoS is another important consideration that should be measured on the wide area and the LAN if voice traffic is to be sent between corporate sites, says Ron Pike, telecom manager for EDAW, an urban planning firm in San Francisco. The company is in the process of installing a 600-phone ShoreTel VoIP network.

Sending IP voice between company facilities can save long-distance charges, particularly on international lines. He knew two years ago when he was studying the problem that

---

VOIP REMINDERS

There are many network questions to answer before deciding to undertake a VoIP conversion. Some of them include:

- What role will VoIP over wireless play and what will be its demands on the network?

- Will video over IP follow voice over IP?

- How much space will new gear take?

- Will air conditioning need to be beefed up to handle heat from new gear?

- Is cabling up to snuff and is enough run to meet future needs?

- How will faxes and other analog phone use be supported?

- How will VoIP networks be backed up?

---

his provider, Qwest, couldn't provide it. But now it can, and he recommends evaluating and upgrading WAN services with guarantees to ensure the necessary QoS.

He also set up queuing on outbound packets as they are routed onto the WAN so voice gets priority and delay of voice packets within EDAW's network is minimized.

This isn't a concern for all corporations, however. Phil Brody, CTO of Clark County, Nev., Public Schools, says he lucked into a WAN that was friendly to VoIP. Two years ago when he started considering VoIP, the district had just

installed a Gigabit Ethernet WAN among the county's schools, which now number 450.

But he did run into other concerns. The LAN infrastructure dictated that VoIP be limited to the WAN and that traditional telephones be kept within the schools, using a gateway to connect to the IP network. Keeping IP phones functioning during power outages called for uninterruptible power supplies, an unacceptable cost to the district. Their maintenance alone was enough to kill the idea because the school committee frowns on substantial continuing costs as part of any IT project, he says.

Audin agrees IP voice implementations require back-up power to keep voice reliability high, but backup is needed only for 5 to 20 minutes. After that, if the electricity stays off, temperatures in equipment closets will start to rise beyond the point at which gear should stay in use, he says.

He also says network power should be overestimated for times when a VoIP system has crashed and needs to come back online. Restarting IP phones requires that each phone re-register with the call server and get an IP address. All the phones becoming active at once will create a temporary drain on the power system.

Brody recommends a careful analysis of voice services such as Centrex to determine if converting to VoIP can save money. Evaluation of the Clark County schools' infrastructure revealed that it had 9,000 Centrex phones, and use of Alcatel IP PBXs has reduced that to 1,200, he says.

For all the work that goes into planning, users say they gain operational benefits that can translate into savings. Pike says putting in a VoIP network saved $40,000 over what traditional phone gear would have cost, and management savings come to $10,000 per month. Employee productivity increases amount to $9,500 per month, he says.

To request reprints of this special report contact networkworld@reprintbuyer.com