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Strategic Analysis Report
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VoIP Technology Is Ready for Small and Midsize Businesses, but Adoption Is Slow

New applications enabled by voice over Internet Protocol may one day be a boon to small and midsize businesses. But their interest in IP telephony still rests on its business value today.

Management Summary

Small and midsize businesses (SMBs) confront many of the same challenges that beset larger enterprises — defending and advancing their market position, enhancing their products and services, squeezing more revenue and profits out of their operations, and responding to the increasing demands of customers and business partners.

Yet SMBs face daily an issue that larger enterprises seldom must acknowledge — winning in the marketplace with limited resources, knowledge and budgets. The appropriate use of information technology, therefore, becomes a critical weapon for SMBs to wield in their battle to survive and thrive.

Many SMBs believe they must wait for technology innovations to proceed through their life cycles before they become affordable, manageable and usable tools to help them grow their business. For example, many SMBs jumped on the Internet bandwagon only when the Web became an important new medium for commercial opportunity.

Often, however, new technology products and services are initially scaled at a more modest level — such as wireless LANs and voice over Internet Protocol (VoIP) — that better meets the immediate needs of SMBs than those of larger enterprises. VoIP technology and Internet Protocol (IP) telephony (the technology application) is presenting SMBs with a rare opportunity to experiment with a new technology — and therefore help shape its market — before larger enterprises can. However, most SMBs have rated VoIP as low priority in their overall IT and networking initiatives planned for 2003.

This *Strategic Analysis Report* focuses on the drivers and inhibitors for the adoption of VoIP and Internet telephony by SMBs. The report examines the following Key Issues:

- How will SMBs minimize the total cost of ownership (TCO) of their IT infrastructures while keeping pace with the demands on these infrastructures?
- What new technologies will change today's business processes during the next three years?
- How will IT architecture evolve for SMBs during the next three years?

The report contains the following Strategic Planning Assumptions:

- Through 2004, only 20 percent of SMBs will articulate the business value of IT well enough to capture sufficient discretionary funds for nonutility initiatives (0.7 probability).

- SMBs should expect at least two major customers to request an e-commerce linkage in 2003, and to demand it by year-end 2004 (0.7 probability).
- Through 2003, 80 percent of enterprises deploying premise-based, IP-based telephony products will experience a TCO increase of 15 percent to 25 percent (0.7 probability).
- Through 2003, justification for IP telephony will focus on increasing the number and quality of applications over current telephony alternatives (0.8 probability).
- By 2005, vendors will succeed in making IP-based telephony products the de facto architecture standard for all new premise-based shipments (0.8 probability). However, through 2005, traditional private branch exchanges (PBXs) will continue to be the dominant type of installed premise-base switching (0.7 probability).

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1.0 Introduction

Traditional voice vendors of PBXs and key systems are aggressively selling telephony equipment that adds an IP telephony application onto enterprises' installed communications equipment. Other vendors are trumpeting their IP-based telephone equipment as an immediate, cost-saving panacea to enterprises that wish to merge their voice and data communications networks.

Vendors are trying to attract SMBs to VoIP and IP telephony through the lure of lower operating costs, ease of management and the promise of forthcoming, new applications that will help strengthen their competitive standing.

But does the technology and its application really make sense for SMBs? As with most questions of leveraging IT, the answer is "it depends." In this case, the factors the answer depends on include:

- Enterprise size
- Technology adoption culture
- Operational and workplace characteristics
- Communication application needs
- Resources

Chief among these factors are the benefits that new, innovative applications can offer enterprises to become more competitive while reducing costs and increasing efficiency. SMBs must focus on the application needs of their users and the benefits that IP telephony would bring to them as they consider whether and when to deploy IP telephony.

2.0 Business and Technology Challenges That SMBs Face

Key Issue: How will SMBs minimize the TCO of their IT infrastructures while keeping pace with the demands on these infrastructures?

Strategic Planning Assumptions:

- *Through 2004, only 20 percent of SMBs will articulate the business value of IT well enough to capture sufficient discretionary funds for nonutility initiatives (0.7 probability).*
- *SMBs should expect at least two major customers to request an e-commerce linkage in 2003, and to demand it by year-end 2004 (0.7 probability).*

When considering adoption of new technology, SMBs traditionally move at a deliberate pace, preferring to wait until new IT products and services reach the mainstream of the business world. The primary reason for this risk-averse attitude is that SMBs' resources (budget, staff and skills) allocated to IT development, deployment and management are often highly constrained. Besides the impact of their size, SMBs also adopt technology based on the needs of their industry. For example, smaller enterprises in the financial-services sector are more-aggressive technology adopters than SMBs in the construction industry.

Most of the business and technology challenges that SMBs face stem from the above-mentioned resource limitations. For example, SMBs typically underinvest in security because nearly 60 percent of them lack a dedicated resource to manage security needs.

Other critical business and technology challenges confronting SMBs include the following:

Lack of IT Strategy: Most SMBs are so busy focusing on day-to-day operations that they fail to address the need for an enterprise IT strategy. Without such a strategy, they lack the blueprint to effectively select, deploy and support the technology — including voice and data communications — necessary to fulfill business objectives. SMBs tend to approach IT on an ad hoc basis, fulfilling investment requests emanating from the business units, departments or executives that have the most clout, or that can make the most compelling argument for their "pet" project. Because of this approach, which focuses on incremental spending in the absence of an enterprisewide IT strategy, SMBs often cobble together IT architectures that fail to align with and support enterprise business strategies and revenue-producing opportunities.

Ironically, an IT strategy is critical to help SMBs understand the role of IT in their enterprise, which in turn helps determine the funding levels and organizational model needed to support key IT initiatives. Without a strategic IT game plan, SMBs won't be able to make sound decisions about which projects should be funded (or abandoned) and how to allocate resources to support chosen IT projects. The ability to accurately determine appropriate spending and staffing levels is essential to resource-constrained SMBs. An IT strategy focuses on maintaining the enterprise's competitive advantage as much as it does on deploying and enhancing IT systems and services.

TCO Pressures: SMBs face a burden — staff and budgets often don't keep pace with the demands of their IT infrastructures. Therefore, SMBs must find ways to decrease the TCO of their IT infrastructures and minimize IT staffing needs. A focus on TCO spurs a greater emphasis on products and services that promote cost-saving attributes such as simplicity, ease of use and reliability. That focus maps with a key trait of SMBs: a tendency to prefer products and services that require little (or no) support. SMBs willingly pay a premium for IT solutions that are intuitive and easy to understand, implement and support. SMBs want IT offerings that are largely preconfigured, integrated, tried and tested.

This preference underscores why SMBs tend to opt for packaged solutions over best-of-breed offerings: They want to minimize complexity in their IT infrastructure. That explains why a commodity mind-set is more advanced in SMBs than in larger enterprises. For example, SMBs lead in adopting industry-standard technologies — such as those from Intel and Microsoft in the PC and server segments.

Difficulty in Building a Business Case: In a period of continuing economic unease, all enterprises are increasingly scrutinizing infrastructure purchases (especially IT) for their ability to tangibly contribute to business value and the bottom line. Before granting funding approval, SMB senior executives are asking IT leaders to demonstrate benefits such as:

- Increased efficiency
- Process optimization
- Improved customer relationships
- Enhanced revenue opportunities
- High return on investment

This puts the onus on IT leaders to position IT differently — from boosting internal efficiencies and cost savings to leveraging IT to enhance business performance and competitive standing. Therefore, it is becoming more important for IS organizations to translate their activities into business terms to build and

sustain sponsorship and funding for IT. Future investments will be justified and approved based on their ability to deliver high business value.

SMBs shouldn't fall into the trap of simply spending less on IT; rather, they should aim to spend *smarter*. The key is to find the right mix of IT investments to support business processes that improve customer service, drive top-line growth and cut operational costs. Through 2004, only 20 percent of SMBs will articulate the business value of IT well enough to capture sufficient discretionary funds for nonutility initiatives (0.7 probability).

Vendor Selection, Negotiation and Management Challenges: SMBs shouldn't simply adopt the technologies, vendors, products and services used by large enterprises. Those that do risk paying up to twice as they would if they standardized on SMB-focused solutions from IT vendors. Moreover, SMBs usually don't get the preferential treatment vendors grant to larger enterprises. Many SMB IS organizations lack the skills required to negotiate effectively with vendors on an IT purchase. SMBs often solicit products and services on a project-by-project basis and end up paying 10 percent to 40 percent more than enterprises that negotiate annual or multiyear deals. In addition, when seeking new IT solutions, SMBs often turn first to their incumbent providers, which may not offer the best or most appropriate solution for the requirement at hand. Although SMBs try to minimize the number of vendors they use, they still need to enhance their skills in vendor management and technology procurement.

The Need to Collaborate Outside the Enterprise: After decades of primarily using IT to streamline the internal, post-sale needs of their business, enterprises are now challenged to meet external, customer-facing requirements. Many SMB back-office systems and applications that work fine on their own cannot be easily linked to external business systems and processes. Moreover, the cost and difficulty of implementing such connectivity often is an inhibitor.

Nevertheless, SMB trading partners are beginning to demand that more business be conducted electronically — such as sales force automation or order fulfillment. This trend toward externalization affects SMBs more than larger enterprises, because their survival and success may depend on establishing competitively advantageous links to partners, customers and suppliers. To enhance customer service while developing closer relationships with alliance partners and suppliers, SMBs must begin to strategically integrate technology that enhances their connectivity and information-processing capabilities with key business partners.

SMBs will have to implement connectivity to their most important customers or risk losing profitable relationships. SMBs should expect at least two major customers to request an e-commerce linkage in 2003, and to demand it by year-end 2004 (0.7 probability).

Underinvesting in IT: SMB IT portfolios are usually weighted heavily toward infrastructure and utility applications, and scrimp on enhancement and frontier applications — the technologies that help an enterprise perform better and differentiate itself from its competitors. Gartner defines these IT investment categories in the following manner:

- Infrastructure — The foundation of essential elements, such as networks (data and voice), PCs, PBX and key systems, training and help desk support, and the maintenance required to deploy, run and support applications within the enterprise.
- Utility applications — These may be mission-critical (such as payroll and self-service human-resources systems), but they offer scant contribution toward improved enterprise performance.

- Enhancement applications — These applications enable the enterprise to perform better than it would without them, as measured in speed, convenience, reduced cost of business operations, working-capital requirements and quality. Examples include supply chain management and customer service/contact center applications.
- Frontier applications — These cause a major change in business performance, alter the competitive landscape and are often risky at the outset. Examples include online consumer credit and Web storefronts.

SMBs should gauge their IT spending health by evaluating spending among these four categories. SMBs that spend less than 20 percent of their IT budgets on enhancement and frontier applications risk underinvesting in their IT future. SMBs that spend more than 20 percent are acting to influence the performance of the enterprise as a whole and, by doing so, contribute directly to achievement of key business objectives.

Reliance on External Sourcing: Given their resource constraints, SMBs tend to rely heavily on external service providers and vendors to help them assess, develop, implement, operate and maintain IT and telecommunications initiatives. SMB spending on outsourcers grows significantly (by double digits) each year. Yet, year after year — regardless of the state of the economy — SMBs typically identify such third parties as targets for cutting costs.

Although SMBs strive for control and independence, they need help deploying and managing their IT initiatives. With limited skills, SMB project managers often need to seek external sources to plug their IT skills gaps. SMBs often struggle to find the proper balance between internal and external IT resources. They must honestly assess their IT competencies, and determine which skills are needed in-house and which should be sourced externally. Waiting to acquire skills until forced to — by customer demand or market shifts — is likely to be costly and disruptive, and to produce poor results.

2.1 The SMB Opportunity Posed by New Technologies

Although SMBs face unique IT challenges, technology can pose unique opportunities for SMBs as well. Not all new technologies, products and services are ready-made for quick adoption by larger enterprises — some IT innovations, such as wireless LANs, enter the marketplace at a smaller scale that is better suited to the needs, interests and budgets of SMBs than to those of larger enterprises.

In these instances, SMBs can take an unaccustomed leadership role in helping to shape the direction of such new technologies. This is the situation that exists today with VoIP and IP telephony.

3.0 A New Direction for Communications: IP Telephony

Key Issue: What new technologies will change today's business processes during the next three years?

VoIP is propelling an evolving enterprise network — one that merges separate voice and data communications systems into one converged network that promises to usher in new, sophisticated services. SMBs, like larger enterprises, will likely benefit from such convergence in increased efficiency, ease of operation and potential cost savings.

VoIP is the *technology* that enables voice communications to traverse data (multiservice) networks. IP telephony is the *application* of that technology to deliver telephony features over packet-based IP data networks, such as enterprise LANs, wide-area networks (WANs) and managed intranets. IP is a

communications protocol that was developed for transmitting data, not voice traffic. However, because IP is the strategic direction for networking, this protocol is being enhanced for voice communications.

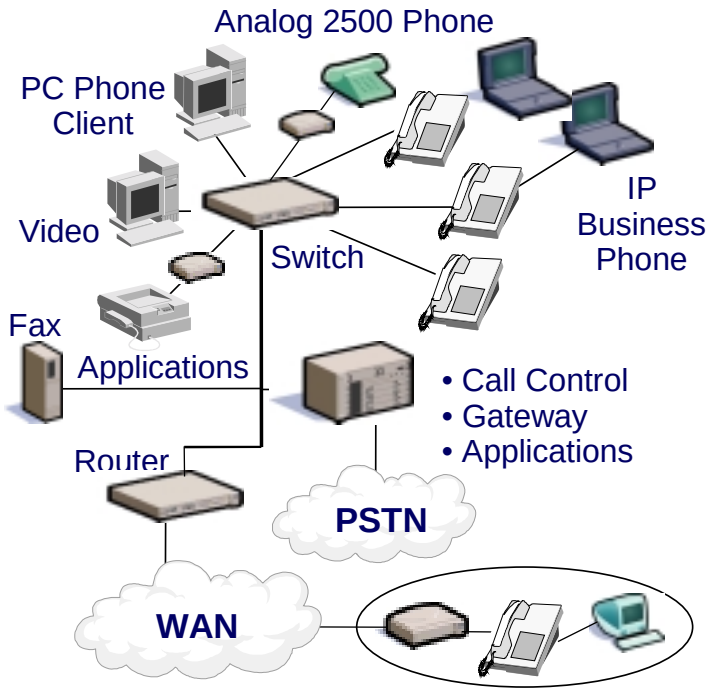
Throughout this report, Gartner uses the term "IP telephony" when discussing IP-based solutions such as LAN-attached telephones, fax machines and "soft clients" — PCs or handheld computers that use software to enable voice communications. These solutions encompass phone-to-phone, PC-to-PC and PC-to-phone connections, as well as interfaces to the public switched telephone network (PSTN) and to application servers for fax, voice mail or other applications (see Figure 1).

Requirements for Voice

- Same level of features and functions
- End-user service-level expectations
- Reliability and availability
- Power plant and power backup
- Security
- Maintenance and warranty

In Addition

- Network design engineering
- QOS for voice
- Increased WAN bandwidth
- LAN/WAN upgrades
- Voice application support



IP	Internet Protocol
LAN	Local-area network
PSTN	Public switched telephone network
QOS	Quality of service
WAN	Wide-area network

Source: Gartner Research

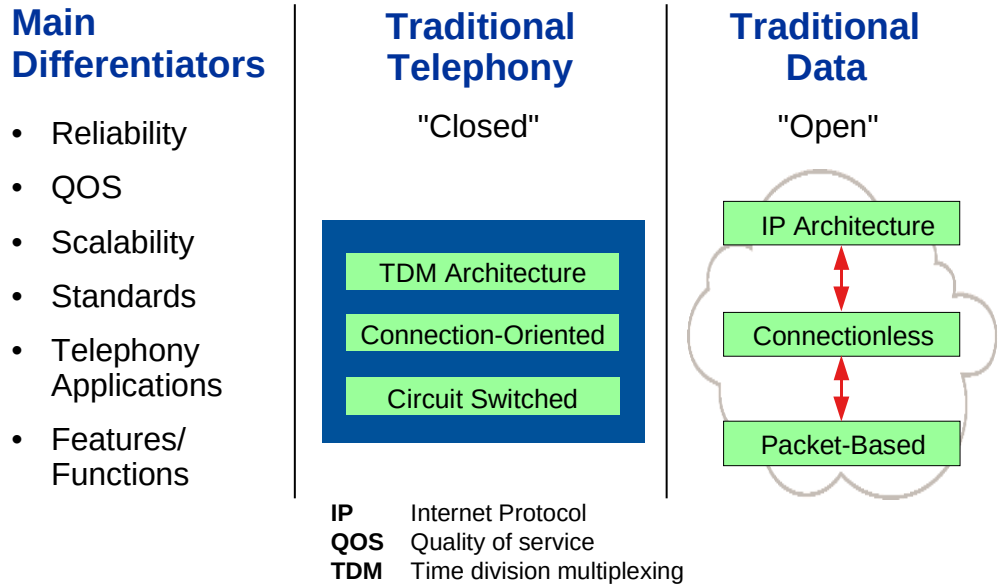
Figure 1. The IP Telephony Solution

Voice communication is primarily provided over circuit-switched networks — a technology that lends itself to services requiring high quality and minimum delays. A direct connection between two connection points provides a permanent 64-Kbps link for the duration of the call. This link cannot be used for any other purpose during this time. It provides for low latency (delay) and is bidirectional, allowing for two-way (or full-duplex) conversations to take place. The main shortcomings of circuit switching are the inherent lack of network flexibility and efficiency caused by the requirement for dedicated connections.

IP is the dominant data communications protocol today, used in approximately 80 percent of U.S. corporate data networks. That popularity helps explain the increasing interest among enterprises to leverage their IP investments to carry voice and fax traffic, along with their data.

IP networks were designed for data transmission, where delays and occasional loss of data are not as critical as they are in voice communications (see Figure 2). The main drawback of supporting voice over a

packet-switching IP network is the lack of support for quality of service (QOS). Delivering an acceptable level of voice quality for enterprise customers is essential.



Source: Gartner Research

Figure 2. Telephony Application: Voice vs. Data

A simple telephone call best illustrates how IP telephony differs from traditional voice communications. When a call is placed over a circuit-switched network, it travels to the recipient via a circuit dedicated to that call for its duration. That dedicated circuit enables high-quality service and near-instantaneous delivery.

Calls over an IP-based network work differently. When a call is placed via IP telephony using an IP phone, the voice message is carved into digital information packets for transmission. The data packets that comprise the call carry a destination address. As they course through the IP network, network switches (routers) scan the packets' addresses for forwarding to the next router. The packets seek the shortest route, sometimes take different paths, can encounter delays (as traffic builds on multiple routers), are often scrambled and arrive out of sequence (called network "jitter"), and even occasionally get lost along the way. When the call reaches the IP address associated with the recipient's phone, the data packets are reassembled and made audible.

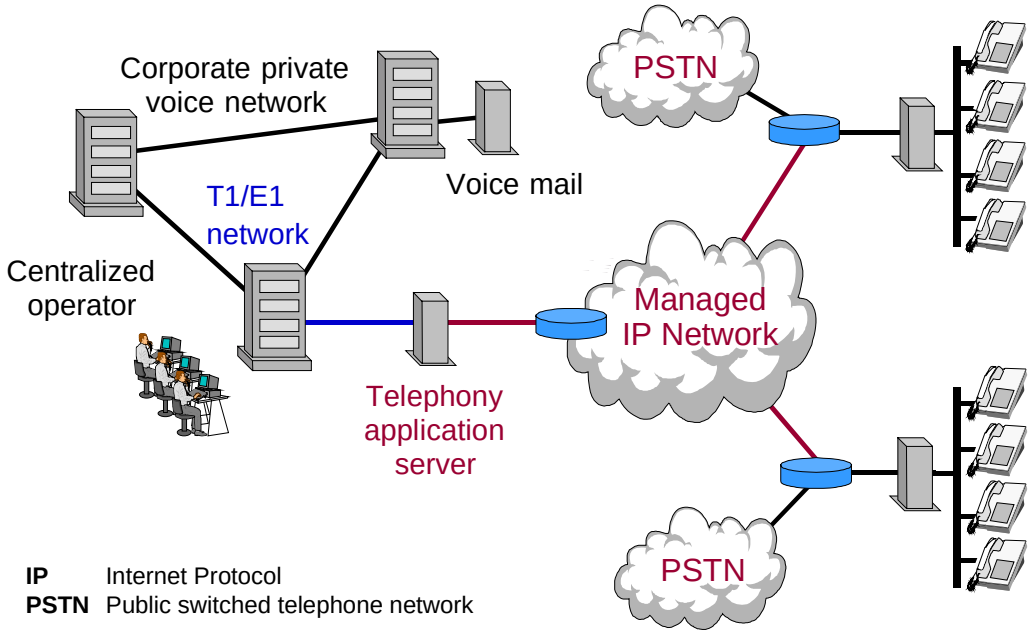
A VoIP connection, unlike a circuit-switched one, isn't dedicated to one call or device. Such a connection-free network allows network resources to be used efficiently, since bandwidth can be shared between varying voice and data functionality.

3.1 IP-Enabled vs. IP-Based Systems

Telephone equipment — PBXs and key systems — that accommodates both voice and data transmission is based on the assumption that circuit switching will be replaced with IP data streams. Vendors are designing their products in one of two ways:

- Evolutionary approach — The classic circuit-switching infrastructure is used and supplemented with add-on, IP-enabled functions, such as integrated IP trunk and line cards.
- Revolutionary approach — Purely IP-based solutions are used.

With the evolutionary direction proposed by the traditional PBX and key system vendors, enterprises' installed telephony equipment can cost-effectively accommodate a range of IP-oriented components — including IP gateways for trunk- and line-side functionality that supports IP network transport and IP end points (such as phones and soft clients). For example, SMBs can extend voice applications to branch offices with offerings that use IP as the transport between these sites. This approach provides SMBs with an evolutionary path to IP telephony. They can continue to use circuit switches at their larger sites, while deploying IP technology to smaller branch locations to extend the functionality of circuit switches (see Figure 3).



Source: Gartner Research

Figure 3. Deploying IP Telephony to Branch Offices

Enterprises can benefit from economies of scale by having a single voice application — housed at a central location and serving multiple, remote office locations — which can be hosted in the enterprise's own managed IP network or by a network service provider (NSP).

4.0 The Value of IP Telephony to SMBs

Key Issue: How will IT architecture evolve for SMBs during the next three years?

Strategic Planning Assumptions:

- *Through 2003, 80 percent of enterprises deploying premise-based, IP-based telephony products will experience a TCO increase of 15 percent to 25 percent (0.7 probability).*
- *Through 2003, justification for IP telephony will focus on increasing the number and quality of applications over current telephony alternatives (0.8 probability).*
- *By 2005, vendors will succeed in making IP-based telephony products the de facto architecture standard for all new premise-based shipments (0.8 probability). However, through 2005, traditional PBXs will continue to be the dominant type of installed premise-base switching (0.7 probability).*

Vendors of IP-enabled PBX and key system equipment — and of newer, IP-based telephony systems — tout significant cost savings for enterprises that implement IP solutions for their voice communications

needs. However, Gartner finds that most of the purported cost savings are difficult to prove. Indeed, for some systems — such as IP-based systems — costs are likely to *increase* rather than decrease (for example, due to the need to upgrade network components). Through 2003, 80 percent of enterprises deploying premise-based, IP-based telephony products will experience a TCO increase of 15 percent to 25 percent (0.7 probability).

Nevertheless, some areas do show the promise of lower TCO, including:

- Network consolidation — Consolidated connections provided by NSPs can cut SMBs' leased-trunk-line costs by as much as 15 percent. As NSPs merge bandwidth into a consolidated connection — such as a T1 line — the result is one, more easily managed network framework.
- Moves, additions and changes (MACs) — SMBs that are highly mobile or that have rapid employee turnover can save $100 or more per MAC, and deliver top-quality customer support to end users.
- Reduced toll costs — SMBs can save on international voice and fax calling by using an IP-enabled system to call between international offices (instead of using the PSTN, where toll charges would normally apply). Toll bypass savings, however, are less applicable within the United States than internationally. And toll bypass is illegal in some countries, such as China.

However, infrastructure costs can *raise* TCO. For example, updating the data network to accommodate the dedicated power requirements for mission-critical voice functionality will add costs. In some cases, these costs can be twice those of traditional voice offerings. Although the perception among many IP vendors is that network support costs will decrease immediately when voice and data are converged, the reality is different. Network management and support requirements will likely stay the same in the short term. Such costs may drop after an IP solution is in place for at least two years.

Most traditional circuit-switched PBX and key system manufacturers are trying to protect their installed bases by offering many varieties of telephony, including evolutionary and revolutionary IP solutions. Their goal is to ensure that the enterprise PBX platform is at the latest release level to accommodate coming IP applications. Often, vendors will offer customers discounts on feature upgrades — such as IP line and trunk cards — so that customers' eventual switch to IP-enabled (and then IP-based) systems will be an easier and smoother migration.

4.1 IP Applications on the Horizon

The most significant impetus for moving voice traffic onto the data network will likely come from new, innovative applications — such as multimedia contact centers — that offer enterprises the opportunity to become more competitive while reducing costs and increasing efficiency. SMBs should focus on the application needs of their users and the benefits that IP telephony would bring to them. Lower TCO will not be the primary driver for IP telephony adoption. Justification for IP telephony through 2003 will focus on increasing the number and quality of applications over current telephony alternatives (0.8 probability).

As data and communications networks converge, new and advanced services will arise and bring about innovative opportunities for enterprises to differentiate themselves. Today, candidate applications for SMBs to evaluate and deploy include:

- Web-based call centers, which promise to enhance customer relationship management and build customer retention and loyalty
- Unified messaging (linking e-mail, voice mail and fax, for example) for mobile and remote workers and project managers

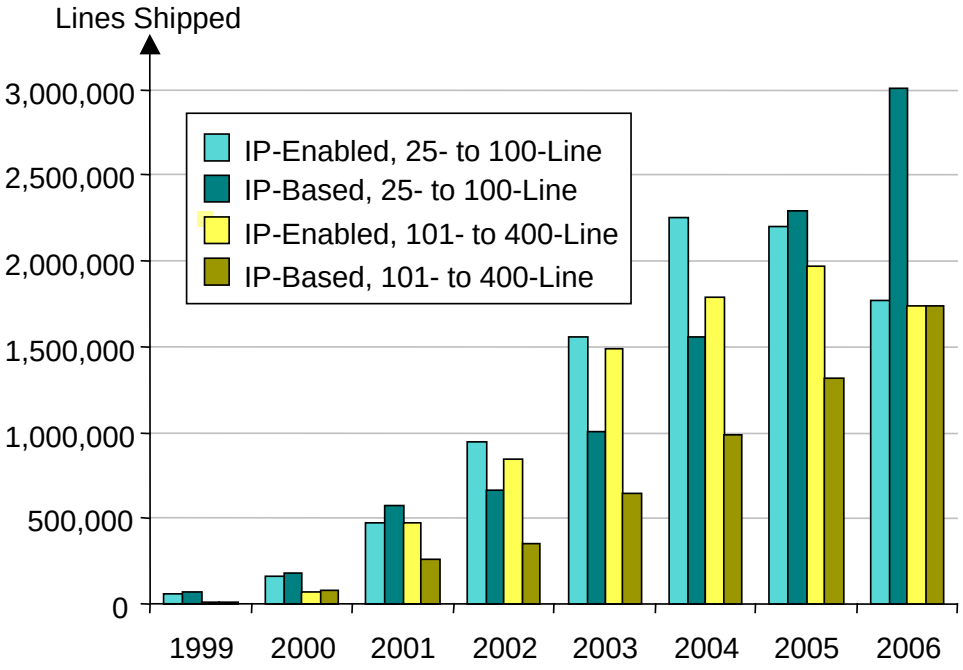
- Remote access to SMBs' voice and data networks through one connection
- IP audioconferencing and videoconferencing

5.0 Forecast of IP Telephony Adoption by SMBs

Key Issue: How will IT architecture evolve for SMBs during the next three years?

Some enterprises began to install IP PBXs and key systems in 1999, many in their branch offices, as a test of the concept. Although Gartner believes that IP PBX systems are viable in switched LAN environments, with excess bandwidth for installations of up to 75 stations, enterprises must evaluate the disruption that large bursts of data can have on real-time voice conversations.

By mid-2000, scalability for business sites with more than 100 lines became practical. By the fourth quarter of 2000, Gartner saw a substantial increase in new line shipments — but they still totaled less than 2 percent of overall PBX shipments. Figure 4 shows Gartner's projections for new line shipments for IP-enabled and IP-based telephony equipment.



Source: Gartner Research

Figure 4. IP Telephony Equipment: New Line Shipments

By 2005, vendors will succeed in making IP-based telephony products the de facto architecture standard for all new premise-based shipments (0.8 probability). However, through 2005, traditional PBXs will continue to be the dominant type of installed premise-base switching (0.7 probability).

5.1 IP Telephony Adoption Slow Among SMBs

SMBs aren't moving rashly into IP telephony products and services — and Gartner doesn't believe they should unless the business benefit is obvious (for example, the enterprise issues multiple MACs). They likely have significant investments to recover from their installed PBXs, key systems and network equipment. Many SMBs, along with other enterprises, are implementing IP PBX solutions in sites with less than 100 lines as a "proof of concept" before moving forward with IP initiatives.

Timelines for implementation will vary depending on enterprise type, end-user demands and events such as opening of a new office site. Figure 5 presents guidelines for IP telephony migration based on location size, as well as the enterprise's technology adoption profile:

- Type A enterprises tend to be technology trailblazers and exploit IT to hone a competitive edge.
- Type B enterprises are in the mainstream and use IT to boost productivity.
- Type C enterprises are technologically conservative and tend to use IT mainly to cut costs.

The circles in Figure 5 represent the weighting that enterprises should give in deciding to opt for an IP system — a solid circle represents 100-percent weight, while a half-filled circle equals 50-percent weight. As discussed previously (see Section 3.1), "evolutionary" refers to IP-enabled systems and "revolutionary" to IP-based ones.

	Enterprise	Timing	Evolutionary	Revolutionary	Replacement
Type A	Less than 100 lines	Now		●	Three to four years
	More than 100 lines	Now	◐	◐	Two to four years
Type B	Less than 100 lines	Now		●	Three to four years
	More than 100 lines	Now to early 2003	●		Three to five years
		Early 2003	◐	◐	
Type C	Less than 100 lines	Now to mid-2003	●		Four to seven years
		Mid-2003		●	
	More than 100 lines	Now to late 2003	●		Four to seven years
		Late 2003	◐	◐	

Source: Gartner Research

Figure 5. IP Telephony Adoption by Location Size and Enterprise Profile

The expected migration path and time frame for SMBs depend on their ability to deal with the technology appropriately and its suitability for the enterprise. Although there will be many exceptions to the guidelines shown above, they represent a reasonable starting point. In these guidelines, we differentiate location size by more-than-100-line and less-than-100-line sets. We then assess the adoption of IP telephony by the type of enterprise, with the assumption that normal life cycle and depreciation schedules for installed voice systems will be followed. Gartner recommends a depreciation schedule of three years for systems with fewer than 100 lines, and of five years for those with more than 100 lines.

Although the number of IP system and line shipments has increased rapidly in recent years, traditional systems still comprise the vast majority of premises-switching and line shipments. Rather than adopting IP-based solutions, many customers are choosing to deploy IP-enabled ones, with many of the lines on these systems still using traditional voice platforms. Migration to next-generation PBX equipment is proceeding at a relatively slow pace, and overall PBX market dynamics have failed to create a backdrop that favors rapid change and advancements.

The bottom line is that traditional PBX systems remain relatively safe investments. Migrating toward a newer, less-proven system presents risks many SMB telecommunications and data managers would like to avoid.

Although the PBX market is migrating toward IP-based and IP-enabled solutions, the migration rate will likely progress more slowly than vendors have projected. Continued growth is occurring in fewer-than-100-line systems, but Gartner expects price pressures in the extremely low end (one to 10 lines) will prevent wide-scale adoption in this key-system-size segment before 2004. Midsize- to large-enterprise IP PBX and key system adoption rates are likely to increase gradually as channels and standards continue to develop, and IP reliability and QOS improve. But IP telephony solutions won't win more widespread adoption rates until these issues are resolved and IT and telecom managers' budgets increase.

5.2 Other Inhibitors to IP Telephony Adoption

The IP network may be the looming strategic direction for enterprise networking. But IP telephony adoption will be inhibited by several factors, such as the following:

- Data network capacity — Gartner estimates that only 20 percent of LAN networks and 10 percent of WAN networks are now capable of handling significant voice traffic without an upgrade. Therefore, enterprises must assess the capability of their data networks to accommodate voice traffic before deploying an IP telephony solution.
- Standards progress — The establishment and widespread adoption of global standards will be needed to drive deployment and adoption of IP telephony.
- Spurious cost benefits — IP PBX and key system vendors must do a better job of defining tangible and realistic cost savings in their promotions for IP-enabled and IP-based equipment.
- Network infrastructure design limitations — IP callers have experienced unclear voice conversations, lower quality, broken lines and traffic congestion that slows access during times of peak use. Although these problems are more likely the result of network design inadequacies than IP product flaws, buyers of PBXs and key systems may not make that distinction and, therefore, blame the product instead of the network provider.
- Limited telephony features — Although most enterprise telephony users fail to use all available telephony features and functions, IP calling equipment lacks many of the most frequently used ones.
- Emergency concerns — With IP-based systems, finding the exact location of an end user (that is, the IP address) within a building or campus environment for emergency calls remains a work in progress that must be resolved.

6.0 Conclusion and Recommendations

IP telephony adoption has yet to take off, although small businesses and low-end midsize enterprises are the likely "sweet spot" for this technology application today. Establishing a converged voice and data architecture, from an IT and business perspective, remains a challenge to enterprises of all sizes. Gartner believes that IP product and service vendors must do a better job of educating and training their prospects and customers about the challenges they'll confront when developing, deploying and managing a converged network.

The most-cited reason for deploying VoIP technology and the IP telephony application is to achieve lower TCO — a benefit that is difficult to prove. Under certain circumstances, however, SMBs can gain

immediately from deploying IP telephony, while positioning themselves for coming new applications and voice functionality.

Gartner offers the following recommendations to SMBs evaluating VoIP and IP telephony:

- Evaluate TCO based on established voice standards and the required service levels needed to deliver the voice application to end users.
- Evaluate IP product vendors' ability to support mission-critical voice applications.
- Follow typical equipment life cycle and depreciation schedules for installed voice systems.
- Make any new installations or upgrades to LAN and WAN infrastructures "voice ready."
- Assess IP-enabling applications to serve the connectivity needs of remote and mobile workers and small office/home office operations.
- Assess IP-enabling applications for employee "hoteling" workplace settings and unified messaging.
- Do not deploy VoIP when an application does not require it.

Appendix A: Acronym Key

E1	A European standard digital facility with a transmission speed of 2.048 megabits per second (Mbps). In the United States, a 1.544 Mbps channel is used (T1).
IP	Internet Protocol
IS	Information systems
IT	Information technology
LAN	Local-area network
MACs	Moves, additions and changes
Mbps	Megabits per second
NSP	Network service provider
PBX	Private branch exchange
PC	Personal computer
PSTN	Public switched telephone network
QOS	Quality of service
SMB	Small and midsize business
T1	A U.S. digital transmission facility supporting a speed of 1.544 Mbps
TCO	Total cost of ownership
TDM	Time division multiplexing
VoIP	Voice over Internet Protocol
WAN	Wide-area network