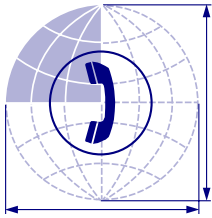


31 May 2002

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# Data Networking

## *Coming of Age: Enterprise IP Telephony*

**Communications Equipment – Data Networking  
Telecom Equipment-Wireline****Highlights of this Issue**

- **The growth of IP telephony in the enterprise is on the rise. More and more enterprises have started to deploy it while others have become increasingly interested in evaluating it. Traditional PBX sales are on the decline while IP-PBX sales are on the rise.**
- **Companies are looking to IP telephony to consolidate their voice and data networks in order to reduce expenses and to deploy new productivity applications. Many organizations, however, remain skeptical of these benefits.**
- **To date, poor performance and reliability have plagued the adoption of IP telephony. However, the quality of service offered today by the leading products compares favorably to that offered by legacy telephony solutions.**
- **IP telephony only represents 20% of the total enterprise telephony lines shipped. IP-PBX line shipments, however, are estimated to grow 50% CAGR over the next 5 years.**
- **We believe the trends toward IP telephony will primarily benefit: Avaya (AV, \$6.82, D-3-2-9), Cisco Systems (CSCO, \$16.01, C-2-1-9), and Nortel (NT, \$2.24, D-3-2-9). Avaya and Nortel are the leaders in enterprise voice infrastructure while Cisco is the leader in enterprise data networking. Each of these companies has the strategic platform and appropriate product mix to establish competitive advantage.**
- **Other potential winners include 3Com (COMS, \$5.72, D-3-2-9), Mitel, Siemens (SI, \$63.49, C-3-2-7), NEC and Alcatel (ALA, \$11.63 C-3-3-8). Each of these companies will most likely capture market share in a particular vertical market or geographic area.**
- **Enterprise data-networking vendors such as Extreme Networks (EXTR, \$11.80, D-2-1-9) and Foundry Networks (FDRY, \$6.94 D-3-1-9) should also benefit from the emergence of IP telephony as customers upgrade their networks to effectively deploy IP telephony across their enterprises.**

**Investors should assume that Merrill Lynch is seeking or will seek investment banking or other business relationships with the companies in this report.**

## Moving To Main Stream

### IP Telephony Comes of Age

*A new market was born...*

In 1995, Vocaltec Inc. (NASDAQ: VOCL) commercially launched the voice over IP industry with the introduction of its Internet Phone software. This software was designed to run on any personal computer equipped with a sound card, speakers, microphone and a modem. Vocaltec's software compressed voice signals and translated them into IP packets to be transported over the Internet to another PC running the same Internet Phone software. This initial PC-to-PC voice communication was limited in quality, reliability and convenience compared to the PSTN however, the cost to use the Internet to make these calls was practically nothing. As a result, a new market was born!

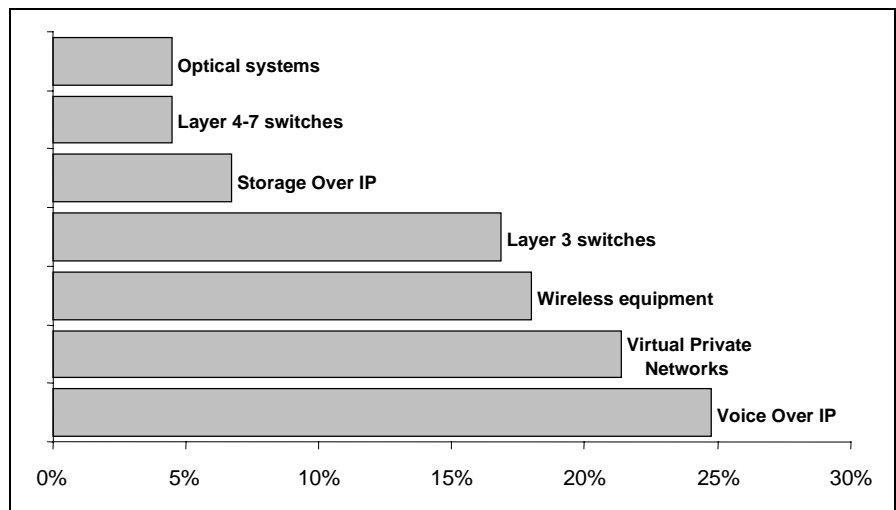
*Then what happened?*

At first, IP telephony remained limited to PC-to-PC type communications; however, new service providers soon emerged to offer IP telephony that could be accessed from any traditional PSTN phone. By deploying gateways that translated PSTN traffic to IP data packets, carriers took calls that originated on the PSTN and transported them across the Internet and then reversed this process through a corresponding gateway close to the location of the person called. More commonly known as toll bypass, this process allowed carriers to offer customers significantly discounted long distance rates, especially between foreign countries. Since quality and reliability remained relatively poor compared to the PSTN, this type of service remained limited to individuals who wanted to save money. Consequently, enterprises never adopted this form of IP telephony.

#### ■ Building Momentum

The IP telephony market has come along way since these humble beginnings. IP telephony has been transformed from an interesting novelty to a serious technology that enterprises are rapidly embracing and starting to deploy. We believe the IP telephony market is reaching an inflection point in terms of enterprise adoption. Through a combination of events including significant technology advancements, the maturation of the data networking industry and the growing trend toward convergence, we believe enterprises will significantly increase the rate at which they adopt IP telephony. In one respect, this trend is already underway as line shipments of traditional telephony Private Branch Exchanges (PBXs) have declined approximately 20% over the past two years while shipments of packet-based IP-PBXs have increased modestly.

*IP-PBX demand is growing...*



Source: Merrill Lynch IT Survey

*IP telephony, VoIP, IP-PBX,  
LAN telephony...it's all the  
same!*

Throughout the rest of this analysis, we will outline in detail what we believe are the primary reasons enterprises will adopt IP telephony in mass. We will also provide an overview of the types of IP telephony solutions they will initially deploy and explain the technology supporting these solutions. Finally, we will review the enterprise IP telephony market from the perspective of the leading technology vendors and assess who will benefit most from the deployment of this new technology.

The communications industry refers to IP telephony in a number of different ways. For purposes of simplification in this report, VoIP (voice over Internet Protocol), LAN (local area network) telephony, IP-PBX and Converged PBX will all refer to IP telephony from the perspective of the corporate enterprise. As IP telephony continues to mature, the difference between enterprise and service provider IP telephony solutions will increasingly blur as the ability to reliably deploy, service and access IP telephony solutions in scale becomes easier and easier. For the purposes of this report, however, we focus on IP telephony only from the perspective of the enterprise.

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## **Technology Overview**

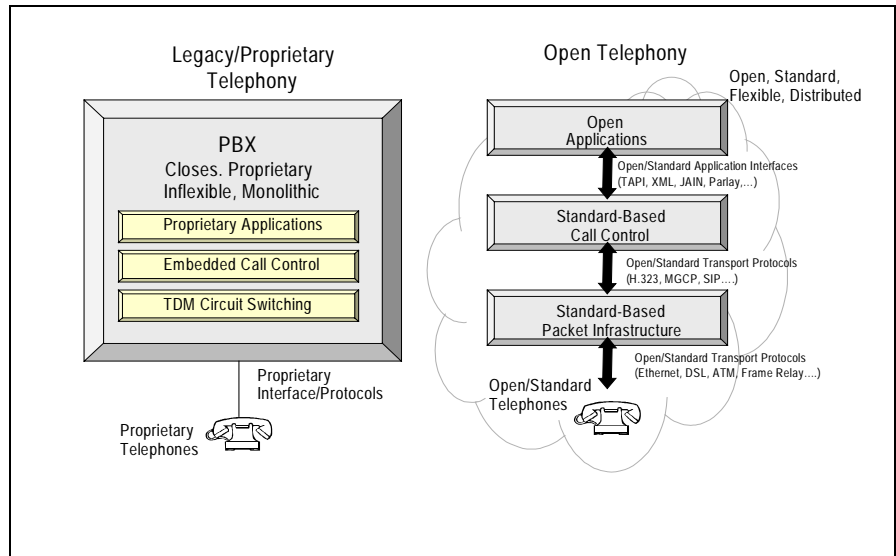
### *Packetized Voice*

Just as computers digitize text or numbers, IP telephony uses the same approach to digitize voice into pieces of data or packets that can be transmitted over a data network. The complexity in IP telephony arises in the transport of these voice packets across a data network in an efficient way. Unlike traditional data communications like email or web browsing where data is not time sensitive and can be understood and interpreted statically, voice communication is dynamic and entirely time sensitive. For a conversation to effectively take place voice packets must arrive at their destination within an appropriate time and be assembled in the correct order. If not, the conversation will be plagued with noise, echoes and moments of awkward silence.

*Open, standards-based IP  
telephony will drive  
innovation...*

From a functional perspective, IP telephony performs the same functions as traditional telephony, however it does so primarily by using standards-based hardware and software similar to practically any other networking application. This fundamental difference between the traditional world of proprietary telephony and the New World of standards-based IP telephony highlights the opportunity for the future of this technology. Based on this open architecture, we expect IP telephony to experience continuous, rapid technological development. Further we believe software developers will continually create new IP telephony solutions that can be easily implemented into existing data networking infrastructures and readily used.

Chart 1: Enterprise Telephony Architectures

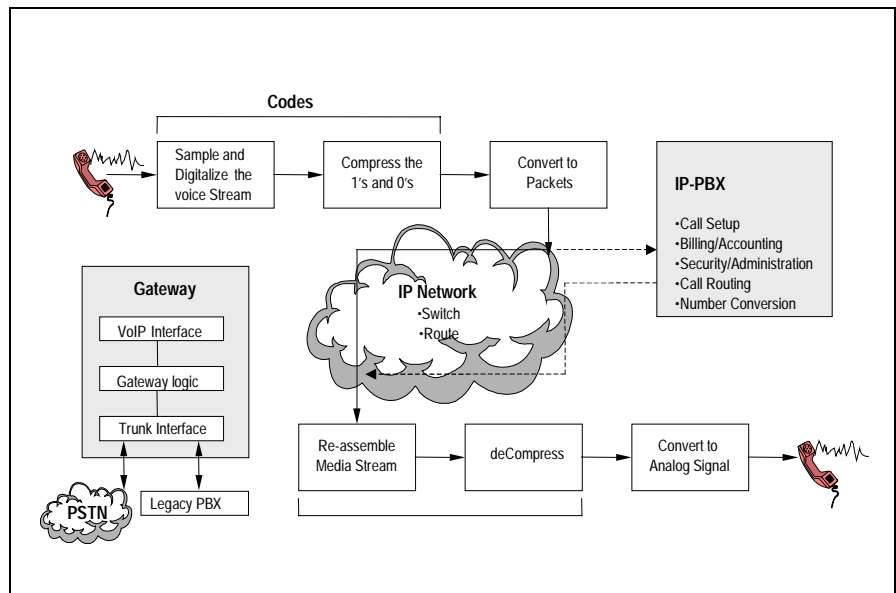


Source: Vertical Networks, Merrill Lynch

**IP-PBX**

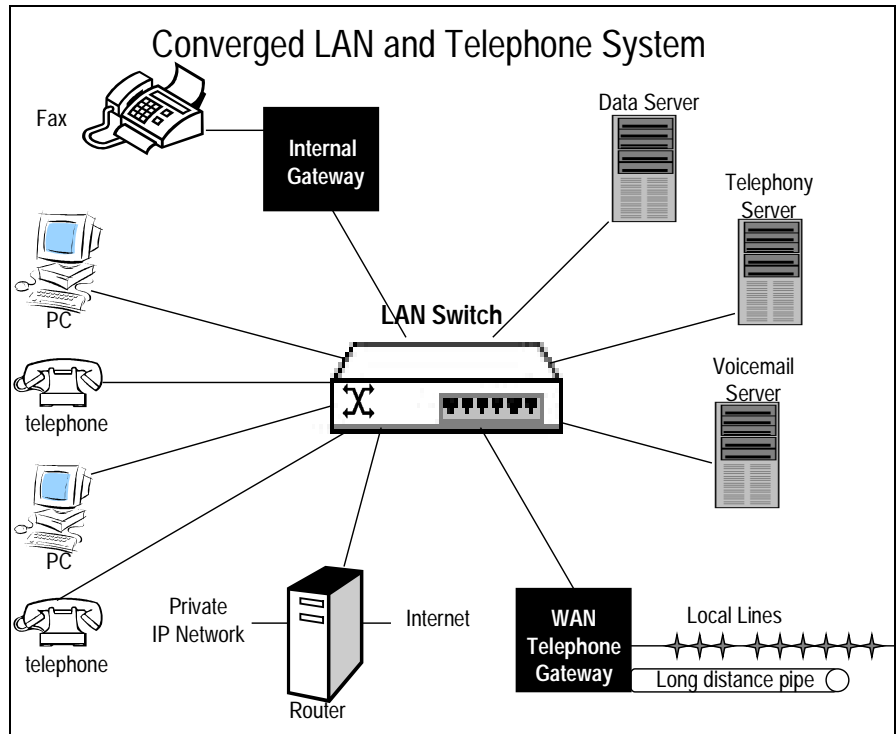
In simplest terms, an IP-PBX leverages a company’s existing data network or LAN to transport packetized voice. An IP-PBX interfaces with a LAN switch and consists of two main components - a communications or media server and an applications server(s). These servers are usually Windows or UNIX based and location independent. They can attach to a LAN via an IP cloud from practically anywhere and manage every telephony element on the network. This allows IP-PBXs to more easily scale and be managed across geographies compared to legacy telephony systems.

Chart 2: IP Telephony Call Flow



Source: Shoreline Communications, Merrill Lynch

The communications or media server provides the call processing capabilities necessary to manage and control all calls on the network. The applications servers meanwhile provide specific telephony applications like voicemail, unified communications, conferencing, etc.

**Chart 3: Converged LAN and Telephone System**


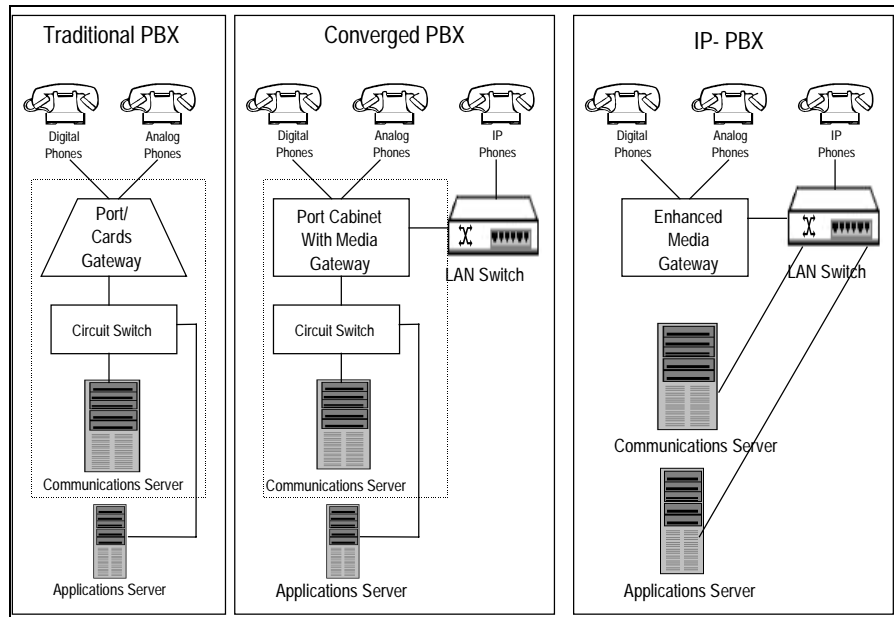
Source: IDC, Merrill Lynch

*Show me convergence!*

**Converged PBX**

Many of the legacy PBX vendors, including Avaya, Mitel, Nortel and Siemens, have been slow to develop pure IP-PBXs. Instead they have developed hybrid or converged PBXs that allow corporations to continue to use their existing PBX and phones simultaneously in an IP telephony environment. These solutions have been designed to protect customer's investments in legacy phone systems and also provide a gradual migration to IP telephony. In these solutions, IP telephony gateway cards are added to an existing PBX allowing it to interface with other IP-based applications running on the LAN such as email, corporate directories and IP phones. To migrate a customer completely to IP telephony, vendors replace the circuit switching technology of the PBX with a LAN-based communications server. Within the past 18 months legacy PBX vendors have also introduced pure IP-PBX systems, however, given their strong customer bases, they remain focused on selling their converged PBX solutions and gradually migrating customers to IP telephony.

Chart 4: Enterprise Telephony Architectures



Source: InfoTech, Merrill Lynch

**IP Phones**

In pure IP-PBX environments, callers use an IP phone connected to a LAN to make calls. These phones attach to a LAN just like any other computer device and provide users with the same functionality as a traditional phone set. Increasingly, many of these phone are coming equipped with small web browser interfaces that allow users to access advanced applications like company or personal directories, web sites, CRM applications, etc.

*Your phone becomes a computer.*

Since an IP-PBX follows the traditional client/server networking model, IP phones of different vendors will interoperate with different IP-PBXs as long as both support an appropriate standards-based signaling protocol (i.e. SIP, H.323, etc.). This is in direct contrast to the legacy PBX market where PBXs have traditionally only supported specific phones made by the vendor of that PBX.

**Network Design**

One of the greatest challenges in deploying IP telephony effectively is appropriately constructing and managing a data network to process voice traffic efficiently. As mentioned above, since voice data is time sensitive it must be managed accordingly and given certain priority. Network devices like switches, routers, etc. must be properly configured to recognize voice traffic and process it in the right manner. As a result, in many instances an enterprise must update its LAN and WAN switches and routers to support higher data rates and new quality of service features before it can offer IP telephony reliably.

In addition, legacy telephony is incredibly reliable and as a result IP telephony must emulate this reliability. One of the key areas it must replicate is in continuing to provide phone service when there is a power outage. For safety reasons, when an organization’s LAN loses power, the IP telephony phone system running on that LAN must be able to continue to provide phone service. To this end, when deploying an IP-PBX, enterprises must also deploy in-line power sources that enable their IP-PBX and associated IP phones to continue to operate when regular sources of power are cut. In addition, for emergency purposes, the FCC mandates enhanced 911 services provide the capability to identify the exact location of a caller based on the number of that caller. One of the key benefits of IP telephony is the ability to allow users to easily move the location of their phone on the network. As a result it is often difficult to determine the exact location of a

*Softswitch: an IP-PBX for carriers.*

caller at any one point in time. Vendors are just now beginning to release E911 solutions that work well in all-IP environments.

### ***Enterprise vs. Service Provider IP Telephony***

Similar to the traditional telephony industry, as the market for IP telephony has matured the solutions that have been created have targeted two types of customers: enterprises and service providers. Although this analysis focuses on enterprise IP telephony, it is helpful to understand how they relate. Just as the PBX was designed for corporate phone networks, IP-PBX's have emerged to provide IP telephony for businesses. Similarly, just as CLASS 4 and 5 circuit switches were created for service providers, Softswitches have been developed to allow carriers to provide IP telephony based services. From a functional perspective, IP-PBXs and Softswitches perform the same tasks as traditional PBXs and CLASS phone switches and differ primarily only in scale and the types of applications they support. As IP telephony continues to mature, the difference between enterprise and service provider IP telephony solutions will increasingly blur as the ability to reliably deploy, service and access IP telephony solutions becomes easier and easier.

Also, in both enterprise and service provider environments IP gateways have been developed to transport traffic between the legacy PSTN and any IP network. IP gateways interface directly with IP-PBXs and Softswitches and enable IP telephony and traditional telephony to coexist.

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## **Adoption Drivers**

### **■ Technology**

#### ***Industry Standards***

*Protocols come to the rescue.*

One of the primary factors that has enabled IP telephony to grow has been the establishment and broad acceptance of industry standards. The emergence of standard protocols such as H.323, SIP and MGCP has given the industry direction and stability. These protocols have provided the foundation for development and the means by which different vendor's solutions can interoperate. This is in direct contrast to the legacy telephony world where phone systems have been based on proprietary technology specific to a particular vendor.

#### ***Quality of Service***

The dramatic improvements made in the quality of service and reliability in making IP-based calls is another leading technology driver that has increased IP telephony adoption. Since its beginning, IP telephony has faced stiff criticism regarding its lack of quality compared to traditional phone networks. Most specifically, the technology has suffered from a problem called latency. Latency is the delay between the time a device receives a data packet and the time when that data packet is forwarded out of the device towards its destination. Since voice communication is time sensitive it is paramount that IP packets traverse across a network efficiently and arrive at a destination in the appropriate time.

Through a combination of improvements to protocols, the creation of new routing techniques and the design of data networks to more efficiently transport and manage voice traffic, latency has been reduced significantly. In properly configured networks, latency has been reduced to the point where the difference between a call over a traditional PBX and one over an IP-PBX is practically unnoticeable.

#### ***Not Without Challenges***

*It's all about quality and reliability.*

Over the course of the past 50 years the PSTN has been developed into an incredibly reliable network providing great voice quality. IP telephony will most likely never reach the same level of reliability and quality as the PSTN, however, we do not believe it has too to become widely adopted. We expect that the IP telephony industry will continue to make technology improvements that will

improve reliability and quality. We believe these improvements will make the performance differences between the PSTN and IP world practically unnoticeable. Ultimately, the significant advantages of IP telephony both from an operating and productivity perspective will far out weigh any of the reliability benefits of traditional telephony.

## ■ Cost Savings

### *Capital Expenditures*

From a capital expenditure perspective, since IP-PBX's primarily run on standards-based hardware, they are cheaper than traditional proprietary hardware telephony solutions. In addition, as the hardware industry continues to commoditize, we expect prices to continue to fall. Many IP telephony critics have noted that the cost of IP phone sets to accompany an IP-PBX, have been prohibitively expensive and have deterred adoption. We believe this is only partially true and expect this to change rapidly as more vendors enter the IP phone set market and the increased functionality inherent in IP phones compared to traditional phone sets, is better understood.

### *Operating Expenditures:*

From an operational perspective, there are also a number of areas where corporations can reduce costs. The most popular area has been the ability to more efficiently manage corporate phone use. By using the company LAN to transport voice traffic, organizations can substantially reduce their long distance costs as voice traffic becomes like any other data traveling across the corporate LAN. Further, by being able to introduce a call into the PSTN from anywhere on the corporate LAN/WAN, companies can use least cost routing techniques to guarantee that every call is completed using the least expensive route based on the rates offered by its service providers. This is commonly referred to as toll arbitrage.

In addition, it is estimated that in a legacy PBX environment, the administrative cost to add, drop or move an individuals phone connection can be between \$75 to \$150 per change. In an IP-PBX set-up, this administrative cost becomes practically nothing as IP phones and numbers are managed centrally like any other device connected to the corporate LAN and can be easily moved from location to location.

Another area of significant cost savings comes in the ability of an organization to fully leverage its data network and no longer manage a separate voice network. Using the same IP-based management and security systems for both voice and data services can significantly reduce the complexity and required personnel to maintain corporate communications. The recent advancements and growth in virtual private network (VPN) technology should accelerate this adoption as corporations become increasingly capable of delivering all of their voice and data applications over a single network interface with guaranteed high levels of manageability, flexibility and quality of service.

## ■ Productivity

### *Unified Communications*

One of the principal advantages of IP telephony is that it extends the capability of traditional telephony and allows it to integrate with traditionally separate applications such as email and the Internet. One of the top applications promoted by many of the leading IP-PBX vendors is unified communications. True to its name, unified communications seeks to consolidate email, voicemail, and potentially any other type of message, into one single repository that a user can access and control from either a computer or telephony interface. Presently, voicemail and email are stored separately in distinct systems that do not communicate with each other. With IP telephony this problem goes away. Since an IP-PBX, by definition, connects to the IP network, the network effectively

*Imagine that...one mailbox for  
all your needs.*

provides a common link between all components on the network including, email servers, PCs, voicemail, IP phones, etc.

### **Remote Access**

#### ***Teleworkers unite!***

Since IP telephony is just another form of data across the LAN, it by definition can be extended to wherever the underlying network extends. For this reason, IP telephony enables corporations to provide remote offices and teleworkers with the same capabilities as if they were located at a central facility. As long as the remote office or teleworker has a broadband connection and access to the corporate LAN, they can effectively use any of the applications offered across that LAN.

### **New Applications**

#### ***Demand for IP call centers growing.***

As a software-based solution, IP telephony can be easily integrated into other applications. Through programming interfaces like XML, TAPI, Parlay, SIP, and others, telephony connectivity can be integrated into applications in new and creative ways. By integrating IP telephony with applications like human resource directories, video conferencing, personal assistant applications, corporate intranets, customer service databases, sales force automation solutions, etc., an enterprise can make more readily available the information its employees need to better do their jobs. This has already been prevalent in the call center market where organizations, by deploying IP telephony systems, have improved customer service through better access to customer data and information. More specifically, companies have been able to better leverage their customer relationship management (CRM) systems by developing repositories of customer information that can be accessed by call agents and sales people through practically any type of interface. In addition, as mentioned above, since all communication applications in an IP world reside on the same network, they, by definition, go wherever the network goes. As a result, by deploying IP-based call centers, organizations can more easily distribute them across varying geographies while at the same time maintain the equivalent level of control and management as if they were all centrally located.

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## **The Market**

The enterprise IP telephony market consists of a combination of a number of legacy PBX vendors, a couple data networking vendors and a few private companies. Presently in the enterprise marketplace, there are two flavors of IP telephony: IP-PBXs and Converged PBXs.

Leading the IP-PBX charge, Cisco and 3Com dominate the IP-PBX market and until recently were the only two vendors to offer pure IP-PBX solutions. Cisco and 3Com have focused on getting customers to replace their legacy PBXs completely with IP-PBX solutions. Unsurprisingly, this strategy was initially slow to win customer traction, as corporations were reluctant to deploy new, relatively unproven technology. However, by aggressive marketing combined with technology improvements and an increasing willingness by corporations to evaluate IP telephony more seriously, these companies have become more and more successful and deployments have become larger and larger in scale.

Deployments were initially limited to remote offices or small campuses, however we are now beginning to see the first large-scale corporate wide deployments. To date, Cisco has focused primarily on large Fortune 1000 customers with its AVVID architecture and claims that over 50% of its largest existing customers have purchased some piece of its IP telephony portfolio. 3Com meanwhile has focused on the small to medium business market with its NBX solution as it has found smaller companies do not require as rich a feature set as larger companies and in general, are more willing to replace their legacy PBXs.

Only recently have the legacy PBX vendors entered the market with competing IP-PBX products. Instead, these companies have focused on IP enabling their

*The voice guys vs. the data guys.*

PBXs to support both traditional circuit switching and IP switching technologies. These converged solutions have focused on providing customers a gradual migration path by which to adopt IP telephony. This strategy has been relatively successful, as many customers remain skeptical of the quality and reliability of IP telephony. Furthermore, many customers invested in upgrading their PBX's in the late 1990's to make them Y2K compatible. As a result, these investments have not yet been fully depreciated. As these systems become fully depreciated in 2003 and 2004, we expect enterprise demand for IP-PBX's to grow and this converged strategy to lose traction as companies become more willing to embrace IP telephony.

Given these market dynamics, we expect the market for enterprise IP telephony solutions to be fiercely competitive over the next couple of years. The top vendors will demonstrate market leadership with solutions that provide industry leading reliability and quality, unsurpassed flexibility and interoperability and a robust portfolio of software-based productivity applications.

In the near term, legacy PBX vendors will most likely have a competitive advantage as customers remain skeptical of IP telephony and are only willing to gradually move toward accepting it. In the second half of this decade, we expect this trend to reverse as IP telephony matures and reaches a critical mass of acceptance. At this point, the competitive landscape will be made up of one or two data networking companies and their respective solutions along with a number of legacy PBX vendors who have successfully migrated their product portfolios to IP telephony.

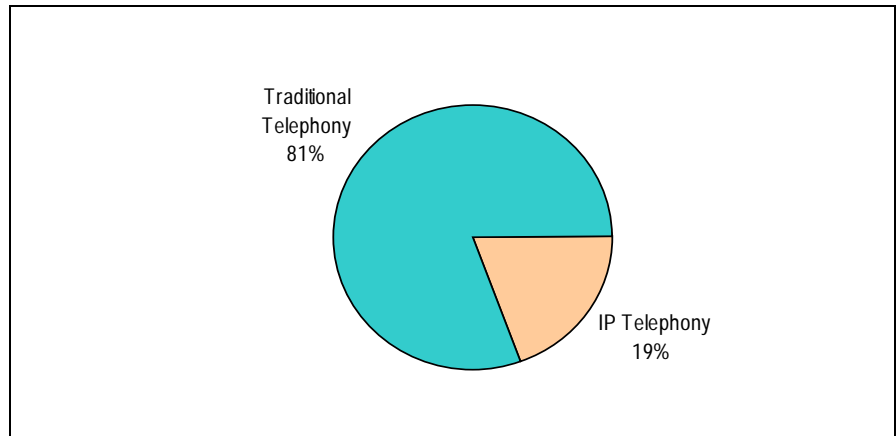
**Table 1: Leading Enterprise Telephony Vendors**

<b>Company</b>	<b>Solution</b>
<b>Legacy PBX Vendors:</b>	
Alcatel	OmniPCX
Avaya	Definity/ECLIPS
Mitel	SX/ICP
NEC	NEAX
Nortel Networks	Meridian/Succession
Siemens	HiCom/HiPath
<b>Networking Vendors:</b>	
3Com	NBX
Cisco Systems	AVVID (CallManager)
<b>Private Companies:</b>	
Shoreline Communications	Shoreline3
Sphere Communications	Spherical
Vertical Networks	InstantOffice

Source: Merrill Lynch estimates.

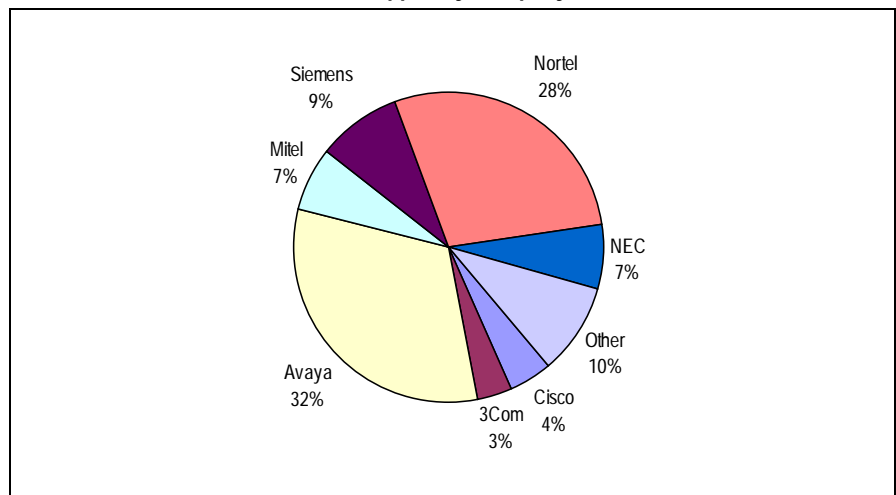
**Market Share**

To date, the IP telephony market makes up a relatively small piece of the overall enterprise telephony market. Of the combined legacy PBX and IP-PBX markets, traditional PBXs represented approximately 80% of the total lines shipped in 2001.

**Chart 5: Total Enterprise Telephony Lines Shipped (2001)**


Source: InfoTech

Not surprisingly, traditional PBX vendors dominate the overall enterprise telephony market led by Nortel and Avaya. Industry analysts, however, estimate that IP line shipments will grow at approximately 50% CAGR over the next 5 years while legacy PBX line shipments will remain flat to slightly negative. We expect that by 2006, 60% to 70% of all telephony lines shipped will be IP.

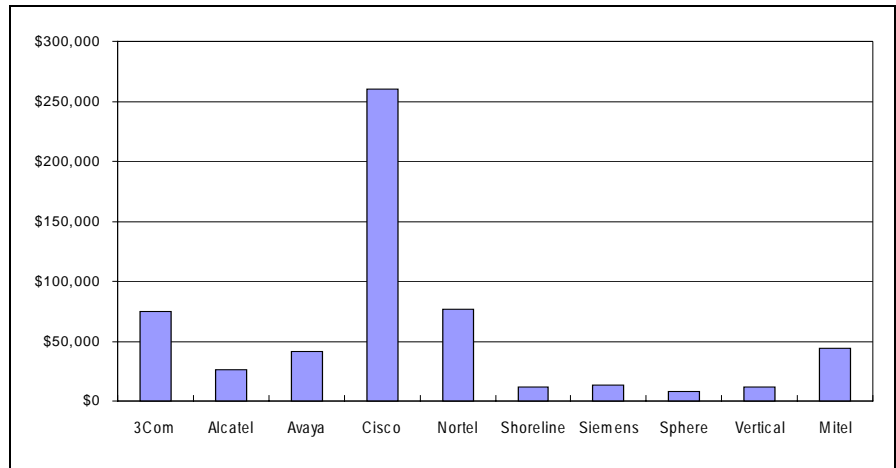
**Chart 6: Total PBX & IP-PBX Lines Shipped by Company (2001)**


Source: InfoTech

*Nortel and Avaya dominate but Cisco is starting to mount a challenge.*

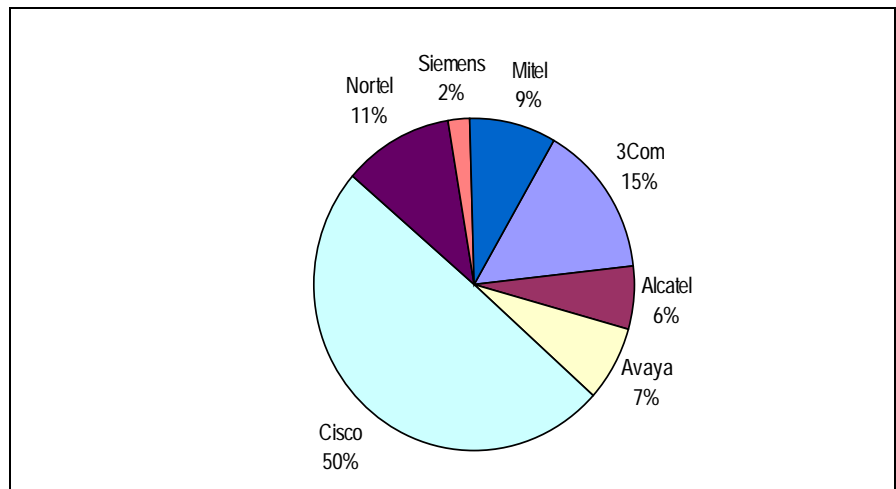
From a revenue perspective, IP telephony revenues were approximately \$600 million in 2001. Cisco led all vendors and was followed by 3Com, Nortel, Mitel and Avaya respectively. As the legacy PBX vendors begin to more aggressively market and deploy their IP solutions we expect that Cisco, Nortel and Avaya will become the dominant players while everyone else will fight for the remaining market share. Industry analysts expect this market to grow to approximately \$4 billion, including IP phones, by 2006. Cisco also led all vendors in IP phone revenue in 2001. We expect that going forward IP phone revenues will make up approximately 20% of total enterprise IP telephony revenues.

**Chart 7: 2001 IP-PBX and Converged PBX Total Revenues ('000s)**



Source: Synergy Research

**Chart 8: IP Phone Market Share (2001)**



Source: Synergy Research

**In Practice**

*Getting up and running with our new IP phone turned out to be easy.*

Merrill Lynch is presently evaluating IP telephony. We are presently in trials with Cisco Systems and its CallManager IP-PBX solution. Currently, we have roughly 2,500-3,000 IP phones installed and are adding new ones almost daily. As part of the trial, we received a Cisco IP phone for use in our San Francisco office.

When we received the phone, we immediately plugged it into a 100 Mbps Ethernet port used for our notebook computer and gave it power. Unfortunately, nothing happened. After a quick analysis of the situation, we realized that the phone was configured for dynamic IP addressing which we do not support in our San Francisco office. After a short consultation with our IT department, we reconfigured the phone for static IP addressing and have since experienced the joys of IP telephony. We have called all over the world, day and night, with no problems. Demonstrating the potential for mobility with IP telephony, the IP phone number that we have been given is a New Jersey number since that is where our trial is based and where we presently host our IP gateways. As a result, all calls that we make to non-Merrill Lynch IP phones are routed to New Jersey and then to the appropriate destination across the traditional voice network. Please feel free to call us on our IP phone at (609) 274-9798.

**Chart 9: Our Cisco IP Phone along side our Avaya (Lucent) 6424 Phone**

Source: Merrill Lynch

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## Conclusion

Like many other promising technologies that have come before it, skeptics continue to ask when will the year of IP telephony finally arrive? Based on a confluence of events and actions, we believe that the wide-scale deployment and adoption of IP telephony is much closer than people think. The technology of IP telephony continues to make consistent improvements and is quickly reaching the level of reliability and quality necessary for wide-scale acceptance. At the same time, the number of IP telephony solutions available from vendors today provides enterprises with a wide variety of options to choose from. This competition will drive the maturity of the industry by improving product quality, setting industry standards and protocols and providing a constant source of innovation. This is exactly the opposite of the status quo that the legacy PBX market has maintained for so long.

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## Company Implications

We believe that a number of vendors will profit from the growth of enterprise IP telephony over the next five years. We expect Avaya, Cisco and Nortel to capture the majority of this market. 3Com, Mitel, Siemens and potentially another legacy PBX vendor will also establish strong presence. From a networking perspective, we also expect the routing and switching businesses of Cisco, Nortel, 3Com and Avaya to benefit from the need for organizations to upgrade their networks to properly support voice traffic. Extreme Networks and Foundry Networks should also benefit from these upgrades.

*Avaya, Cisco and Nortel will lead the way.*

As the top legacy PBX vendors, Avaya and Nortel have competitive advantage moving into IP telephony as they already have large PBX customer bases and strong executive mind share. They both also have strong product portfolios including IP-PBX and converged PBX solutions. In particular, Avaya has done an especially good job in developing advanced IP applications to accompany its new solutions including unified communications and IP call centers. We believe this focus on applications will ultimately provide Avaya with sustainable competitive advantage as it transforms itself from a legacy communications company into a software focused applications company. Nortel, meanwhile, must remain focused on execution as it emerges from restructuring. Avaya and Nortel also possess an appropriate combination of data networking expertise that should enhance their IP solutions.

Cisco, meanwhile, has done an excellent job in establishing itself as the leading IP-PBX vendor to date. We expect it to continue to grow market share however; it must improve and expand its product portfolio to meet customer demands. As IP telephony becomes more and more applications focused, Cisco must no longer approach IP telephony strictly from the perspective of data networking. Rather it must become end user focused and improve and add new applications to its solutions. The company should also explore new ways to leverage its overall networking expertise and dominance to assure customers that it knows how to properly support voice communications.

Finally, we expect that 3Com, Mitel, Siemens and potentially Alcatel and NEC will establish market share within at least some vertical and/or geographical segment(s). We also anticipate that Extreme and Foundry will capture some portion of the IP telephony network upgrade market.

**Intermediate-Term Ratings Distribution: Telecommunications Group (as of 30 May 2002)**

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Strong Buy	18	10.11%	Strong Buy	5	9.09%
Buy	47	26.40%	Buy	16	29.09%
Neutral	92	51.69%	Neutral	26	47.27%
Reduce/Sell	21	11.80%	Reduce/Sell	8	14.55%

**Intermediate-Term Ratings Distribution: Global Group (as of 30 May 2002)**

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Strong Buy	519	17.67%	Strong Buy	151	26.08%
Buy	1053	35.84%	Buy	231	39.90%
Neutral	1187	40.40%	Neutral	175	30.22%
Reduce/Sell	180	6.13%	Reduce/Sell	22	3.80%

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