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Gartner White Paper

Convergence: Evolution or Revolution?

A Review of Voice and Data Convergence and NEC America's Approach

This white paper is an overview of the current market in voice and data convergence technologies, and specifically NEC America's Corporate Network Group's voice and data convergence strategy. This paper includes an assessment of the impact of convergence on three types of customers and how these customers should view NEC's strategy.

The paper is divided into three sections:

Section One provides a short overview of NEC's position in the North American Premise Switching Equipment market according to Gartner's Dataquest group.

Section Two reviews Gartner's position on Convergence and assesses how NEC's strategy compares.

Section Three provides Gartner's analysis of how users should view NEC's strategy as it relates to their specific circumstances. Three types of user scenarios are described.

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Section 1
NEC and the North American Premise Switching Equipment Market

According to Dataquest, in 1999 the North American premise switching equipment (PSE) market displayed moderate growth. PSE system shipments showed steady growth within North America, while line shipments showed much slower growth. Driving these skewed developments was notable growth within the low-end PSE market segment, specifically within the 1-to-8-line size segment, and a drop in shipments in the above 1,000-line market sector.

While NEC, Mitel, Siemens, and Intecom showed positive growth of shipments in the 1,001-and-up line segment, this growth was offset by significant declines by others. Ericsson and Fujitsu's large system line shipments declined almost 50 percent for instance. Overall growth was driven by dramatically increased shipments in the 1-to-8-line segment by several vendors, most notably Nortel and Lucent.

While most vendors experienced a stable flow of shipments from conventional PSE equipment product lines during calendar 1999, most vendors have begun developing/incorporating some type of Internet Protocol (IP) functionality within their product suite. Traditional PBX vendors, such as NEC, Siemens and Ericsson, are releasing IP-enabled convergent systems along with traditional platforms in their product suites. The new wave of converged system vendors selling either IP-based, PC-based, server-based, or un-PBX systems, began making notable moves into the marketplace in 1999. While traditional premise switching system (PSS) shipments composed the large majority of system shipments, sales from private communications exchange (PCX) systems showed strong increases in system shipments.

The market in the United States for Premise Switching Equipment (PSE) is dominated by a small number of established vendors. This group of vendors accounted for over 70% of all the lines shipped in 1999. These five vendors are sub-divided into two tiers.

The first tier includes more than 54% of the North American market. This tier consists of Lucent and Nortel, which bounce back and forth regularly from year to year for first or second place in the overall market. The second tier of vendors includes the next 17% of the market. This includes NEC, Siemens, and Mitel. NEC has overtaken Siemens in the overall third place rank

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NEC and NEC America

NEC is a global technology company. Founded in 1899 its 1999 revenues exceeded $40 billion US. NEC globally has over 150,000 employees and maintains over 100 manufacturing plants in 22 countries.

NEC America oversees a range of telecommunications operations from its headquarters in Irving, Texas. NEC America's Corporate Networks Group (CNG) develops, manufactures, and markets communication products and software for corporate private networks. This includes digital key telephone systems, digital PBX, ATM switching systems, computer telephony products, and audio and videoconferencing systems.

NEC America employs 3000 people generating over US $1 billion in revenue. NEC America introduced its first analog PBX telephone switch in 1970. The NEAX platform of digital switches was originally introduced in 1983. The latest TDM based switch, the NEAX 2400 IMX was introduced in 1998 and is targeted primarily at mid-to-large businesses.

NEC America primarily targets several vertical industries. These include the hospitality industry (i.e., hotels, motels, etc.), universities, health care (i.e., hospitals), and local governments.

The market, however, for NEC (and all the other major vendors as well) is changing. Companies can now consider integration of their voice communications with their data communications. The buzzword for this significant technology change is Convergence. In the next section, we will review Gartner's perspective on Convergence and compare it to NEC's vision for offering Convergence technology to the marketplace.

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Section 2
Gartner's and NEC's view on Convergence

The Adoption of New Technology in the Premise System Equipment World

Convergence is a topic that has been promoted by vendors for several years in various forms, including desktop conferencing, multimedia, and most recently voice/data/Internet convergence. In many ways, convergence makes tremendous sense in the wide area and public networks where the volume of data traffic has exceeded that of voice, but where voice traffic still generates the majority of revenue. Some companies view convergence as a low-cost alternative to current transmission methods, while other companies state that the new converged solutions are a technological smoke screen obscuring solid business justifications. Gartner believes that the mainstream deployment of IP/PBX technology will begin in the small enterprise sector (1 to 100 desktops). Midsize to large enterprise IP/PBX systems are not expected to represent much more than a minority of enterprise PBX shipments for several years to come.

Gartner forecasts the penetration rate of private communication exchange (PCX) systems into the premise switching system market to be about 22 percent by the end of 2003, although the majority of these systems will be shipped to Small and Mid-Size Enterprises and will be enabled for less than 100 lines. The forecast for PCX systems includes PC-based, IP-based and server-based systems. The main challenges facing the adoption of PCX systems in North America are wide area network system deployments and the ability to integrate the management of both data and voice into one network management system. These limitations will slow the adoption of converged systems in the midsize to larger segments over the next five-year planning period.

Convergence Trends in the Enterprise

The enterprise market is comprised of LAN and WAN networking equipment that has been traditionally targeted at large corporate customers (Fortune 2000 companies) but has expanded over the last few years to include the small and midsize enterprises (SMEs). Gartner defines the small enterprise as between 20 and 100 desktops and the midsize enterprise as between 100 and 1,000 desktops. Smaller networks fall into the SOHO category.

Convergence in the enterprise can be defined as the integration of any two or more of data, voice, video and Internet traffic. Some applications that are primarily Internet-based, such as RealAudio and NetMeeting, can integrate most or all of these. However, the demand for video communication within the enterprise is limited to niche applications such as distance learning. Across the enterprise, the most ubiquitous forms of communication involve voice and data. These offer the greatest promise for convergence and are now the most widely touted by vendors. The platforms for supporting voice and data convergence include the ATM-based voice server and IP/PBX.

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Rather than acquire new, unproven IP/PBX technology, midsize to large enterprises with existing investments in traditional PBX systems will take a more risk-averse approach to integrating voice and data traffic when the need arises. The integration of IP functionality will be accomplished through the addition of IP hardware and software in the traditional PBX. Consistent with the needs of the larger enterprise, this is a less disruptive approach that enables IP-based services yet maintains the existing rich set of features and functions as well as the reliability of the circuit-switched PBX.

Market Drivers and Inhibitors

It seems that the traditional voice vendors are making an announcement a day regarding convergence technologies, products or corporate acquisitions. The vendors are displaying a great deal of enthusiasm for convergence. Despite all this vendor enthusiasm, there are many reasons users should not necessarily rush head long into convergence. Why?

First, we need to examine voice vendor motivations for pursuing converged networks. PBXs have been based on circuit-switched architectures since they entered the market more than 30 years ago. PBXs have decreased in price for almost 10 years, and now manufacturers are migrating from legacy circuit-switched architectures to packet-switching-based architectures where features, functions and call control move out of the proprietary PBX onto Windows NT-based servers. However, since current information suggests that the cost of manufacturing these new PBXs will not be significantly lower than today's costs, a manufacturer's only reason to change architectures can be stated in five letters: Cisco. Without an embedded base to protect and a desire to expand traditional data-networking-related revenue streams, Cisco Systems' entry into packet-based voice systems has triggered genuine survival concerns among traditional PBX manufacturers. The motivation to beat Cisco to the punch should not be interpreted as a negative for users. Users simply need to understand why the voice vendors are so aggressively positioning themselves in convergence, and that this reason does not necessarily reflect user demand.

It should be noted that while vendors of traditional circuit-switched equipment are aggressively pursuing convergence technologies for reasons that are not entirely self-less, introducing them now means the outstanding issues that currently prevent adoption by users may be dealt with more quickly.

These issues, or inhibitors, that currently prevent users from adopting convergence technologies, are several. The mere existence of a technology, no matter how hot in the vendor community, does not guarantee its immediate and/or broad acceptance in the communications industry. The PicturePhone and videoconferencing are two well-known examples of such problems. Networking convergence within the enterprise faces challenges to rapid and widespread adoption for a number of reasons, particularly in larger organizations, including the following:

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- Limited applications — Vendors are still working on identifying and developing applications that can really provide a benefit to customers. Certain applications such as call center Internet/voice/data integration can work as true benefits to the enterprise but are still limited to a niche. Broader applications have yet to be identified and developed.

- Current scalability — The existing systems on the market now are usually limited to supporting small enterprises of 100 or fewer desktops. Although this represents a sizable market segment, customers tend to be wary of systems that they may outgrow within a few years.

- Lack of converged management systems — Vendors have spent much time and energy developing and marketing physical layer convergence. However, without a converged management system that can manage a company's voice and data networks as one, companies will find little cost justification to purchase a converged system.

- Investments in installed PBX systems — Enterprises collectively have billions of dollars invested in traditional PBXs and associated handsets. The larger the enterprise, the greater the total investment. This is another factor in limiting newer IP-based voice systems primarily to smaller enterprises and branch office environments.

- Quality of service (QoS) issues — QoS must be dealt with on several levels: availability, uptime and reliability. Converged systems must be able to consistently achieve the "five nines" (99.999 percent) of reliability inherent in today's traditional voice systems. Lack of standards — No commonly applied industry standards now exist for applying QoS to VoIP traffic, creating a further constraint to new technology adoption.

Based on these reasons, Gartner's view on convergence includes the following assumptions:

Gartner Strategic Business Assumptions

1. **Dominant voice (equipment manufacturing) vendors will become the dominant vendors of packetized voice equipment, but will face increased competition for market share from the largest data vendors, which will also compete to become significant players in the market. (0.7 probability).**

2. **By 2004, one third of the PBXs shipped in the United States will be IP-based, however the majority of these will be less than 100 lines (0.8 probability).**

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3. **Through 2003 the customer's primary driver for VoIP voice switch implementations will be perceived lower acquisition cost; however savings will not be realized in a TCO model for more than 90 percent of implementations (0.8 probability).** (See Note 1)

Note 1: This is owing to factors such as staffing costs and required compatibility with existing systems. Furthermore, reductions in toll charges are driving down the operating cost of existing solutions and taking away a lot of the original justification.

Ultimately what does this mean to the user? It means users should not follow the hype in this market and immediately adopt or deploy convergence technologies. Enterprises need to carefully evaluate where convergence makes sense in their organization and move slowly to implement such technologies where appropriate. For many users this will mean mixed environments that concurrently support both traditional voice and data networking and converged networking.

Vendor Convergence Strategies

The five major vendors all have articulated their migration strategies. Some are pursuing a Best of Breed strategy, meaning that they will attempt to integrate into mixed environments with equipment that is better suited to particular applications in networking than that available from End-to-End vendors. Generally NEC, Siemens and Mitel are articulating this strategy. Others such as Lucent and Nortel view themselves as End-to-End vendors.

There are advantages and disadvantages to both Best of Breed and End-to-End strategies. Choosing a vendor with an End-to-End strategy offers a single point of accountability but more dependence on a single vendor, which ultimately means greater risk. Choosing a vendor with a Best of Breed strategy reduces dependence or exposure to a single vendor, but introduce risks of greater costs or project re-starts because of a lack of promised interoperability. Depending on how well an end-user manages contracts, either could cost more. Given the current drivers and inhibitors of convergence Gartner believes that most users should take small steps toward convergence, which in many cases will mean mixed environments, and thus generally favors vendors with a Best of Breed strategy. However, each end user must carefully examine their own environment and requirements to determine what is appropriate in their individual case. We discuss this in more depth in Section 3.

Much of what the vendors are saying may sound the same, so it is important to dig a little deeper to see what's behind these announced strategies. One way to judge just how real a vendor's claims might be is to review how well they have done in the past in delivering on their claims. Were products delivered on time and did they contain the features promised? How well does the vendor support products over time with upgrades and new feature? These are important bits of history to evaluate, because they may foretell how these same vendors will deliver in the future.

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NEC's Convergence Strategy

NEC's stated convergence strategy parallels a number of the key elements in Gartner's recommendations to clients, particularly as it relates to evolutionary change and its view on retaining the same user experience. The following items, according to NEC, summarize their convergence strategy.

1. Over the last seventeen years NEC has striven to introduce new technologies in its PBX line that are evolutionary and not revolutionary. NEC has provided a consistent migration and upgrade path for its PBX customers and has been able to offer migration and backward compatibility to the very first digital RDS system of 1983. NEC has an impressive and consistent strategy of offering investment protection for existing NEC customers.

2. NEC believes the IP Telephony Convergence will follow the Internet model wherein there is ubiquitous infrastructure with open connections for an unlimited number of developers to add value. As a result of this belief, NEC has announced the development of a new IP telephony switching system that will transfer the core switching functionality of traditional PBXs to a network of interrelated call processing units. Elements of the new IP telephony switching system include distributed call management devices, directory servers, Integrated Multimedia eXchange (IMX) gateways, applications servers and “smart” terminals. NEC's strategy is to "provide the customer the same experience, the same expectations on an IP enabled platform as a TDM platform.”

3. NEC believes there is no one vendor end-to-end solution for convergence. Therefore vendors must be 'Best of Breed' to survive. NEC's strategy is to let customers choose which network infrastructure vendor they prefer and integrate into whatever environment that is, whether it be a Lucent, Nortel, Cisco or another vendor's collection of network 'plumbing'. They believe this strategy ensures the customer is not locked in to any one vendor's hardware or application software.

4. NEC believes the customer should have the same experience, the same expectations, on an IP enabled network as a circuit switched network. NEC's approach is to allow the customer to ‘try’ IP without committing to an entire IP Telephony network. NEC views voice and data convergence as an evolutionary process not a revolutionary process. NEC plans to allow customers to utilize integration of voice to the corporate LAN or WAN at their own pace and schedules**.**

5. NEC believes the customer should not be tied to one transport method - reliability and quality should be the same regardless of network fabric. Whichever 'flavor' of transport- VoATM, VoIP, or Voice over Frame Relay - chosen by the customer, vendors should offer and connect with any or all of them.

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In the next section, we look at three different types of customers and discuss how convergence will impact them and also evaluate NEC as a potential supplier.

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Section 3
NEC's Convergence Strategy: The impact on three profiles of Customers

Voice and Data Convergence means different things to different people. It is not correct to assume that a converged network would be the same in terms of technology or in terms of implementation for all types of customers.

In order to understand the different impacts, we have created three profiles of customers. These profiles would be similar for any Convergence vendor, not just NEC. Based on which of the three profiles fits its current situation best, a customer/prospective customer can better understand how NEC's Convergence strategy relates to their needs.

Customer Profile 1: An NEC installed customer.

This customer has an existing NEC NEAX network. Their voice needs are fine tuned and well-managed by the current NEAX network and there is no immediate plan or expectation that the network will need to expand other than routine station/terminal additions or changes.

The key question faced by this type of customer is the continued viability of NEC's platform of TDM based switches. Will the NEAX platform be supported over the next 3-5 years? Will there be a continued course of enhancements and upgrades to the NEAX platform? Customer #1 may be concerned that they will be forced to adopt new convergence packet switched technology because they are hearing that the future of TDM based technology is uncertain.

For this type of customer, Gartner believes that NEC has an excellent track record. NEC's past strategy on technology migration of the NEAX platform has been very good. NEC's evolutionary track record over the past 17 years, from the RDS in 1983 to today's NEAX 2400 IMX is impressive. There is always risk that NEC may change their strategy in the future due to a refocusing of corporate energies, but given their track record, we believe this is a low risk. The long term backward compatibility of the NEAX platform suggests that NEC will continue such a strategy and NEC has stated that their strategy going forward will remain the same.

NEC states that the NEAX platform of TDM based switches will continue to be enhanced and improved over the next 3-5 years. They state that there are no plans to discontinue or diminish the NEAX platform of products. NEC believes that there will continue to be a need for TDM based switches for the better part of this decade. Why? Because not all companies need packet switched technology or are ready for the substantial investment

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to upgrade data networks. In addition, not all companies have the resources to retrain technical staff to become both voice and data experts.

Customer # 1 is in a good position, for even though the NEAX platform can be IP enabled today, there is no need to do so if the user does not want to. If this customer has an 'if it ain't broke, don't fix it' approach to its communications, this approach is recognized and compatible with NEC's overall voice communications strategy.

NEC's strategy enables a scenario where customers wish to mix both NEAX TDM based switches with NEC IP based telephony switches in the future. NEC today is stating that this mix and match scenario is planned for and that customers who wish to do so can design their networks and growth plans with this in mind.

For customers of this type who have not yet identified a need to move toward IP, being able to take small steps as applications are identified, is a very sensible and practical approach to IP telephony. As do other large vendors, NEC recognizes the importance of preserving the existing value and investment of their customers NEAX systems. 'Forklift' expansions are bad news for all customers. It appears that NEC understands this and plans to provide choices to avoid it.

Customer Profile 2: Customer has a mixed vendor environment that includes NEC.

This customer has multiple vendors switches installed across their network and are happy with their networks overall performance. All of their current vendors are providing adequate service and support.

For this type of customer the main question when expansion or change is needed is “Which of my current vendors should I use?'

Almost all of the major voice technology vendors today recognize the need to be able to offer customers the ability to integrate a mix of vendors' equipment across a network. All the major vendors cite the standards that they adhere to. Code words like QSIG, H.323, and G.723.1 are printed over all the vendor literature as proof that each vendor can 'interoperate' with other vendors. However, as many users have painfully learned, simple adherence to standards does not ensure interoperability.

Rather than relying only on vendor claims, there are some simple rules this customer should follow when they are faced with the need to add or change out a system when they have a mixed vendor environment already. One of the simplest is to look first at the vendor that has been the best to work with before the purchase situation arose. The initial cost of the acquisition is significant, but the ongoing cost and ease of working with a vendor after the sale is more important in almost all cases.

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Another critical factor in choosing the right vendor is their local support presence. Most major voice technology vendors have excellent remote diagnostic centers that can check and even predict when there might be a problem, but local expertise is just as important. In addition, in a converged environment, support may be needed for more than just a voice connection; it's voice and data, and how they impact each other. A vendor's local support presence is key to a successful relationship with a vendor. The size and quality of training of the staff are some of the key factors. Both local vendor direct offices and authorized dealers should be scrutinized carefully because these are the first lines of defense when support is needed. In a multi vendor environment, it is critical that the vendor chosen supports the "It's my problem until I can prove it is someone else's' mantra rather than 'It's someone else's problem until you can prove it's mine'. There are always exceptions, but vendors that want to 'do it all' may be more apt to adopt the latter attitude and vendors that want to be 'best of breed' are more apt to adopt the former attitude. We strongly recommend that these types of commitments be included in the support agreement at the time that the contract is signed.

There are a number of additional components that have to be taken into account in making this vendor selection decision. Initial cost, as well as ongoing support and expertise are two of these components, but, as noted in the Customer #1 scenario, how a vendor handles product migration also needs to be considered. NEC, like some of the other major voice vendors, offers upgrades to their current systems that will allow users to take small 'baby steps' toward IP enabling. One possible example would be to add an IP pipe to the PSTN cloud to reduce the number of T1 trunks needed. This step should have minimal user impact and could possibly produce considerable savings.

Given NEC's announced strategy for continuing to enhance existing products as well as IP enabling them, and that NEC is price competitive and has seasoned local resources available, NEC should qualify for Customer #2's short list of 2 to 3 vendors for expansion projects.

Customer Profile 3: A 'Green field situation'. This customer needs to implement voice communications in a brand new campus or office.

This customer may be similar to Customer #2 in that they may already have other locations installed and operational. The principal difference is they currently have no NEC systems installed in any of their sites. It also applies to a pure startup situation.

Customer #3 is in an interesting position. Customer #3 not only gets to choose from the 'Big Five' vendors noted earlier, but they also could be looking at a number of new IP start-ups or even some data networking vendors that are now saying they can provide a single converged network for both voice and data communications. Customer #3 isn't just weighing whether to consider NEC as a shortlist vendor, they may be faced with dozen or more vendors that are pounding on their door.

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Customer #3 doesn't have to worry about migration, or do they? While it is fairly certain that the current generation switches will begin to be phased out over the next 3-5 years, should Customer #3 select one of the Next Generation switches that are currently on the market? Gartner recommends that users test the new technology in small branch or department settings with less than 100 stations. Whether to select current technology or go with Next Generation technology is probably the most important issue Customer #3 will face. Vendors must clearly describe (as part of the contract) how they will address any transition issues that might arise. Unless Customer #3 is only looking to equip a small location as noted above, they should choose the current proven switching technology.

We noted a prediction earlier in this paper relating to the converged marketplace that Customer #3 needs to consider.

Dominant voice vendors will become the dominant vendors of packetized voice equipment, but will face increased competition for market share from the largest data vendors, which will also compete to become significant players in the market. (0.7 probability)

This prediction should send a message to Customer #3. That message is ”don't be blinded by technology.” Purchasing any type of voice and data infrastructure network is extremely costly and not the sort of investment that can be quickly written off if suddenly the vendor no longer exists or is assimilated by one of the dominant vendors

Customer #3 also needs to be aware of another 'myth' related to converged networks, that of cost savings.

Through 2003, the customer’s primary driver for Voice-over-IP voice switch implementations will be perceived lower acquisition costs; however, savings will not be realized for more than 90% of implementations. (0.8 probability)

So, given that cost savings are elusive and that long-term convergence success belongs to the major vendors, how should Customer #3 move forward in determining a short list?

In addressing the cost element, the initial acquisition cost is important but ongoing cost and ease of working with the vendor or dealer are at least as important, if not more important. In fact, total cost of ownership (TCO) is an excellent metric to use in selecting a vendor.

One of the key components of TCO deals with the amount of product integration needed for each vendor's solution. Do you choose a vendor that can offer an end-to-end solution or a vendor that can offer a 'best of breed' solution? For the end-to-end vendor, there should be less concern about whether products will work together because the same vendor will supply the products. With 'Best of Breed' there may be potential

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integration problems and possibly additional cost associated with getting products to "talk" to each other.

There are a number of positives and negatives to both approaches. Do not automatically assume that one of these strategies is better in all situations. Some of the vendors (NEC included) have strong dealer organizations and good relationships with other infrastructure vendors to address the integration issue. Customer #3 needs to get detailed quotes for both integration and ongoing support from both types of vendors. There is no guarantee that the end-to-end vendor's solution will produce the lowest TCO. Ultimately the customer needs to balance the risk of higher integration costs versus the risk of dependence on a single source. In the first case, despite claims of adherence to industry standards, inter-operation between various vendors is never a sure thing. In the latter case, the customer is completely exposed to one vendor's ability to execute on their strategy and their long-term commitment to it. Customer #3 must make this choice but for many customers it has already been made. Those who currently use mixed environments should most likely stay with mixed environments, as they are familiar and comfortable with the risks. Those in single vendor environments should most likely stay with a single vendor offering.

Of course there are always exceptions to the rule. Customer #3 and others like them, if still in doubt about the risk profile they are most comfortable with, need to follow a structured approach to the vendor evaluation process. Customer #3 must identify criteria according to organization-specific requirements, and then decide on an acceptable level of compliance with those criteria. Once this is done, a short list of vendors should fall out. In short, Customer #3 should not start with the vendors, they need to start with their requirements and let vendor selection be driven by these requirements.

If pending this review, it is determined that the customer is more interested in a mixed environment, NEC's stated strategy and track record makes them a viable choice for consideration and in most cases should be on a short list of evaluated vendors for a converged voice and data network.

Summary

Within the dynamic voice communications market entering the era of voice/data convergence, vendors must proactively deploy convergent product, marketing, sales and support plans to attain premise switching system market growth. In 1999, IP-enabled systems failed to account for a significant percent of premise switching shipments, but during the year most end users indicated a desire to be able to migrate to open, standards-based voice/data systems within the next two years. Vendors offering solid convergence solutions that allow customers to eventually leverage a high proportion of

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existing equipment and incorporate this infrastructure into an IP-enabled architecture are expected to experience greater success.

In summary:

- While Convergence is the hot topic in the networking industry there are significant inhibitors to user adoption of these technologies.
- Users should proceed with caution recognizing that convergence may not be right for their situation. However they should begin evaluating the potential impact of these systems on their current environment.
- Most users should take small steps toward convergence and focus on testing rather than replacing existing working systems.
- Vendors must integrate converged migration solutions into traditional product suites to defend market share.
- Vendors must incorporate a strong mix of voice/data convergence-savvy distribution partners and channels to gain market share.
- Vendors must effectively communicate marketing messages to end users regarding investment protection of existing infrastructure and converged system migration opportunities.
- NEC is pursuing strategies that focus on IP-enabling current products and on integrating into mixed environments.
- If properly executed, NEC's strategy (Evolution, not Revolution) will allow users of NEC equipment to move slowly toward convergence, an approach that will be appropriate for many end-users.
- Each end-user needs to evaluate for themselves what approach to convergence will work best for their enterprise.

Ultimately, each end-user must choose for themselves what the best approach to the convergence of voice and data is appropriate to their situation. Each approach, and each vendor strategy for convergence, carries with it costs and benefits. Despite the hype around the entrance of traditional data networking players into voice technologies, the top five voice technology vendors, of which NEC is ranked number three, will continue to be a major factor in providing the systems, and more importantly the service and support necessary for successful converged implementations. As users examine each of these players, they should keep in mind that one of the major issues to examine is the strategy of the vendors for delivering convergence – and whether this strategy matches the end-users requirements to continue to deliver on the Quality of Service expected from voice. In many cases this means an evolution of the existing infrastructure rather than a revolution.