Nortel Networks Internet Telephony Transports Your Business to Next-Generation Success

Internet Telephony Market Dynamics

One thing is clear: Nortel Networks' Internet Telephony is the wave of the future, and its proven Voice over Internet Protocol (VoIP) technology can boost your business performance and accelerate your business success today.

For Enterprises, Internet Telephony means lower costs through network simplification, higher employee productivity, better customer service, more revenue and greater profitability. And isn't that the name of the game?

Nortel Networks delivers a business-building suite of advanced multimedia applications to enable the delivery of new services and dramatically increase revenue opportunities.

For businesses and organizations of all sizes, this includes multimedia contact centers and high-powered business applications such as unified messaging and management, e-Business productivity tools, customer relationship management (CRM), and mobility.

Customers also can save time and money through simplification because Nortel Networks' Internet Telephony literally transforms existing multiple networks into a single, multi-service network, while also driving simplicity to the desktop.

Importantly, it protects the Enterprise's investment in its current network. No forklifting required. The end result is a great Enterprise network that is reliable, rich in features, offers economical and efficient solutions, and low latency. Nortel Networks has an installed base of 43 million customers worldwide and can deliver the benefits of Internet Telephony to them today.

Bottom line: Nortel Networks offers Enterprises choice in Internet Telephony deployment – whether it's upgrading an existing Meridian or Norstar system or the customer is ready to make the move to a pure-IP (i.e., Greenfield) solution.

On the following pages, we'll discuss how Nortel Networks delivers customers a true choice in Internet Telephony deployment via a seamless spectrum of voice, data, and converged Internet Protocol (IP)-based solutions that are designed to help emerging and established businesses reach greater success.

NORTEL NETWORKS

Internet Telephony Is A Convergence Technology

Nortel Networks is a believer in the enhanced power that Internet Telephony brings to business … power that delivers benefits far beyond simple VoIP.

Nortel Networks differs from other vendors because they can offer businesses a choice of deploying IP technology using current network capabilities rather than requiring them to replace their entire systems across the board.

After all, $1 trillion (U.S.) has been invested globally in telephony infrastructure. Nortel Networks is simplifying the evolution and implementation of Internet Telephony so millions can realize this dynamic new technology -- technology that is transforming the way networks drive performance across the entire Enterprise.

Internet Telephony is now a key factor in differentiating a business' operations and customer service strategies, offering companies a key competitive edge in the global economy, where the nearest competitor is now only a click away.

With Nortel Networks' Internet Telephony portfolio, customers can experience the benefits of IP while retaining the reliability, applications, features and functionality they have come to expect from their traditional voice networks.

Nortel Networks offers two comprehensive Internet Telephony solutions: One is designed for companies with an installed telephony base that want to IP-enable their existing communications system, whether it is powered by Nortel Networks leading Meridian* 1 Private Branch Exchange (PBX), Meridian SL-100 or a Norstar* KSU.

Meridian 1 and Meridian SL-100 effectively become an IP hybrid system because they can be used in conjunction with Nortel Networks' Internet Telephony Gateway (IP-connected gateways with trunk and line interfaces), the i2004 Internet Telephone, the i2050 Software Phone, and Optivity* Telephony Manager.

Also, Business Communications Manager integrates with the award-winning Norstar system, leveraging investment in handsets and line cards while delivering the enhanced benefits of a converged network.

A second Internet Telephony deployment option is designed for businesses that want to install a pure IP-based system from the ground up with technology based on the highly reliable and fully proven software of Nortel Networks Meridian 1 and Norstar. Succession Communications Server for Enterprise 1000 offers a pure-IP, server-based solution for large enterprises, and Business Communications Manager offers a pure-IP solution for small- and medium-size businesses.

No one is as experienced as Nortel Networks in leveraging network investments, or as committed to ensuring their customers gain the full value of Nortel Networks solutions. Therefore, Nortel Networks' systems and applications are designed to ensure that small, medium, large and multinational companies meet their business priorities.

And the Nortel Networks customer guarantee ensures that businesses that invest in Nortel Networks' solutions will experience the reliability, quality and product performance they were promised.

While Internet Telephony can increase business productivity, it can also enables businesses to save money, gain proven reliability and protect their telecommunications investment into the future.

Driving the Global Market Shift to Internet Telephony

Internet Telephony is converging previously disparate voice and data networks into one intelligent network – the global high-performance Internet -- that prioritizes the information and sends it faster and less expensively.

It differs from traditional telephony, in which transmission depends on dedicated links and circuit switches. Internet Telephony "packetizes" speech and transmits both voice and data in packets across dynamic IP networks.

Furthermore, Nortel Networks is driving the global market shift to Internet Telephony – either through IP-enabled or pure-IP systems, or a combination of the two – to bring the power of the high-performance Internet to the Enterprise by:

- Leveraging the speed, reliability, and simplicity of advanced technologies, like Optical Ethernet, to reduce installation time and decrease networking and computing costs, all of which can enhance profitability,
- Maximizing the existing telephony network investment, and simplifying network management while optimizing performance.

In fact, Nortel Networks has demonstrated how fast and easy it is to deploy Internet Telephony systems and equipment.

For example, Nortel Networks often demonstrates to its customers how installers can put in Internet telephones on-site at a rate of about 50 phones per hour, and connect them to a centrally managed network. The same installation in the circuit-switched world often requires the better part of a full day.

The Promise of Internet Telephony

Nortel Networks offers the most flexible and robust Internet Telephony solutions available today through its IP-enabled systems, which help Enterprises ***migrate*** to IP telephony, or through pure-IP solutions for Enterprise customers worldwide.

Enterprise customers receive a wide range of benefits from Internet Telephony, including:

- *Cost Savings.* IP networks can be significantly less expensive to operate and maintain. The simplified network infrastructure of an Internet Telephony solution cuts costs by connecting IP phones over the LAN wiring system and eliminates the need for dual cabling. Internet Telephony can also eliminate toll charges on site-to-site calls via global four-digit dialing. And, by using the extra bandwidth on your WAN for IP Telephony, you leverage the untapped capabilities of your existing data infrastructure to maximize the return on your current network investment.

- *Portability and flexibility.* Employees can be far more productive because they are no longer confined by geographic location. Your IP telephones work anywhere on the network, even over a remote connection. With Nortel Networks wireless e-mobility* solutions, your phone, laptop, or scanner can work anywhere on the network where there's a Nortel Networks Access Point installed. And, network deployments and reconfigurations are simplified, and service can be extended to remote sites and home offices over cost-effective IP links.

- *Simplicity and consistency.* A common approach to service deployment allows further cost-savings from the use of common management tools, resource directories, flow through provisioning and a consistent approach to network security. Additionally, customers can centrally manage a host of multimedia services and business-building applications via a Web-based browser. Speaking of centralizing, the ability to network existing PBXs using IP can bring new values to the enterprise. For example, the ability to consolidate voice mail onto a single system, or to fewer systems, makes it easier for voice mail users to network.

- *Ubiquity.* Internet Telephony is supported over a wide variety of transport technologies. A user can gain access to just about any business system, whether it's through analog line, Digital Subscriber Line, a LAN, frame relay, asynchronous transfer mode, SONET or wireless.

- *Scalability.* A future-proof, flexible, and safe solution coupled with high reliability allows your company to focus on customer needs, not network problems. Nortel Networks Internet Telephony solutions offer hybrid environments that leverage existing investments in Meridian and Norstar systems.

- *Increased customer satisfaction.* Breakthrough e-business applications help deliver the top-flight customer service that leads to success. By providing your customers rapid access to sales and support personnel via phone, the Web, and e-mail, your business can provide better customer service than ever before.

Where the Rubber Meets the Road

When the Oregon Department of Transportation (ODOT) was faced with building out its voice infrastructure statewide and extending enhanced telephony services to a new temporary office about 10 miles away, the government agency chose Nortel Networks Meridian IP-enabled Internet Telephony solution -- Remote Office 9150.

ODOT maintains about 7,500 miles of roads and highways across the state. It owns and maintains 2,700 bridges and oversees 2,600 route miles of passenger and freight rail. It's also responsible for a Driver and Motor Vehicle Services Branch that licenses nearly 3 million drivers and registers more than 3 million vehicles throughout the state. The department's existing Meridian portfolio gave all agency employees voice mail, caller ID, call forwarding and access to other enhanced services through the Meridian 1 systems.

The key challenge was to extend unified messaging capabilities to remote branches.

Nortel Networks' Internet Telephony solution provided cost-effective voice connectivity to the new office, while also extending familiar, value-added services. It enabled employees to move their personalized telephone handsets to new locations and connect them to the data network.

That saved about $40 per month for each phone line. And no training was needed because the employees were using the exact same phones that they had on their desks before the new solution was installed.

Reliability is another key issue for any mission-critical organization. In this case, the ODOT's use of Remote Office 9150 also monitored the IP network's Quality of Service (QoS). If high-quality voice conversations cannot be supported, calls can be dynamically rerouted to the public switched telephone network over a backup ISDN connection.

Finally, Remote Office 9150 will be redeployed in the future when the department sets up new temporary offices for highway construction.

While Nortel Networks' installed-base businesses and organizations may deploy an IP-enabled system, others might aim for pure-IP Internet Telephony solutions.

The pure-IP system is achieved through Nortel Networks Succession Communication Server for Enterprise 1000, which consists of a packet-switched PBX that runs on a telephony-optimized server.

Succession Communication Server for Enterprise 1000 is based on an open architecture with IP as the common thread, and provides businesses with a full set of converged telephony capabilities over a data network infrastructure. Switching is packet-based, cabling is simplified, management of voice and data is unified, and user access is flexible. The user can connect with any type of device from any location.

The Succession Communication Server for Enterprise 1000 also offers distributed, scalable network elements, based on global standards and interconnected with IP.

For your business, this results in a flexible terminal and system element deployment network-wide, whether over a LAN or a WAN, easier management with fewer call processors and application servers, integration with current and evolving telephony feature sets and protocols, and a simple, collapsed voice and data network infrastructure and topology.

Quiet Campus Revolutions

Lakehead University of Thunder Bay, Ontario is deploying the largest "evolutionary" Internet Telephony network in North America. The University's new network will include three "revolutionary" Succession Communication Server for Enterprise 1000s and 2,100 i2004 Internet Telephones. But by no means is the University "ripping and replacing" its legacy infrastructure. Lakehead is deploying Meridian Internet Telephony Gateways to IP-enable its circuit-switching PBXs. This will enable the University to leverage its existing equipment, protect its previous technology investment, and evolve to pure IP without discontinuity or disruption.

Students on and off campus will benefit greatly from the new network. For example, students will be able to register for courses and purchase supplies using the IP phones that will be located at most buildings and residences across the campus. And using their IP telephony-enabled PCs, students in separate locations will be able to create "virtual" workgroups in which they will view and work on shared documents in real time.

Perhaps, most exciting are the advances in distance education the network brings. Key to these efforts is video conferencing. Leveraging the new network and special equipment, the University plans to transmit high-quality video of its classes over the Internet.

Ontario's Minister for Northern Development and Mines, Dan Newman, lauded all three partners (Lakehead University, Nortel Networks, and Bell Canada) for bringing technology advances to the north—advances that will open opportunities for students and enable northern communities to develop, attract and retain the best and the brightest:

"The VoIP network is a strategic addition to the Ontario government's support for the construction of an Advanced Technology & Academic Center at Lakehead, which is one of the main facilities where a large number of the Internet phones will be housed for use by students and faculty," he said. "Partnerships of this nature will ensure that Thunder Bay remains an important science and technology hub for government, industry and business in Northern Ontario and that Lakehead continues to be an key training center for the knowledge workers demanded by today's economy."

Spring Independent School District (ISD) of Houston, Texas is deploying one of the largest completely converged data, voice, and video networks in the U.S. The district is deploying 1,200 Nortel

Networks i2004 Internet Telephones. The new IP telephony infrastructure will provide a wealth of new voice services and will enable the district to eliminate a substantial monthly charge for hosted telephony services.

In addition, the new converged network will enable teachers and students to stream educational video across the district's 57 square miles and into its many classrooms. The new video capabilities will enable the district to achieve two important goals: 1) to better address the needs of auditory, visual, and kinetic learners, and 2) to provide world-class distance learning services. Spring ISD plans to share its distance learning capabilities with neighboring school districts and receive educational video from Texas A&M University. Additional planned uses include videoconferencing, IP telephony, and video-on-demand from virtually any school location within the district. "Traditionally, certain classes were only available at one or more locations, so if you weren't at the right campus, you couldn't take the class," said Pete Davis, Assistant Network Engineer at Spring ISD. "But with our new IP video capabilities we can transmit video of our classes to every campus simultaneously. We can also convert all of our analog video into digital format and archive it, thus making it more easily available to faculty and students. The end result is we're reaching more people more easily."

A Solution for All Sizes

We recognize that small-to medium-sized organizations and branch sites have unique needs, too. Nortel Networks Business Communications Manager offers an integrated Internet Telephony solution that provides circuit switching, packet switching or both.

The Business Communications Manager delivers e-mobility wireless solutions, a Web-enabled Call Center application, site-to-site Virtual Private Networks (VPN) capabilities, and easy-to-use, Web-browser-based network management. Along with the Nortel Networks Business Policy Switch, the Business Communications Manager introduces Internet Telephony to the desktop with the support of the i2004 Internet Telephone and the i2050 Software Phone.

Nortel Networks Business Communications Manager also offers access to the Internet for office-to-office networking. And Call Center and unified messaging platforms enable small- and medium-size businesses to offer as much customer service and functionality as companies twice their size.

By supporting both digital and IP-based telephony, Business Communications Manager preserves existing investments in Norstar telephony equipment and, once again, lets companies adopt IP-based solutions at their own pace.

For **financial and insurance institutions**, Business Communications Manager provides security and flexibility for multiple sites, and offers a 20 percent to 30 percent cost savings over buying separate PBX and data networking equipment. IP telephony, voice mail and four-digit dialing between branches improves efficiency and cuts costs, and security is enhanced by using file transfers and email to replace faxes.

Incoming customer calls can be routed through a main or regional office and distributed to branch offices using Auto Attendant or Intelligent Caller Routing, cutting costs once again by consolidating incoming lines.

Furthermore, VPNs can be set up to create secure data tunnels over the public Internet, delivering top-level security with no need for costly leased lines.

Customer service is enhanced by supporting e-mail and voice mail access to corporate workers, and PC kiosks in the branch lobbies add the convenience of quick, personalized account access.

Business Communications Manager enables Nortel Networks to revolutionize the way **health care institutions** operate by delivering both wireless high-speed data and voice services over the same network. For example, hospital staff members have instant access to medical records on their mobile laptops from anywhere in the hospital, making their jobs easier and more efficient.

Wireless phones keep the staff in touch with coworkers, and additional savings can be realized by using the IP network to support the telephony system.

Since the hospital's internal network is converged, there is no need to buy, cable, manage and maintain legacy telephone equipment.

Nortel Networks recognizes the benefits of Internet Telephony extend to any business, whether it's a government agency, a multinational institution, a health care institution, a banking institution or any other vertical market player.

If a global **financial institution** installed IP-enabled PBXs or a pure-IP PBX system, its employees

could simply dial a four-digit code, for example, to call anywhere in the world.

While four-digit dialing can be achieved today on the traditional network, it requires the costly addition of a telephony system that networks directly with the headquarters. With an IP-enabled or pure-IP system, however, it can be linked directly to the traditional network to provide voice and data services globally with all the features and dialing support as if the users were physically connected to the headquarters network.

The result, dubbed "the death of distance," means a worker in downtown Hong Kong could connect on his or her IP-enabled or pure-IP network to a branch office in Hong Kong or a neighborhood bank in Moline, IL, just dialing a four-digit number.

This results in tremendous cost-savings in long-distance phone charges, intra-state tolls and other expenses, and ensures secure access.

Importantly, Nortel Networks can simplify the financial institution's global network management, leaving it free to focus on its core competencies.

Extending Reach to Customers

Since eBusiness remains a part of global business, IP networks provide invaluable multimedia support. Call centers, in their role as key revenue drivers, are a prime example.

Nortel Networks Symposium* Call Center Server, a Windows NT-based solution, routes customer calls to networked agents based on each agent's skills. A pop-up screen instantly tells the agent every detail about that caller, including his or her buying history and preferences.

For end users who are surfing the Web and need help, a call button on the Web site lets the user talk with a "live" service representative.

Nortel Networks' solutions also recognize the need to support cutting-edge wireless IP telephony solutions. For example, a retailer who needs to control merchandise levels, a network manager who needs to inventory office equipment, or a shipping and receiving officer will find simplicity by using headset phones, accessing the Internet with wireless laptops, and using wireless bar-code scanners.

Technical Considerations

Be sure to consider these important factors before converting your data network.

1. **Latency and packet loss.** You should measure and characterize end-to-end latency and packet loss for the IP Telephony traffic class across your network. Whether the results are acceptable depend on the quality of voice you expect and the amount of bandwidth used. There are also strict requirements concerning the type of codec and end-to-end packet loss and delay. Consider the G.729 standard voice-encoding algorithm. There must be fewer than 150 to 200 ms for packet loss values of 1 percent to 2 percent to obtain reasonable voice quality. That means 98 percent to 99 percent of the packets must travel the IP network within 50 ms to 100 ms, assuming a 100 ms endpoint delay budget. If bandwidth use is not a concern, the G.711 standard will provide good quality at end-to-end delay values of 200 to 300 ms and packet loss levels of 2 percent to 3 percent.

2. **Recognition of the 802.1P standard.** Your wiring closet should be able to recognize the 802.1P protocol for traffic prioritization at Layer 2.

3. **Ability to prioritize at Layer 3.** The core data network must be able to provide Layer 3 priority. It is also optimal to recognize DiffServ, an IETF standard for differentiated classes of service for various applications and business requirements. However, routers with priority queuing capability should be fine for initial deployment.

4. **IP telephony call patterns.** You should determine what the telephony call patterns will be like across the IP infrastructure. The telephony usage patterns of your Enterprise should give you a good starting point.

5. **Determine WAN utilization before voice is added.** To fully determine the ability to carry voice over long distance, you should examine WAN use. Have the WAN running no more than 85 percent utilization at peak traffic. The acceptable percentage of voice traffic should be engineered for each transmission link in the IP network, and should be estimated based on the Enterprise's telephony use.

6. **Traffic patterns and peak utilization.** You should be aware of network traffic patterns at different times of day. Examine these patterns

over a defined time period to determine peak times in network use, such as monthly rollups or end-of-quarter processing.

7. **Link speed and voice quality.** The speed of network links – connections between devices – will affect voice quality. Consider the possible impact of VoIP bandwidth on the data flows on the same links.

8. **Network congestion and drop packets.** Examine areas of network congestion and measure your IP switches and routers for the degree of drop packets and re-transmission, queue exhaustion, ingress and egress delay and CPU utilization. You also should evaluate where to place the Connection Managers.

9. **Reliability of the network infrastructure.** You should be careful to determine such things as LAN Mean Time Between Failure, router functions and recovery. You should also check the network powering standards.

10. **Policy servers.** Finally, you should consider your strategic direction on policy servers. They are a good strategy for supporting different levels of services on an IP network.

Internet Telephony: Now And In The Future

Nortel Networks brings the power of IP to Enterprises worldwide to unleash the profit potential of the Internet, enabling them to deliver new multimedia services and applications and reduce network costs through simplification, resulting in speed to profitability.

The world has a $1 trillion (U.S.) investment in telecommunications infrastructure. We are enabling our 43 million users globally – the largest installed base in the world – to leverage that investment as they make the transition to new services based on the Internet.

Only Nortel Networks offers customers a choice in deployment from the complete spectrum of traditional telephony, IP-enabled or pure-IP telephony solutions, with the same available features as Nortel Networks' leading Meridian 1 and Norstar products.

Other key features Nortel Networks' Internet Telephony solutions provide to Enterprise customers include:

- eBusiness applications, like Personal Call Director, integrated seamlessly with Internet Telephony features
- Multimedia Contact Centers – These solutions integrate self-service capabilities like IVR and speech recognition with Nortel Networks assisted service capabilities, including real-time agent communications with web collaboration capabilities, "click to talk," chat and Web page pushing
- Unified Messaging across the desktop integrated into the IP network
- Flexibility - 'Plug-and-play' moves, ability to immediately add, expand and change phone access with the total feature set, much like plugging in a PC from any location
- LDAP: Interface with corporate directory, eliminating significant time and resources to input to multiple systems, reduces redundant database creation
- Lease-line cost reduction through the elimination of DSI circuits
- Network administration savings: Managing voice, data and multimedia over one network

What We're Doing to Make It Happen

Nortel Networks' Enterprise Internet Telephony portfolio is unparalleled in addressing Enterprises' differing business goals, communications requirements, and technology adoption rates through:

- Pure-IP/Greenfield Solutions: Succession Communication Server for Enterprise 1000 and Business Communications Manager

- IP-enabled Solutions: Succession Internet Enabled Solutions for Meridian (Internet Telephony Gateways, i2004 Internet Telephones, Remote Office 9150, Option 11C IP Expansion), Business Communications Manager, and Instant Internet

- Digital Telephony: Meridian and Norstar

- Infrastructure: BayStack*, Passport*, Business Policy Switch, and OPTera* Metro

- Unified Management/Quality of Service: Optivity portfolio and Business Policy Switch

- Advanced Application/eBusiness: CallPilot, Wireless LAN, Symposium, Clarify*, e-mobility, and Periphonics*

The Future is Now

Nortel Networks is simplifying the evolution and implementation of Internet Telephony – by taking a customer-focused approach, offering solutions that are congruent with their business goals and network requirements.

With our Internet Telephony portfolio, Enterprise customers can experience the benefits of IP taking an 'evolutionary or revolutionary' approach– IP-enabled or pure-IP systems -- while retaining the reliability, applications, features and functionality they have come to expect from their traditional voice networks.

For Enterprises, Nortel Networks' Internet Telephony drives lower costs through simplification, higher productivity, and enhanced customer service.

We also deliver a robust suite of advanced multimedia applications for the delivery of new services and customer applications that result in speeding time to profitability. That's why Internet Telephony is ultimately about the bottom line.

Nortel Networks' Internet Telephony enables Enterprises worldwide to unleash the profit potential of the high-performance Internet and eBusiness to drive their business success.

Nortel Networks' Internet Telephony is the wave of the future. We're delivering it today, with a full spectrum of solutions designed to meet the varying needs and adoption cycles of businesses around the world – because we recognize every business is unique.

We invite you to become a part of the new IP-powered world of tomorrow – today!

For more information, please contact your local Nortel Networks account representative or call 1-800-4NORTEL (1-800-466-7835) or 1-506-674-5470.
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