An Introduction to Next-Generation
Network Services

The Next Big
Opportunity on
the Web

intel®

Table of Contents

Today's business environment is more competitive—and complex—than ever before. Customer service is the key to success. And demand is growing for powerful new communications services as a strategic way to enhance customer service and build a competitive edge. At the center of these new services is the next-generation network (NGN).

What is a next-generation network? It's the next step in world communications, traditionally enabled by three separate networks: the PSTN *voice* network, the *wireless* network and the *data* network (the Internet). NGNs converge all three of these networks—voice, wireless, and the Internet—into a common packet infrastructure. This intelligent, highly efficient infrastructure delivers universal access and a host of new technologies, applications, and service opportunities.

Three types of services drive NGNs: real-time and non real-time communication services, content services, and transaction services. The services-driven NGN gives service providers greater control, security, and reliability while it reduces their operating costs. Service providers can quickly and cost-effectively build new revenue.

Built on open, modular elements, standard protocols, and open interfaces, the NGN caters to the specific needs of all users—enterprises, remote offices, telecommuters, and small office/ home office (SOHO) customers. It unites traditional wireline and wireless voice, video, and data using a packet-based transport. The new class of services it enables is more flexible, scalable, and cost-efficient than services that have been offered in the past.

One key NGN service is voice portal, which provide callers with anywhere, anytime access to information like news, weather, stock quotes, and account balances using simple voice commands and any telephone. Voice portals are poised to become the Next Big Thing in communications. The organizations using them will have

a very real edge in the marketplace—differentiating themselves from their competitors, attracting loyal customers, and growing their revenues.

Whether you're looking to build, integrate, or sell any kind of voice-based service for the next-generation network, Intel has the hardware, software, and services for next-generation network solutions, including a complete voice portal platform. Intel® technology enables companies to develop and deploy speech-enabled telephony applications, like voice portals, that make the most of current technology in order to deliver voice commands with the highest accuracy and best performance.

NEXT-GENERATION NETWORK BENEFITS

- **More Choices—** Open systems promote multi-vendor participation in the marketplace.

- **Lower Costs—** Solutions built on open standards cut development time for solution providers.

- **Innovative Services—** Working to standards frees developers to concentrate on adding value.

- **Lower Risk—** Compatibility with products and technologies from many suppliers decreases the risk of ownership.

Deploying NGN Services

Next-generation communications solutions are built with open, flexible, standards-based building blocks. The reasons are clear: with open solutions, there's no need to start from scratch to add next-generation voice-enabled e-Business services. Using modular building blocks makes it easy and affordable to add new features, services, and value to existing systems. It all adds up to powerful, affordable solutions that protect your—and your customers'—investments.

The NGN begins with media servers, which provide advanced media processing capabilities. The value of a media server is its flexibility for supporting advanced media processing services like basic voice announcements, interactive voice response (IVR), conferencing, messaging, text-to-speech (TTS), and speech recognition. Built with open, standard computing and voice processing boards, media servers can be deployed many ways. For example, a voice portal platform is a media server that provides a speech-driven user interface with simple speech recognition and TTS capabilities, providing voice-client access to Internet content, messages, or both.

Voice Portals Mean Explosive Opportunity

Speech-enabled Internet portals, or voice portals, are quickly becoming the hottest trend in e-commerce—broadening access to Internet content to everyone with the most universal communications device of all, a telephone. Voice portals put all kinds of information at a consumer's fingertips anytime, anywhere. Customers just dial into the voice portal's 800 number and use simple voice commands to access whatever information they need. It's quick, easy, and effective, even from a car or the airport.

The potential for voice portals is as wide as the reach of telephones, which today number 1.3 billion around the world. Compare that to the 250 million computers with Internet access and it is easy to understand why analysts believe voice-enabled Web access will take off. Frost & Sullivan* estimate a 54 percent growth rate for the voice portal market segment over the next six years. The Kelsey Group* predicts US $5 billion in voice portal service revenues by 2005, including advertising, subscriber bounties, and location-specific commerce, with an additional US $7 billion incremental revenue to the infra-structure providers that serve those companies. By 2005, they predict, 45 million users of wireless phones in North America will regularly use voice portals to handle their everyday cyberchores.

Today's voice portals are just the tip of the iceberg—the first step in changing the way people access Internet content and, ultimately, how businesses and consumers will conduct business over the Internet. Over the next few years, voice portals—and the core technologies behind them—are poised to profoundly change both the way people use their telephones and the way businesses view and interact with their customers.

Voice portals are changing telephone interaction from a vendor-centric to a customer-centric experience—increasing satisfaction for customers while they improve efficiency and cut costs for businesses. A voice portal provides telephone users with a natural language interface to access and retrieve Web content. An Internet browser can provide Web access from a computer, but not from a telephone. A voice portal is a way to do that. Of course, simple access and retrieval of information is just the beginning. A voice portal can also provide users access to virtual personal assistants and Web-based unified messaging applications.

Voice portals can also cut operating expenses by freeing up agent time and replacing human operators with an easy-to-use automated solution. They also provide new revenue opportunities by opening up the possibility of new subscription services or building revenue through advertising.

Voice portals are the next frontier in convergence, the intersection of the Internet and telecommunications, blurring the distinctions among voice and data, computers and telephones. And, like any frontier, the rewards are great for staking your claim early.

The voice portal reference system is a packaged, integrated hardware and software reference system for building hardened e-Business and speech-enabled voice portal solutions. Combining the power of server technology with telephony interface boards in an integrated server reference system, it is embraced by leading speech technology providers.

WHAT VOICE PORTALS MEAN FOR YOU

- **A Competitive Edge**—Add customized features to differentiate yourself from your competitors and create a "sticky" environment. Offer your customers one-stop shopping, self-service, and instant 24x7 access to their account information.

- **Customer Satisfaction**—Let your customers use the telephone to easily retrieve information or manage accounts using natural voice commands. Provide a friendly, efficient caller experience that surpasses today's touchtone systems. Offer convenient, flatter menus that don't lock up your customers.

- **Cost Savings**—Save on operator expenses and free up agent time by replacing human operators with an easy-to-use voice solution. According to a study by Goldman Sachs*, each human-assisted call costs US $3—compared to the 20 cents it costs for a call with automated response.

- **More Revenue**—Offer new subscription services or build revenue through advertising.

- **Improved Security**—Use speaker verification to validate callers' identities

VOICE PORTAL REFERENCE SYSTEM

- Complete, single-source solution for voice portal applications providing server, network interface and voice hardware, support, development tools, and professional services

- Delivered on the Intel® ISP2150 high-performance 1U and 2U rack mountable chassis for reliable, flexible, high-density solutions in a small footprint

- Integrates Intel® communication building blocks from the Dialogic® family of products, which provide voice and global network interface options for enterprise and service provider markets

- Incorporates Continuous Speech Processing (CSP) software features, providing advanced barge-in, echo cancellation, and speech detection for host-based automatic speech recognition (ASR) engines

- Scalable configurations supporting 36, 42, 60, and 96 CSP ports, enabling high density and improved price-performance

- Advanced design of barge-in and pre-speech buffer features offer best-in-breed software reference system for scalability and accuracy

Why Now?

When Alexander Graham Bell said, "Watson, come here; I need you," instead of, "Watson, what time is it?" he unwittingly signaled the need for a powerful new communication medium. Over the next century, and beyond, the promise of offering telephone access to simple information services like time—or more advanced services like stock trading or account management—was always there. But that potential was never fully tapped.

There were several reasons. For one, the telephone keypad can give users only a limited number of choices. Also, a phone provides no easy way to navigate from one question or information source to another except to go back to a beginning menu. In wireless communications, this problem is being addressed by a standard, lightweight browser and application protocol for phones using technologies like wireless application protocol (WAP). However, this interface can still be cumbersome for a caller who is driving.

Also, there were no Internet business advertising models for content delivery. Most telephone-based information providers charge users a fee for sports scores or even weather. But there are limits to what consumers will pay for information.

Why is now the right time to give users telephone access to widespread information resources? Because much has changed in the last several years: the structure of the communications industry, the technology, and user expectations.

First, deregulation of the telecommunications industry has given rise to a new class of service providers who need to set themselves apart in a fiercely competitive market. Voice portal services are a way to do this. Relatively straightforward to deploy, they offer many opportunities to carve out a singular niche in the market. Every service provider wants to be the next Yahoo* or AOL*. Voice portals offer service providers an incredible opportunity to expand their user base.

At the same time, existing portal and Web site operators have huge databases. Also, they can support telephone applications with minimal investment. And the business models driving the success of the Web—advertising-based instead of fee-based—can be easily adapted to Internet access using the telephone.

Technology has also evolved. Speech recognition technology in particular has made dramatic advances, powered by huge increases in processing power. Text-to-speech (TTS) technology has also improved. The adoption of a standard voice scripting language, like VoiceXML, can be expected to fuel voice portal services the same way HTML fueled development of the Internet. The cost of creating a speech-based portal platform also continues to decline. Increasing densities and decreasing costs for voice processing and network interface hardware allow service providers to serve more users at less cost.

Finally, the Internet has raised public expectations. Internet users have grown accustomed to having information at their fingertips. Once people learn to expect immediate Internet information— for example, e-commerce, stock quotes and trades, paying bills, transferring funds— the transition to getting that information over the phone is the next logical step.

For those without computers, the telephone is a natural way to cross the digital divide into the new world of information access. In fact, the number of persons with access to telephones is expected to be 4.9 billion worldwide by 2004, while the number of persons with access to the Internet is estimated to be 800 million. *(Source: Telsurf Networks* white paper)* And as more people use cell phones, they expect instant access to information even when they are away from their homes or offices.

It all adds up to a new kind of convergence. The Internet, designed as an information medium, is quickly becoming a communications medium. The telephone was designed as a communications medium, but is transforming into an information medium with the emergence of voice portals. And in a digital world, communications and information are converging into a stream of digits that can be readily accessed by many devices—whenever and wherever people want.

Who Provides Voice Portals?

The voice portal industry is still emerging, with business plans changing fast and the prospect of mergers and shake-ups ahead. Today, start-up voice portal companies, Web portals, and network service providers typically provide voice portal services.

START-UP VOICE PORTAL COMPANIES
These companies' basic business is building, hosting, and marketing voice portal services targeted to particular audiences. An example is HeyAnita*, whose voice portal provides a different mix of information services directly to businesses and consumers. HeyAnita debuted its services in the fall of 2000.

WEB PORTALS
A second kind of provider is a traditional Internet portal looking to extend its reach over the phone. For example, AOL recently purchased Quack.com* to allow people to access AOL by telephone. It's easy to understand the advantages of voice enabling a Web portal. As Kathy Kinney, MapQuest* Director of Business Development, told the *Wall Street Journal*[†]: "As a dot-com, our reach was limited to those who got to the Internet through some type of techie device. We looked at the phone service and said 'Holy cow, this is the way we can reach the neighbor across the street through the phone in her kitchen that she's been using all her life.'"

(*[†]Wall Street Journal*, June 20, 2000)

NETWORK SERVICE PROVIDERS
The third major category of voice portal service provider is telecommunications or Internet service providers. These providers are looking to build customer loyalty and maximize network usage with branded portal services they host in the network or obtain from third-party suppliers. For example, Talk2.com* is partnering with wireless companies that want to add value to their packages.

Telera*, Netbytel*, and iBasis* are all examples of hosting service providers that allow ISPs and start-up voice portal companies to extend enhanced services using voice—without having to build and maintain the technology infrastructure. The ISP does not need to be an expert in a particular technology or application like speech recognition or telecommunications. Instead, the ISP can concentrate on launching new services and growing its business. These hosting service providers are all based on Intel® technology, which allows them to scale and change to meet an ISP's growing needs. In short, an ISP can select the best-of-breed application that fits its business model and stay focused on attracting and locking in customers, not on maintaining technology.

Technology Trends and Their Providers

Several technology trends are speeding the emergence of voice portals. Most significant is speech technology, which has grown at a breakneck pace over the last few years. Most analysts project a continuous growth rate of 31 percent each year from 1999 to 2004.

AUTOMATIC SPEECH RECOGNITION (ASR) SOFTWARE
Automatic speech recognition (ASR) is rapidly entering the mainstream. Early speech applications recognized only a small vocabulary of 20 to 30 words, but the accuracy and vocabulary size of ASR engines has dramatically improved fueled by refined algorithms, dramatic increases in processing power, and lower costs. Today's speech systems support naturally spoken phrases and do not require prior training.

Major vendors of speech recognition software include IBM*, Nuance*, Philips Electronics NV*, and SpeechWorks International*. In the U.S., Nuance and SpeechWorks are popular choices for speech recognizition software with support for multiple languages.

CONTINUOUS SPEECH PROCESSING (CSP)

Continuous Speech Processing (CSP) technology from the Dialogic family of products, eliminates the need for dedicated speech hardware. CSP optimizes the performance of host-based speech recognition engines by streaming preprocessed voice data between the telephony boards (analog, T-1, E-1) and the host computer's central processing unit (CPU). Because CSP supports hardware from the Dialogic family of products, it is used for front-end data processing, the host system is better used for speech recognition.

Systems built with CSP provide higher-density capability by offloading CPU-intensive functions to the digital signal processing (DSP) speech detection modules—including high-quality echo cancellation, voice activity detection (VAD), and a pre-speech buffering. This frees the host processor from wasteful continuous processing of irrelevant data like silence.

Supporting up to 120 ports per board, CSP software features a unified application programming interface (API) for enhanced system scalability. Developers can add hundreds of speech-enabled ports and still effectively deliver high-quality speech recognition—plus tremendous savings in infrastructure and deployment costs.

TEXT-TO-SPEECH

Once information is accessed, it needs to be communicated to the user. One way to do this is with text-to-speech (TTS). Increasingly used to speak email and Web-based text to callers, TTS will play an even wider role in the future. Real-world applications like email can be read over the phone by preprocessors that handle so-called "dirty" data like acronyms, contractions, and differences in intonation. Lernout & Hauspie* is a principal TTS vendors with support for multiple languages.

VoiceXML

Just as growth of the Web was catalyzed by the development of the HTML scripting standard, the acceptance of a universal standard for voice-based services is propelling the growth of voice-based services.

Voice eXtensible Markup Language (VoiceXML) is the major standard for voice-based services. It will allow providers to open up Web services to customers using voice interfaces. It will handle synthesized speech for TTS recognition of spoken input, recognition of dual-tone multi-frequency (DTMF), recording of spoken input, and telephony call control. Enterprises can build automated voice services using the same technology they use to create visual Web sites, significantly reducing the cost of construction and delivery of new capabilities to telephone customers. Because established Web technologies are used, the integration with back-end databases can be shared with the HTML application.

VoiceXML, which began at AT&T Bell Laboratories*, brings together Lucent* and AT&T Markup* languages with IBM's SpeechML* and Motorola's VoxML™. Most major players in the development of speech-based players are members of the VoiceXML forum.

NEW TESTING TOOLS

The success of speech-based applications depends on factors like the phrasing of voice prompts, as well as on other behavioral factors. That makes it important to be able to easily encapsulate lessons learned into new applications.

Speech technology providers have created powerful tools to speed up deployment. One high-level applet, for example, contains much of the knowledge gained from an application's dialog design and implementation of frequently used caller interactions. This can reduce the time it takes to build a new application from 30 person-years to months or even weeks.

Deployment Options: Buy or Host

No matter which path you follow, here's what you need to consider when choosing a voice portal vendor:

- Is the solution built with open, standards-based components?

- Is it scalable?

- Is there a clear and definable growth path?

- Is there adequate flexibility in the platform to add or modify service offerings?

- Does the vendor provide adequate support?

- Is training available?

- How robust are the consulting services offered by the vendor for system planning, design and deployment?

BUY A SOLUTION

As the market for voice portals matures, a growing number of voice portal solution providers are supplying leading-edge applications. When you evaluate sources, look for a vendor that provides all the components your voice portal solution needs including voice boards, network interface, software development tools, applications platforms, and computing hardware—all bundled into a single solution. Also, make sure that individual hardware components can be optimized for a specific configuration, providing reliability and bulletproof operation. The applications that reside on these tightly integrated platforms can be turnkey products or toolkits that make it easy to tailor the solution to individual needs.

One company supplying a complete voice portal solution is HeyAnita, which offers a customizable system that can turn any organization into a virtual one-stop shop. Developed with Intel® building blocks, the HeyAnita solution provides flexible options for letting customers use the telephone and simple voice commands to manage their accounts. For a financial institution, for example, these options might include letting customers access their stock portfolios, 401K plans, and account balances and even use a business locator to find the nearest branch office. The HeyAnita solution also provides an easy way for customers to get up-to-the-minute information like stock quotes and company news.

> **HeyAnita offers a customizable system that can turn any organization into a virtual one-stop shop.**

HOST A SOLUTION

On the data side, the Internet ecosystem has evolved into a model where space, hardware, and event content can be hosted by one or more third parties. The voice portal market is moving in the same direction.

A fully-managed hosting solution provides the advantages of a bandwidth-rich environment that is built and monitored to ensure mission-critical reliability. You can deploy solutions almost immediately. You do not have to manage any hardware or bandwidth. Instead of focusing on the technology, you can focus on your business. Besides dramatically decreasing your time to market, outsourcing offers scale and expertise, while allowing providers of voice portal services to concentrate on their business, rather than on technology.

Get Started Now

Whether you're looking to build, buy, or host next-generation network services like voice portals, turn to Intel, the only company to offer the breadth of products, services, and network of strategic alliances for successful voice portal solutions.

Intel technology enables companies to develop and deploy speech-enabled next generation network services, like voice portals, while delivering voice commands with the highest accuracy and best performance.

Working to enable our customers for more than 15 years, Intel has developed a solid understanding of the problems and challenges you face. It doesn't matter whether you build your own solution using our open standards-based building blocks. Whether you purchase a system developed by one of our strategic partners. Or whether you have your service hosted. Intel can steer you toward the right solutions and strategic alliances for your business—helping you maximize your opportunity in today's explosive marketplace.

Also, Intel consultants can help you develop your technical strategy and design and implement large, shared-tenant, interactive voice response and speech recognition systems. We specialize in designing interactive voice response systems with large-scale configurations, system availability and reliability, and support for multiple applications and script owners. We can also help with voice application toolkits and scripting languages to speed your application to market.

Intel has a proven history of helping companies make the most of revenue opportunities available for supplying global communications services in today's growing business markets. It is a recognized pioneer and industry leader supplying open hardware and software products for voice, fax, Internet telephony, data, voice recognition, speech synthesis, network interface and contact center management—the building blocks for many of today's leading communications solutions.

> **For more information on Next-Generation Networks contact: telecomsales@intel.com**

Intel around the world

United States and Canada
Intel Corporation
Robert Noyce Building
2200 Mission College Boulevard
P.O. Box 58119
Santa Clara, CA 95052-8119
USA
Phone
General information: (408) 765-8080
Customer support: (800) 628-8686

Europe
Intel Corporation (UK) Ltd.
Pipers Way
Swindon
Wiltshire SN3 1RJ
UK
Phone
England: (44) 1793 403 000
France: (33) 1 4694 71701
Germany: (49) 89 99143 0
Ireland: (353) 1 606 7000
Israel: (972) 2 589 7111
Italy: (39) 2 575 441
Netherlands: (31) 20 659 1800

Asia-Pacific
Intel Semiconductor Ltd.
32/F Two Pacific Place
88 Queensway, Central
Hong Kong, SAR
Phone: (852) 2844 4555

Japan
Intel Kabushiki Kaisha
P.O. Box 300-8603 Tsukuba-gakuen
5-6 Tokodai, Tsukuba-shi
Ibaraki-ken 300-2635
Japan
Phone: (81) 298 47 8511

South America
Intel Semicondutores do Brasil
Avenida Dr. Chucri Zaidan, 940, 10t
Sao Paulo
Brazil
Phone: (55) 11 3365 5500

For more information
To learn more about Intel Corporation,
visit our site on the World Wide Web
at www.intel.com