Luminosity

Spotlight on Emerging Technologies

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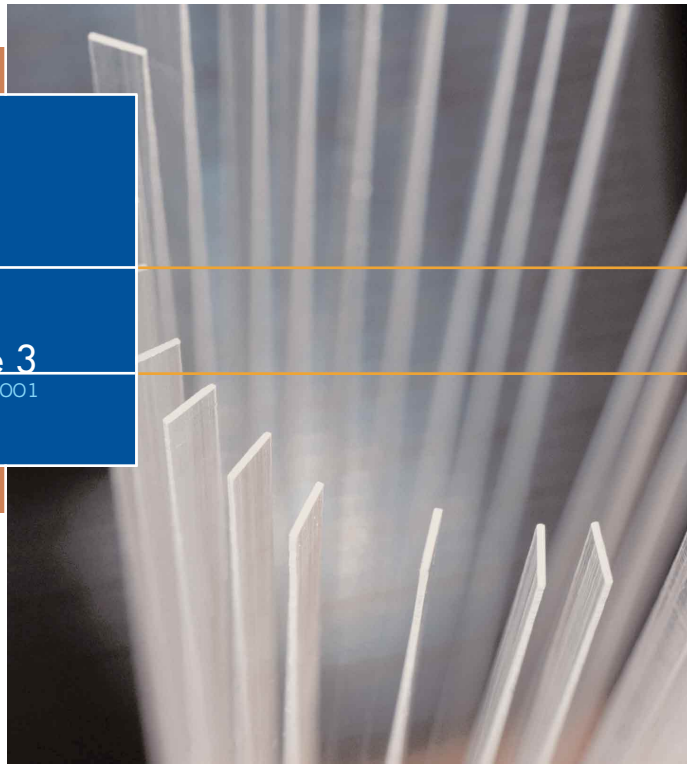

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In This Issue of Luminosity

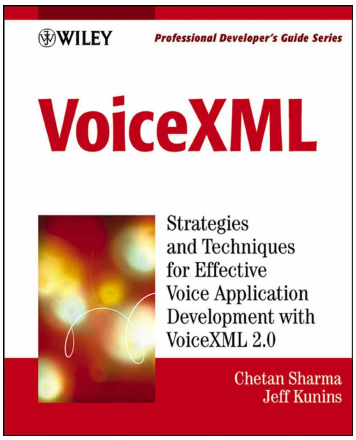
In this issue of Luminosity, Ankur Laroia and Leo Sayavedra continue the discussion on Enterprise Application Integration (EAI) in the final column in a 3 part series on EAI - "A guide to implementing EAI driven technologies" (for part I and II of this article, please refer to the past two issues of Luminosity). Ankur and Leo have successfully designed and implemented EAI strategies and solutions for Fortune 1000 clients across multiple industries.

Wireless Internet is a conundrum to many. In the Guest Column, "Q&A with Sunil Jain", we hook-up with Sunil Jain, a wireless industry expert and analyst for Amerindo Investment Advisors, Inc., a firm specializing in the management of concentrated emerging technology portfolios. In this discussion, we look at both the current and future of wireless Internet.

Your comments are always welcome.

Chetan Sharma
Luminosity Editor

Editor's Opinion: VoiceXML for the Enterprise—Deployment Challenges



On October 23rd 2001, W3C released the first public working draft of VoiceXML 2.0 specification. VoiceXML has very quickly become the standard essential to making Internet content and information accessible via voice and phone. The following excerpt is reprinted with permission from John Wiley & Sons from "VoiceXML: Strategies and Techniques for Effective Voice Application Development with VoiceXML 2.0" by Chetan Sharma and Jeff Kunins to be released worldwide next month.

In theory, VoiceXML makes it as easy to build and deploy enterprise-class voice applications as it has been with traditional Web-based applications. While this is true from a pure application development perspective—authoring VoiceXML code that seamlessly integrates with existing Hypertext Transfer Protocol (HTTP) interfaces to middleware and back-end systems is analogous to authoring Hypertext Markup Language (HTML)—in practice, designing great voice applications and deploying the requisite telephony and voice recognition infrastructure in a scalable and reliable fashion is dramatically more complex and demands rare and specialized skills.Voice Application Networks are a network-based solution that help enterprises bridge this gap and rapidly capitalize on the benefits of VoiceXML and great voice applications.

Infrastructure Requirements for Deploying Voice Applications

Typically, enterprises deploying voice applications are looking to provide automated self-service for some set of tasks and to make that service available through a free (e.g., 1-800), local toll, or pay-per-call (e.g., 1-900) phone number on the public switched telephone network (PSTN)—in other words, to make their automated in frastructure answer a normal phone line so anyone from any phone can call in at any time to access the application. Recent advances in Voice over Internet Protocol (VoIP) technology through next-generation carriers (e.g., Level 3) and value-added VoIP providers (e.g., iBasis) have begun to expand the options companies have to choose from, making it possible to push the Internet Protocol (IP)-PSTN interface point further away; however, at the end of the day companies must still deal with provisioning a specific number of actual phone lines from a PSTN carrier (e.g., AT&T, MCI, Qwest, Sprint, etc.).

In order to put together a complete on-premises system for production-class voice applications, many additional pieces must be procured, installed, configured, and integrated. These can be summarized as follows:

1. Provision of telecom capacity. As described earlier, telecom capacity must be provisioned. Typically, capacity is provisioned in 24-phone-line bundles known as T1s. Twenty-eight T1s can be aggregated into a DS3 (672 phone lines). Typically, provisioning new T1s or DS3s from leading carriers takes 3 to 4 months, even for Fortune 500 companies. DS3s are typically priced as a monthly lease fee.

2. Provision of specific phone numbers. If the company is delivering a new service that needs to be available through a new phone number(s), then these new numbers must be provisioned. If a particular (e.g., vanity) number is desired, the search can take months; if any number is acceptable, or if an existing number is already in place, then this step is trivial. For 1-800 numbers, pricing is typically a small per-month fee in addition to the telecom capacity.

3. PBX. A Private Branch Exchange (PBX) is a physical set of boxes that performs switching functionality and handles incoming and outgoing calls. Most medium- to large-sized businesses have PBXs for their internal office phone systems. For large call center applications, PBXs are typically enhanced with Automatic Call Distribution (ACD) software that facilitates flexible rules-based routing of calls to various components of their overall deployment. For example, the PBX may be configured to route calls directly to one of 257 operator desks if one is available and staffed, and to route all other calls (up to the total amount of capacity provisioned on the system) to the local interactive voice response (IVR) until an agent is available. PBXs are typically priced as hardware, per-port licensing fees for each physical phone line to be provisioned, and 18 percent annual maintenance.

4. Voice Response Units (VRUs) (IVR hardware). VRUs (interactive voice response systems) are another physical set of boxes that connect via phone lines to PBXs (or directly to the PSTN) and are responsible for processing all automated phone calls. Traditional VRUs embed vendor-specific, proprietary IVR platforms that support various related software components such as automatic speech recognition (ASR), text to speech (TTS), and modules for back-end systems integration. IVR applications are authored using vendor-specific graphical user interface (GUI) tools and/or scripting languages. These application scripts are physically loaded onto the hardware, and communicate at run time with back-end systems. Companies looking to build applications using VoiceXML and open standards must purchase VRUs from a vendor that has expanded its on-board platform to include/support a VoiceXML interpreter and at least one ASR and TTS engine. VRUs are typically priced as hardware, per-port fees, and 18 percent annual maintenance.

5. ASR. ASR is voice recognition software. Most leading IVR/VRU platforms have the capability to support each of the leading ASR engines. This ASR software must be installed and configured on each VRU (and often on additional separate personal computer [PC] hardware). ASR is typically priced per port with 18 percent annual maintenance.

6. TTS. TTS software generates natural-sounding speech in real time from any arbitrary text. IVR and ASR applications typically use TTS technology to present very dynamic data that cannot be prerecorded and to save money by not having to prerecord all necessary prompts in each application. TTS software is also installed and configured on each VRU. TTS is typically priced per port with 18 percent annual maintenance.

7. VoiceXML interpreter. Typically, ASR and TTS platforms expose low-level, proprietary C, C++, or Java application programming interfaces (APIs) for building applications. VoiceXML interpreter software encapsulates these lower-level APIs and enables application developers to author in VoiceXML. The VoiceXML interpreter is also responsible for all Internet communications with Web servers that host VoiceXML applications. VoiceXML interpreter software must be installed and configured on each VRU and must integrate with the ASR and TTS software. A VoiceXML interpreter must be purchased that supports and integrates with the specific VRU, ASR, and TTS solutions being used.

VoiceXML interpreters are typically priced per port with 18 percent annual maintenance.

8. Call center integration. Most large call centers have invested deeply in computer-telephony integration (CTI) middleware systems that make it possible to cleanly administer and operate large numbers of geographically distributed PBXs, ACDs, VRUs, and physical agents. For example, the CTI middleware can give the call center manager a centralized view of all real-time traffic on the network and essentially remote control of each unit on the system to dynamically move traffic between physical centers. CTI systems are also used to coordinate data collected during an IVR/VRU session and live agents, facilitating a screen pop on a specific agent's desktop when a call is transferred to him or her that contains information and context already collected from the caller during the automated portion of the call. For each new VRU added to the system, additional hardware (often called gateways) and per-port licenses must be purchased to connect the system to the CTI infrastructure. Each VRU must be connected to and configured for interacting with the CTI system, and each application must have custom logic written to take advantage of CTI capabilities such as screen pops.

9. Operations staff. Dedicated operations staff with specific expertise in telecom and IVR systems must be hired to install, manage, and maintain all on-premises infrastructure. Assuming that a company already has 24/7 operations staff coverage for maintaining all critical information technology (IT) systems, typically one dedicated staff person is required for each 500 ports of VRU/IVR.

10. Speech science staff. As outlined in detail later in this chapter, voice recognition software does not perform optimally out of the box. In order to achieve production-quality results from voice applications, it is typically necessary to pay significant ongoing attention to the low-level configuration of the system. This is similar to requiring a database administrator (DBA) for a large enterprise database system such as Oracle. Deploying the same applications with a specially trained, expert DBA can easily achieve 1000 times better performance than without one. However, there are orders of magnitude more trained Oracle DBAs in the world than qualified speech scientists. Over time the number of qualified speech scientists will undoubtedly grow rapidly; in the meantime companies must search hard to hire this rare expertise in-house.

11. Design and building of shared application components. Many companies are looking to deploy comprehensive voice solutions that provide callers with a wide range of choices. For example, an airline may wish to allow callers to look up flight arrival and departure information and find lost luggage, as well as provide driving directions to the nearest airport and real-time weather conditions in cities customers are traveling to. Companies that build applications in house must build everything from the ground up or license shrink-wrapped prebuilt application components. As of August 2001, few options are available for licensing shrink-wrapped applications for on-premises systems.

12. Design and building of application-specific application components. All application-specific VoiceXML and back-end integration must be authored.

13. Deployment of applications on local Web infrastructure. VoiceXML applications must be deployed on company's existing Web infrastructure. If a Web infrastructure does not exist, it must be procured and deployed as well.

Challenges of Achieving Optimal Voice Recognition Performance

Speaking is the most natural form of human communication, so it is natural to assume that building great voice applications would be at least as easy as designing a Web site. However, it turns out that crafting a voice interface that is easy to use and pleasing to customers is actually difficult. Great voice applications help companies deliver exceptional customer service at reasonable costs, but great voice applica-

tions are rare because they are very hard to build and deploy successfully. Companies without core competencies in voice user interface (UI) design, speech science, and audio production will find it difficult to deliver on their own voice applications that callers enjoy and that deliver the expected benefits.

Conversations Are Different than Touch-Tone or Web Pages

Even if voice recognition technology were perfect (which it isn't), designing voice applications would remain fundamentally harder than building Web sites or touch-tone IVR. Consider the following issues:

• Speaking is slower than reading. Just think about how much time it takes to read a grocery list out loud versus quickly reading it in print or on a Web page. On the phone, options have to be listed one at a time, and that gets frustrating very quickly. Tasks such as choosing from long lists or listening to long passages of audio (e.g., reading e-mail) will always be harder on the phone,
and will require creative solutions that keep the caller engaged. By contrast, Web pages can display hundreds of choices at the same time.

• People quickly forget what they just heard. On a Web page, people can carefully browse through screens and menus to find the exact option they're looking for. On the phone, however, information is gone as soon as it's been given, and callers have to remember everything because they can't see the choices any more. Consider what happens when people call 411; without a pencil and paper ready, people often forget the phone number they just heard in the few seconds it takes to hang up the phone and start dialing.

• It's not clear what you can't say. Web pages and touch-tone IVR applications are bounded. There are a fixed number of links to click or keys to press, and people can't move their mouse beyond the edge of the screen. Conversations are unbounded because someone can say anything in response to a given question or prompt. Even if voice recognition were perfect, people would still need to be carefully guided through the available options so they could quickly find what they were looking for without being frustrated. Minute differences in the way prompts and menus are structured have a dramatic impact on customer satisfaction, because callers need to be gently and clearly directed to say the right things, and apologetically led back on track when they get lost or confused.

Recognition Quality Depends upon Specialized Design and Tuning

Voice recognition is demonstrably mature enough for mission-critical applications, and production applications successfully automate hard tasks such as driving directions and stock trading. However, recognizing human speech is still an enormously complex computational task that relies on applying sophisticated heuristic techniques to massive statistical data models in real time. Voice recognition software out of the box does not perform adequately, and applications require specialized design and tuning by qualified experts to be successful. Consider the following issues:

• People will always say unexpected things. People are accustomed to having real conversations over the phone; they immediately assume voice applications can understand whatever they say, and can quickly get frustrated when their expectations aren't met. Even applications that prompt callers to choose from a short menu can consistently get hundreds of distinct responses. Voice applications can only understand the specific things they're trained for—similar to the situation when people first bring their phrasebooks to a foreign country. As with people, voice applications do their best to match what they're hearing with the phrases they know, and can easily mistake similar-sounding words for ones that are actually in their list. Depending on the situation, this can quickly lead to a frustrating experience. For example, consider a simple menu of keywords that includes movies and restaurants. Callers who say moving without knowing that it is not a valid choice are likely to consistently get

thrown into movies and be very frustrated. For this reason, applications must use clear, concise prompting to guide callers to say the right things, and must use data from large amounts of real-world usability testing to take into account the unexpected things people tend to say. Minute shifts in prompt wording or the underlying grammars can have dramatic effects on usability, and ultimately the automation rate and return on investment (ROI) of voice applications.

• Grammars must be tuned. As just stated, voice recognition technology works by comparing what the caller said to a specific list of expected choices. These grammars are required to make it computationally feasible to do speaker-independent voice recognition in real time. Large grammars, such as the 10,000+ companies on U.S. stock exchanges, can work very well in production today. Achieving this requires careful attention by both application designers and speech scientists tuning the underlying recognition engine. For example, Pfizer and Fiserv sound almost identical; the underlying grammar must be tuned to know which choice is more commonly selected, and the application must be carefully crafted to help callers get back on track when the system makes a mistake.

• People pronounce the same words differently. Pronunciations for words and phrases can vary widely across regions of a given country. Proper names further complicate the matter—consider, for example, how to pronounce Qantas Airways or Worcester Court. Voice recognition engines rely on built-in dictionaries that specify each of the ways callers may say each word and common phrase. If a grammar includes a word that isn't in the dictionary, the recognition engine must guess how it is supposed to be pronounced. While this can work reasonably well, the system is likely to make mistakes or miss common alternative pronunciations. Especially because voice recognition is rapidly being deployed in new industries for new applications, it's critical to ensure that all relevant pronunciations are in the dictionaries—otherwise, recognition quality and automation rates can suffer significantly.

• Acoustic models must be continually refined. Voice recognizers use acoustic models to decide whether a caller has said something that matches a given grammar. Acoustic models are essentially a mathematical representation of how a wide variety of people sound when they say each of the building blocks of words (e.g., buh or ing). Acoustic models are built by analyzing millions of diverse recordings of real people actually speaking over the telephone. The more data that is used to train these acoustic models, the better recognition quality becomes, particularly when the data is collected under real-world conditions using the same hardware and software. In addition, it is critical to ensure that the voice recognition software has been adequately trained on all of the words and phrases that make up the grammars for a particular application.

• Noisy environments are problematic. Phone conversations—particularly on mobile phones—often contain a lot of background noise. This noise can be ambient sound (e.g., wind, cars honking), ambient conversation (e.g., other tables in a restaurant), side speech (e.g., "Kids, I said stop it!"), or unintended sounds (e.g., a cough or sneeze). Consider how difficult it is sometimes even for real people to distinguish the actual conversation from background noise; the problem is compounded for voice recognition engines because they have far less intelligent context about how to differentiate sounds and speakers' voices from one another. Voice applications and voice recognition platforms must be carefully designed to accommodate and minimize the difficulties presented by background noise.

• Hundreds of thousands of calls must be transcribed by hand. In order to compile the necessary data to address most of the problems just listed, it is necessary to manually compare what callers actually say with what the voice recognition software thought they said. Very large numbers of calls must be manually transcribed in this fashion, so that speech scientists can analyze the data and determine how accurately each grammar in an application is performing. This is a very labor-intensive process, but it is critical to give

designers the information they need to make the adjustments to call flows, grammars, prompts, pronunciation dictionaries, and acoustic models that are necessary to achieve the expected benefits of great voice applications.

Audio Production Dramatically Impacts Customer Satisfaction

Automated voice applications allow companies to use distinctive voice talent and professional sound design to consistently convey the full, unique richness of their brand identity and customer service philosophy. This opportunity directly translates to customer satisfaction and can make the difference when customers are selecting whom to do business with.

• People love applications that sound natural and feel good. People simply appreciate and respond more favorably to applications that sound professional, engaging, and personable. This is true for live operators, and is doubly true for automated systems. Poor recording quality, bad music, and robotic-sounding synthesized speech are some of the key reasons why people tend to hate traditional IVR systems so viscerally. By contrast, companies can use a combination of natural-sounding prompts, well-crafted interface design, and creative musical effects to deliver a very compelling experience that callers enjoy and positively associate with the company's brand and commitment to customer service.

• Crafting the optimal voice and sound is an art. Voice talent and sound engineering are an extensive industry in their own right; the American Federation of Television and Radio Artists (AFTRA) union talent contracts alone total more than $1 billion annually. Crafting the optimal audio experience for voice applications is a new and unique art form that demands specific field experience and talent. Creative challenges include choosing the right voice talent (e.g., the optimal voice for stock trading is useless for selling children's games). One of the greatest technical challenges is properly designing and recording prompts for concatenative speech. Concatenative speech is a technique whereby short bits of prerecorded audio are quickly played in sequence to form longer phrases and sentences. Concatenative speech makes it possible for voice applications to sound very human and natural, even when delivering dynamic data such as stock prices or flight information. Without great concatenative speech, applications must resort to robotic-sounding synthesized speech for dynamic data, because prerecording all possible combinations is prohibitively expensive. For example, there are nearly 10 million potential U.S. phone numbers, whereas concatenative speech can be used to deliver outstanding phone number playback with only 1800 prompts,. In addition, applications are not static, and new prompts often must be recorded on a moment's notice. It is necessary to have the infrastructure and methodology in place to record new prompts at any time and in different cities, so that they sound in distinguishable from other recordings.

• Delivering world-class quality at reasonable costs is challenging. Voice talent, studio time, and editing facilities are all expensive. While there are some economies of scale here, most of the expense is human-intensive and does not inherently drop with volume. Companies must have processes, techniques, and relationships in place to maximize quality at reasonable costs.

Chetan Sharma

Chetan Sharma is Director of R&D and leads the Emerging Solutions Practice at Luminant Worldwide. He is author of the best-selling book "Wireless Internet Enterprise Applications" and co-author of the upcoming book "VoiceXML: Strategies and Techniques for Effective Voice Application Development" (both published by John Wiley & Sons). He is frequently invited to speak at industry events worldwide and often quoted in media publications.

Jeff Kunins

Jeff Kunins is a Senior Manager in the Technical Marketing group at Tellme Networks. Jeff is a respected industry leader in the fields of voice application networks

and VoiceXML technology. Jeff regularly contributes articles to publications, including the VoiceXML Review and WirelessDevNet.com. Upon joining Tellme in early 2000, Jeff co-conceived, built, and managed the debut of Tellme Studio.

Previously during a 4-year tenure at Microsoft, Jeff led a diverse set of platform and consumer efforts, including Microsoft Passport, Microsoft SILK advanced Web server technology, and Microsoft Cinemania. He is a co-inventor of patent pending technologies for distributed Web authentication and key management, has several patents currently pending in the area of voice application development. Outside of the technology industry, Jeff is a critically acclaimed composer and sound designer.

In Depth: A Guide to Implementing EAI Driven Technologies

By Ankur Laroia & Leo Sayavedra Jr., Luminant

This is the third in a series of three articles meant to provide:

- An overview of EAI (its beginnings and its future);
- A discussion of business drivers that create the need for EAI along with some key considerations for successfully completing EAI projects;
- A detailed discussion of various aspects of deploying a successful EAI Project.

EAI initiatives usually begin with a business need or problem. Article two of this series discussed business drivers that create the need for integration and high-level considerations for a successful implementation. This is the third and final article in our series, and will shed light on best practices and methodologies for implementing EAI technologies.

Framework for Implementing EAI Technologies

Once a business need or issue is identified, there are several ways to deploy EAI technologies to provide a robust, scalable solution. Industry proven best practices for managing EAI engagements from inception to delivery are outlined in the following sections.

Strategic Technical Assessment

The STA or Strategic technical assessment phase serves to inventory the business problem and crucial systems, which support the business. Ideally, this should be the first phase of the project. The strategic assessment's objective is to help companies understand how EAI technologies can change or enhance their business model with a focus on adding value, improving efficiency and strengthening customer relationships. Through interactive collaboration and visioning, technologists and business analysts work closely with companies to identify and prioritize the opportunities for EAI solutions. The main purpose of the strategic assessment is to help companies understand how EAI technologies can add value, improve efficiency and strengthen customer relationships. The result should be a catalog of fundamental business processes and the systems that support them. Breakdowns in process and systems should be documented. Conceptual solution frameworks and the processes and technologies that will mitigate breakdowns are created.

The assessment typically lasts two to four weeks and should answer the following questions:

- What are the critical design and technology issues facing an EAI solution?
- Where is the value in EAI solutions for my business?
- What are the opportunities for an EAI solution to improve efficiency?

- Generate revenues?

- Enhance customer relationships?

The main goal of any such endeavor is the evaluation of strategic options and the creation of an EAI solution that delivers on innovation and investment.

At the end of this phase you should have a better understanding of the market or line-of-business trends, technical infrastructure and architectural concepts, opportunity prioritization and most importantly an EAI solution roadmap.

Defining the EAI Solution

Once the Strategic Technical Assessment is complete, a prototype should be constructed to demonstrate EAI's potential in your business environment. An opportunity is selected from the prioritized list generated in the initial effort (STA), and a working integration framework is created to educate key decision-makers within the company as well as potential customers and partners. The purpose of this prototype is to illustrate key functional features and to serve as a guide for developing a full-scale EAI initiative. Developing a prototype plan typically includes a six-week engagement to provide a business and technical context for the developers that will implement the EAI solution. There

are typically seven key gates to the requirements and definition engagement:

1. Business Requirements
2. Technical Architecture
3. Information Architecture
4. Usability
5. Project Plan
6. Performance Assurance
7. Deployment Plan

Gate One – Business Requirements

This section delineates the criteria for achieving the company's business plans through an EAI solution. Business and technical analysts draw out the business drivers and requirements for the initiative to perform the following:

- Provide a clear direction for the detailed specifications and design team by delineating key business processes.
- Convey an explicit understanding of the expected business impact that the EAI solution will have on these business processes.

Key objectives include:

- Conduct interviews with line-of-business leadership.
- Develop and compile functional requirements.
- Interface design.
- Develop the conceptual technical architecture.

Gate Two – Technical Architecture

This section describes how the EAI solution will be implemented, including:

- Technical infrastructure
- Development architecture
- Application architecture
- Data architecture
- Architecture management
- Connectivity

Key objectives include:

- Analysis and documentation of existing architecture.
- Develop and compile functional requirements.
- Interface design.
- Develop the conceptual technical architectures.
- Analysis and documentation of software and applications components that will comprise the prototype.
- Identify and document post launch support requirements.
- Analysis and documentation of partnership opportunities to leverage complimentary technologies and services.

Gate Three - Information Architecture

This section delineates the Information Architecture design for presentation of information after the EAI solution is implemented. Typically this involves describing presentation interfaces such as corporate portals or Intra/Extranet sites.

Key objectives include:

- Detailed interface analysis.
- Analyze existing site structures.
- Develop high-level sitemap and navigational recommendations.
- Develop high-level schematics and logical visual groupings.

Gate Four - Usability

The success of the EAI solution depends upon the level of user acceptance and impact. Most of the heavy lifting is performed on the back-end. However, the resulting integrated information is usually presented on a personalized front end that leverages the integration. This section will identify the following factors as they relate to the user experience:

- Roles and responsibilities of the target user groups
- Characteristics of the user groups that may influence how they use the technology

- User concerns regarding current work practices and processes
- Preliminary usability criteria for the device and related applications

Key objectives include:

- Conduct user focus groups and sessions to gather requirements for prototype.
- Identify user roles, responsibilities and profiles.
- Identify user characteristics and concerns.
- Develop preliminary usability criteria, features and descriptions.
- Develop a usability test plan to define more specific usability and measurement methods to assess usability of prototype.

Gate Five - Project Plan

A project plan is created for the EAI solution prototype.

Key objectives include:

- Identify and document the prototype functional deliverables.
- Identify the documents to be delivered during and after the prototype development.
- Develop a timeline for major implementation activities.
- Develop a project work plan including staffing models and options.
- Develop cost projections and order of magnitude cost range estimates including consulting fees, software, and hardware.

Gate Six - Performance Assurance

This section delineates the measures of success for the project. In most cases, it is likely that one measure cannot fully capture a project's success or failure. For this reason it is helpful to devise a full range of performance metrics which provide information on various aspects of a project. From this information a more complete picture of a project's merits can be developed.

Key objectives include:

- Identify and document performance metrics (i.e. project, technology performance, productivity, system impact, user feedback) and success criteria.
- Identify the risks incurred with the prototype (i.e. user risks, project and technology)
- Develop a risk mitigation plan to anticipate significant potential pitfalls and describe how these challenges can be overcome through careful planning to reduce risk.

Gate Seven - Deployment Plan

This section provides the details on how to roll out the prototype as a production release and how to address future releases/versions. The deployment plan should carefully balance resource availability, time-to-market, capital budgets available and change management. To create this balance, a multiple, staged project program should be employed. These projects will form the releases of the prototype. This approach will provide the ability to produce rapidly delivered projects with the flexibility to alter the overall shape of the initiative for changes in business priorities, technology, and user feedback.

Key objectives include:

- Identify and document prototype release priorities.
- Describe current and future releases.
- Develop a release roadmap and schedule.
- Develop funding map for future deployments.

Summary

This article guides the reader through a typical EAI engagement, cataloging key activities and outlining major milestones and phases. EAI projects can get out of control quickly as there are several processes and technologies that need mitigation and management. Experience demonstrates that when a proven methodology is employed, engagements can be scoped precisely, delivered on time and on budget. An outline of key activities, phases and milestones is presented as the foundational building block for such a methodology.

Leo Sayavedra Jr.

Leo has more than a decade of experience in business consulting and project management. During the last four years he has focused exclusively on technology solutions consulting – assisting clients in defining, executing, and implementing innovative digital strategies by matching core business requirements with technology solutions. The focus of his strategic engagements has consistently been to develop solutions that integrate and extend the enterprise, and most importantly, cut costs and add revenues to his clients' bottom lines.

Ankur Laroia

Ankur Laroia is responsible for the leadership and vision in defining and implementing Enterprise Application Integration (EAI)-based solutions and business strategies for Global 1000 companies. Under his leadership, Luminant's industry-recognized EAI experts help businesses successfully integrate disparate line-of-business applications. Laroia's experience includes Fortune 500 clients and spans a wide range of industries including pharmaceuticals, telecommunications, energy, messaging, utilities and high tech.

Guest Opinion: Q&A with Sunil Jain

Amerindo Investment Advisors

Wireless Internet has had its share of triumphs and defeats over the past couple of years. As carriers make plans for future network upgrades, many are doubtful of the wireless industry's prospects as it struggles to emerge from the depths of hype, disappointing investments, and a troubling economy. Sunil Jain, wireless analyst at Amerindo Investment Advisors Inc. has seen it all. After successful stints with Sprint PCS and Phone.com (now Openwave), he has been looking at the opportunities for investment in the wireless space for Amerindo Investment Advisors Inc.

Q: Many analysts contend that the promise or hype of wireless Internet has been a disappointment thus far in the states. Do you agree? If yes, what do you think led to its fall?

A: I would not categorize it as a fall but rather a "slow start." A number of pieces must fall into place for a wireless data offering to be successful. Compelling applications, feature-rich handsets, packet-based billing, and enabling networks, are all part of the wireless data value chain. In the U.S., these parts were clearly missing at the outset. Hence U.S. carriers' initial attempts to duplicate the wired Internet browsing experience over wireless met with only limited success. The service was characterized by poor user interface, lack of handsets, slow access time, and the service was expensive to use. Lack of wireless centric content and applications reminded us of TV programs that aired when TVs were first introduced--these programs simply duplicated radio programming on the screen without leveraging the enormous visual potential of the new media.

During the initial launch period of wireless data service, carriers realized the value of the missing links in the value chain, i.e., the need for packet-based networks and the support of handsets. So instead of making further futile attempts to reinvigorate the market, carriers have now shifted their focus to the launch of next generation networks and to supporting handsets. In essence, they have put the entire wireless data offering on hold.

"A number of pieces must fall into place for a wireless data offering to be successful. Compelling applications, feature-rich handsets, packet-based billing, and enabling networks, are all part of the wireless data value chain."

Q: What about GPRS and 1X? Initially, they were seen as intermediary technologies that bridged 2G and 3G. What do you think their role is going to be in the coming months and do you see 3G being introduced in markets worldwide?

A: The initial over enthusiasm for 3G during the Internet craze of 1999-2000 has given way to FUD (fear, uncertainty and doubt). Carriers are increasingly skeptic about pouring billions of dollars into a business model that is yet to be proven. The return on investments from 3G seems distant, as carriers haven't figured out how well they can monetize these offerings. 2.5G technologies (GPRS, 1X), therefore, play a very critical role for carriers since they can validate these models at a fraction of the cost. The low risk approach to next generation packet-based networks has already persuaded more than 80 carriers across the world to embrace 2.5G technologies.

The future of 3G networks will depend on the outcome of 2.5G. Note that the 2.5 networks utilize the current spectrum, and technologies like GPRS do not increase spectrum efficiency. Hence, if the packet-based offerings on 2.5G networks are widely successful, carriers (who are already spectrum constrained) will be forced to move to 3G. So initially the motivation for carriers to migrate to 3G will be higher capacity and spectrum efficiency rather than higher speeds.

Q: What about WLAN and Bluetooth? Do you believe that these technologies would be a competition to 3G?

A: I think wireless LAN is mostly about "portability," wireless WAN about "mobility," and wireless PAN (Bluetooth) is primarily about "convenience." I consider them more complementary than competitive because each of these technologies represents a unique tradeoff in terms of range, data rates, power consumption and cost. Wireless LAN and WAN might compete against each other in some situations, however, fundamentally WLAN is about "IP going wireless" while WWAN is about "wireless going IP"

Inside offices and buildings, the utility of wireless LAN is clear and analogous to having cordless phones at home. They extend the reach of office LANs without requiring extensive wiring. Outside in the public space, wireless LAN is analogous to using pay phones. Pay phones were very successful but their popularity disappeared as wireless phones became more pervasive, reliable, and affordable. Initially, wireless LAN would be the preferred choice for wireless data service that requires high bandwidth and QoS at affordable prices. As wide-area data networks start to close this gap, the traffic would migrate to these networks. However, the two networks (WLAN and WWAN) will continue to coexist for a long period of time.

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Q: What are some of the most exciting features and services you see coming out from carriers in the US in the next two quarters?

A: The deployment of packet-based networks by U.S. carriers enables the launch of new and exciting data services. Initially, I envision carriers to focus on messaging and entertainment. Today in the U.S., there are approximately 7 short messages (SMS) sent per subscriber per month versus a global average of 50.

I expect carriers to improve this situation by aggressively pursuing the rollout of enhanced message service (EMS), multimedia message service (MMS) and applications like Instant Messaging (IM) and mobile email. IM rollout will probably be the most aggressive since 45% of people in North America use IM once a week, and 90% of those people use it daily. Entertainment offerings by wireless carriers will primarily focus on games and the downloading of ringer tones and wallpapers (combined these two entertainment services constitute almost half of the current traffic on DoCoMo's iMode service in Japan).

Q: What is your vision of a handset one year from now?

A: As carriers launch the next generation packet-based networks, wireless devices will transition from "communications only" devices to those that also incorporate "computing and data processing" needs, in order to support new data oriented applications. Handsets will incorporate higher memory capacity (move to DRAM), increased processor capabilities, higher storage, lower power consumption, high- resolution color display, and they will support multimedia capabilities like MP3, MIDI, MPEG4, FM radio, and images. I also expect integrated support for Bluetooth, GPS (for location), and accelerator chips for technologies like Java. One of the most serious drawbacks of current handsets has been their limited data-entry capability. The recent launch of the Nokia 5510 handset indicates improvement in this area too.

"Handsets will incorporate higher memory capacity (move to DRAM), increased processor capabilities, higher storage, lower power consumption, high-resolution color display, and they will support multimedia capabilities like MP3, MIDI, MPEG4, FM radio, and images."

Q: How important is the transition from circuit-switched data to packet-data in the mobile environment?

A: The transition from circuit-switched to packet-data is going to be very critical for wireless carriers. Wireless voice is getting commoditized, it is becoming increasingly challenging to attract new subscribers. The current attempts by carriers to make money off "wireless data" services over circuit-switched networks have been met with only limited success. Packet based networks utilize spectrum much more efficiently and will enable delivery of data services at a lower cost per byte. The "always-on" network will encourage the rollout of exciting new services. Together they provide a "realistic" opportunity for carriers to effectively monetize their investments in the wide-area networks.

Q: What do you think about DoCoMo's 3G launch? Though it is still early to gauge, are there any lessons we can learn? What should the operators be worried about?

A: It's definitely too early to gauge. The business model for deployment of 3G networks has been "Build it and they will come." Technical issues aside, operators holding billions of dollars worth of 3G licenses should be worried about the lukewarm response to the "so-called 3G services." If the value proposition is not there, the operators will be challenged with the stigma of throwing good money after bad.

Q: There already has been talk of 4G and 5G. Is it too premature to think about these?

A: 3G development started in the early 1990s, so I don't think it is premature to talk about 4G. These technologies take time to develop and even longer to implement. 2G (digital) for example was developed in the early 1980s, and we still haven't completed the migration from first generation analog networks to digital (more than 20% of wireless subscribers in the U.S. are still using analog networks). Technologies beyond 3G will increasingly focus on spectrum efficiency because spectrum is, and will remain, scarce.

Q: How important do you think MVNOs (Mobile Virtual Network Operator)will be in shaping the industry over the next few years?

A: MVNOs are value-added resellers that help carriers earn better return on invested capital by generating more traffic and reducing churn. MVNOs add value such as brand appeal, differentiated services, and access to distribution channels. Except for Europe, the MVNO concept has not gained much popularity. Carriers are capacity constrained and do not have an incentive to partner, except when they are required by law. MVNOs offering, on the other hand, is the same, undifferentiated voice service. However, this could change as carriers launch the next generation data networks. New breed of resellers may emerge, such as AOL and Microsoft, offering differentiated data services. At that time, carriers might be more motivated to partner as they attempt to generate an acceptable return on their 3G investments.

Q: What's one wireless application or service that you love using on a daily basis and why?

A: I use my RIM device almost daily to check and send emails. The increase in productivity is significant and is a good enough reason to justify the cost.

Sunil Jain

Sunil Jain oversees investments in the wireless industry for Amerindo Investment Advisors. Prior to Amerindo, he held several positions with Sprint PCS and Phone.com, leading many of their services and product launches. Engineer by training, Sunil's opinions are widely sought by leading financial institutions and technology groups alike.

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