



IP Telephony

Contact Centers

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Services

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PAPER

Delivering Superior Self Service with Open Standards

VoiceXML and the Future of Services Oriented Architectures
May 2005

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Section 1: Introduction

Business leaders are more and more focused on innovation, new product development, and customer acquisition and they expect IT to take a more proactive visionary role that delivers results to the top and bottom-line. The importance of open IP based, intelligent communications in business is ever more critical than before.

Standards such as VoiceXML have helped business and IT managers leverage existing web and IP investments in the delivery of new and differentiated services. VoiceXML powers a variety of mission-critical and business-critical applications from customer care, directory assistance, telematics and unified messaging. Hundreds of millions of calls are answered on VoiceXML based Avaya Self Service solutions every day. And it is estimated that more than 10,000 commercial VoiceXML-based speech applications have been deployed worldwide across a diverse set of industries from financial services and insurance, retail, telecommunications, travel and hospitality.

This paper will outline Avaya's view on VoiceXML and how it plays a lead role in the emerging trend of more open, intelligent communications solutions.

Section 2: What Is VoiceXML?

Voice Extensible Markup Language (VoiceXML) is an industry standard voice application development language based on the Extensible Markup Language (XML) standard from the World Wide Web Consortium (W3C). The W3C is the world's standards body defining internet-related standards. In March 2004, the W3C adopted the current VoiceXML specification, 2.0, as their formal recommendation for standards-based voice applications.

VoiceXML's purpose is to automate transaction and customer interactions over the phone. It defines things like user interfaces, dialog design, and overall application definition and flow. VoiceXML uses automated speech recognition (ASR) and/or touchtone (DTMF) for input, and pre-recorded audio and text-to-speech synthesis (TTS) for output. Callers interact with VoiceXML applications over the telephone via a VoiceXML browser running on a telephony server.

The best parallel example of this model would be Web surfers interacting with HTML applications via graphical browsers on their personal computers. (Figure 1)

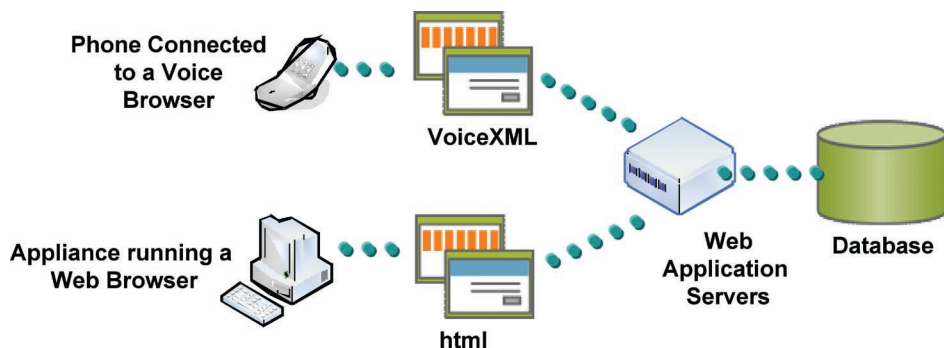


Figure 1: Similar to web surfers viewing html pages through web browsers like Microsoft Internet Explorer, VoiceXML allows users to interact with voicexml "pages" through a voice browser over their telephone.

Section 3: VoiceXML is Driving Openness and Choice

VoiceXML is invigorating openness in application creativity and vendor choice while decreasing the technology costs required for design, deployment, and management. Prior to the ratification of industry standards, self

service applications were written in closed, proprietary languages that required cumbersome, special purpose, proprietary hardware and software to execute. In the 80s and 90s, these solutions were implemented with strong business justification as self service costs were significantly less than the costs of live support in contact centers and other enterprise functions like directory assistance. Requirements for more advanced telephony integration and sophisticated call controls drove up solution and integration costs, severely limiting reuse and portability of the investment.

Standards such as Voice over IP, VoiceXML, and SIP are reducing the dependency on proprietary technologies and allowing expanded options for application creation, deployment, and voice browser options. Many of these options are merging into a broader range of web-based solutions, being driven by strong web application/Web Services vendors.

Section 4: Unlocking the Benefits of VoiceXML

At its core, VoiceXML is web technology and executes in an open web model. Today the power of some of the most advanced self service applications is predicated on the power of VoiceXML.

Organizations around the world have invested heavily in web-based architectures, applications, and skills. These companies have built workflows, business rules, and complex data storage systems based on the robust, proven, standardized web applications and self service model. Rather than employ specialized, scarce human resources to build, deploy and maintain proprietary voice applications, organizations are now leveraging their web development resources to also manage their voice application efforts. This has provided a much larger pool of available development resources, increasing creativity and efficiency while driving costs out of voice application development.

VoiceXML promotes the reuse of existing investments across the IT organization, including both human and capital resources. It helps businesses leverage the power of standardization to focus staff and resources on business problem solving and new communications solutions rather than just the underlying intricacies of the technology. In addition, the inherent attributes of applications portability and code reusability help drive down costs of upgrades or changes by making applications and compatible software components more easily deployable across the entire enterprise.

The ongoing work of technology bodies such as the W3C and industry non profits like the VoiceXML Forum provide an even stronger level of assurance around standardization through the formal advocacy of certification of solution components across vendor applications, platforms, tools, and development environments.

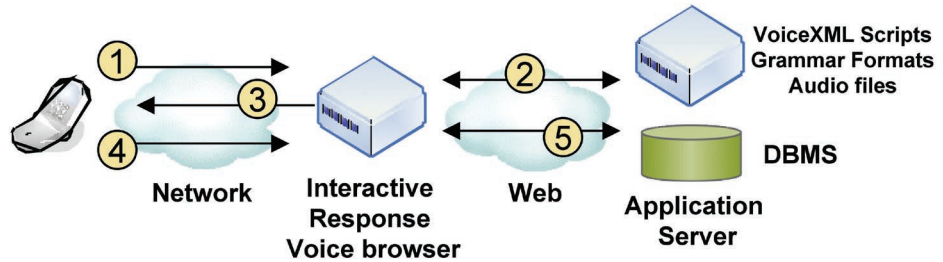
In many of today's leading technology companies, VoiceXML is seen as a fundamental element in an organization's overall Web Services/Services Oriented Architecture (SOA) strategy. In the past, more traditional standalone voice self service applications duplicated processes and application intelligence that already existed in the web self service model. Today, businesses are using VoiceXML to flatten application logic and standardize processes into common elements, allowing their operations to better use of existing workflows, logic, APIs, and reporting tools that already exist to support their enterprise web portal. The flattening of application logic is also helping to significantly lower application development costs.

When integrated with other contact center communication channels, this significantly increases the intelligence, usability and consistency of speech self service which leads to improving caller satisfaction with the customer's experience.

Section 5: VoiceXML Expands Deployment Options

Because VoiceXML is a web-based technology, it fundamentally allows applications to exist and be accessed from anywhere on an IP network (public or private), as long as that network has a VoiceXML browser. This

basic architecture opens up a wide array of options for businesses to deploy voice self service applications. Voice applications can be developed in VoiceXML in one location, deployed in a different location, and maintained in yet another location, all by leveraging its basis as a web technology. Application creation tools, application servers, and application browsers all subscribe to the open standards of the web, allowing tremendous flexibility in the configuration of VoiceXML-based solutions.



1. User places call from any phone.
2. Voice browser downloads voicexml scripts, grammar formats, audio files from application server to the speech server.
3. Voice browser speaks either a prerecorded audio or synthesized prompt.
4. User responds. Network transfers speech from phone and the speech platform processes it.
5. Voice browser accesses enterprise applications and web services via network to complete transaction.

Figure 2: VoiceXML lets developers speech enable web applications that can be deployed anywhere across the IP network and accessed by users through their phones.

Businesses have several deployment options which they can consider.

An enterprise may elect to follow a more traditional model of application creation, deployment and maintenance in a centralized environment, where the application server and application browser are physically near each other and connect via an IP network. This configuration provides for simplicity in monitoring and maintaining the system, and affords the network designer the ability to closer control things like bandwidth availability.

A business may decide not to invest in the application server and/or browser components. Instead, they may elect to outsource those pieces to a service provider, where the provider offers some of their system capacity to host applications and handle incoming/outgoing calls. This is a pure hosting model, and leverages the lower costs of an IP-based infrastructure to provide cost-effective outsourcing options of their customers.

A variant of the pure hosting model may find a business wishing to outsource the browser portion of the configuration, but maintain control of the applications. VoiceXML applications reside on traditional web server technologies, which allow for the wide distribution of applications across IP networks. Those voice applications get “served up” across the network to the VoiceXML browser, which in the case resides at a service provider location.

Speech applications development and tooling environments can leverage industry web tooling standards like Eclipse to create dynamic VoiceXML applications. Eclipse is an open standard graphical environment for rich application creation and integration. It also allows for 3rd party Eclipse-based tools to interoperate together to create unique synergies across speech, communications, and web enabled business processes.

What is Eclipse?

Eclipse is an open platform for tool integration built by an open community of tool providers. Operating under an open source paradigm, with a common public license that provides royalty free source code and world wide redistribution rights, the eclipse platform provides tool developers with ultimate flexibility and control over their software technology. To learn more check out: <http://www.eclipse.org/>

Avaya is leveraging the work of the eclipse community to create and offer a powerful application design tool – a tool that not only builds great voice applications, but provides a common tooling environment across Avaya’s web-based contact center portfolio. The end result is a single common tool to define user dialogs across Avaya contact center applications, resulting in more integrated, intelligent customer service applications that support more open standards based means of building speech applications or switching call flows.

Section 6: The Evolution to Web Services and Services Oriented Architectures

Organizations around the world are moving rapidly towards a common web and IP architecture. In recent years, this move has included the consolidation of the traditional switched-telephony networks into the core IP-based infrastructure. By consolidating two separate networks (PSTN and IP) into a single IP-based network, organizations and their customers are seeing dramatic results as voice and data are being intelligently combined to provide meaningful value and cost savings.

In 2004, U.S. enterprises spent over \$1.4 billion on IP Telephony products, and increase of over 48% from 2003! For the first time, IP-PBX solutions outnumber traditional PSTN solutions installed in the United States. Even “central office/Centrex” solutions made the crossover, with 50% of those solutions being IP-based in 2004.¹

This convergence in systems and communications is redefining how business and customers interact. As the world moves to converged IP-based networks, companies are demanding improved ways to leverage the software assets that are connected to these networks. Web Services and Services Oriented Architectures (SOA) are growing technologies to meet this demand.

Web Services are a new breed of software application. They are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web. Web Services perform functions, which can be anything from simple requests to complicated business processes. Once a Web service is deployed, other applications (and other Web Services) can discover and invoke the deployed service. Web Services allow applications to communicate with each other in a platform- and programming language-independent manner. A Web service is a software interface that describes a collection of operations that can be accessed over the network through standardized XML. It uses protocols based on the XML language to describe an operation to execute or data to exchange with another Web service. A group of Web Services interacting together in this manner defines a particular Web service application in a Service-Oriented Architecture (SOA).²

Web Services and SOA is rapidly becoming a critical IT initiative for business. According analyst IDC, over 50% of US enterprises have completed 1 or more strategic Web Services and SOA projects, and another 30% are evaluating a strategic implementation of SOA.³ SOA allows for each component on an IP-based network to independently and intelligently “serve” the other components on the network.

Section 7: Speech, VoiceXML and Services Oriented Architectures

Speech and voice self service is one of the first areas seeing the benefits and value of converged IP and web based communications applications. Speech recognition technologies have become essential to management of voice based services and support in today’s contact center. It allows for the automation of complex applications that otherwise would require live-agent interaction. Not only does speech provide additional automation opportunities (and great return on investment), it also affords the ability to drive critical improvements in customer satisfaction and loyalty through “branded personas” — actual human personality that occurs through the speech interface.

Prior to standards like VoiceXML, programming Automated Speech Recognition (ASR) or Text to Speech (TTS) engines was vendor proprietary. VoiceXML 2.0 defines the basics so that speech applications can be written to be

portable across ASR/TTS vendor technologies. VoiceXML 3.0 will extend its coverage of ASR & TTS features, so that even more complex applications will also become more portable across voice platforms and speech vendors.

As a web technology, VoiceXML fits perfectly within the evolution from IP to Web Services to Services Oriented Architectures. VoiceXML allows for voice applications to intelligently “plug in” into an organization’s overall infrastructure. In a SOA, VoiceXML applications become a service, accessible by everything else connected to the network. Likewise, other elements connected to the network become easily accessible resources that the VoiceXML application can access. The end result is both a highly effective voice application as well a leveraged investment in voice self service, all of which drive dramatic returns from the investment in the voice self service solution.

When implemented within a SOA, VoiceXML helps make the speech resources an extension of the SOA. In an SOA environment, the incremental investment in speech is offset not only by the automation of a select group of voice applications, but also by allowing the speech resources to become more accessible from across the enterprise.

Section 8: VoiceXML in Today’s IP Contact Center

Avaya sees significant business value in adoption of VoiceXML and other open standards. Defining user dialogs, interfaces, workflows, and reporting requirements are not unique to voice self service applications. Nearly every intelligent communications application, from proactive outbound dialers to messaging and voice mail to CTI and screen-pop, has similar requirements for design, development, integration, and management.

Rather than duplicate these common functions and communication services across the MultiVantage™ Communications Applications portfolio, Avaya is moving to a common, Web Services based architecture. This enables software capabilities across the portfolio to become modularized and accessible by each.

Avaya has modularized and standardized technology components such as our VoiceXML 2.0 certified voice browser so it can be redeployed as a common component within Avaya Interactive Response and other software across the MultiVantage Communications Applications portfolio.

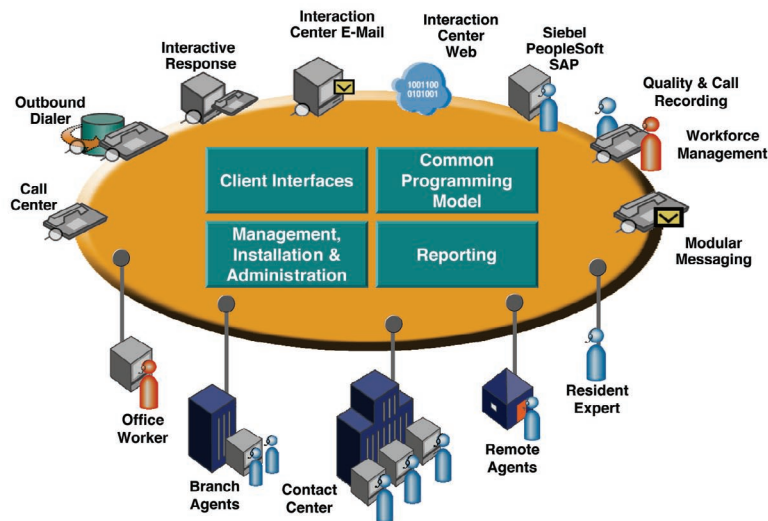


Figure 3: Communications applications based on VoiceXML and SOA simplify design and development through support of common interfaces and programming models for clients, administration, and reporting.

This commitment to modular, open web-based architectures provides businesses with unparalleled value. This not only drives significant reduction in development and ownership costs, but it allows for a VoiceXML

certified application to be deployed and interact as needed with the appropriate contact center capabilities necessary to fulfill a particular communications need.

It allows enterprises to make investments today in Avaya's contact center and communications solutions, at their own pace. Businesses can select the right contact center components for their needs, at the moment they need them, with the knowledge that those components will fit perfectly into their evolving web-based infrastructure and will also integrate together with the entire Avaya Customer Interaction Suite and MultiVantage™ Communications Applications portfolio. For instance, A business can invest today in a VoiceXML speech application for Interactive Response and be assured that as technology evolves that the investment will be portable and deployable to new or future processing platforms.

Section 9: Avaya Continues to Lead As VoiceXML Matures

With a long standing history in voice self service, messaging, and contact centers, Avaya has some of the world's largest and most successful open standards VoiceXML deployments within the industry today. Nearly 100% of new Avaya Self Service customers are deploying applications based on VoiceXML today.

Avaya is a pioneering leader in the development of VoiceXML. In March 1999, the VoiceXML Forum was founded by AT&T, Lucent Technologies (an AT&T spin off in 1996), IBM, and Motorola. In September 2000, Avaya spun off from Lucent Technologies. This rich heritage has provided Avaya with a tremendous opportunity in providing leadership in the development of the VoiceXML standard, and many of the scientists and engineers who helped define VoiceXML now work within Avaya Labs continuing to contribute to the VoiceXML development community and through advocacy groups such as the VoiceXML Forum.

Through both technology and market leadership, Avaya continues to lead the way towards a new era of intelligent communications. Avaya customers will find significant commonality across Avaya's contact center offerings and offering roadmaps, from common base web architectures, to specific product components like a common VoiceXML browser across products.

As organizations continue to strive to deliver rich, integrated, intelligent communications solutions, Avaya will be there with industry leading solutions that help simplify complex business demands that deliver a superior return on investment.

Footnotes

1 Source: Instat MDR 11/04

2 Source: <http://www.alphaworks.ibm.com/webservices/newto#01>, May 3, 2005

3 Source: IDC Fall 2004

About Avaya

Avaya enables businesses to achieve superior results by designing, building and managing their communications infrastructure and solutions. For over one million businesses worldwide, including more than 90 percent of the FORTUNE 500®, Avaya's embedded solutions help businesses enhance value, improve productivity and create competitive advantage by allowing people to be more productive and create more intelligent processes that satisfy customers.

For businesses large and small, Avaya is a world leader in secure, reliable IP telephony systems, communications applications and full life-cycle services. Driving the convergence of embedded voice and data communications with business applications, Avaya is distinguished by its combination of comprehensive, world-class products and services. Avaya helps customers across the globe leverage existing and new networks to achieve superior business results.

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