Technology Backgrounder on Applications Convergence Basics

By Larry Hettick and Steven Taylor

*T*he advantages of convergence are many. For example, businesses can reduce their costs for voice systems management when they shift to a voice over IP (VoIP) based implementation. Multi-site businesses can save on transmission and switching costs by converting to VoIP. But while network cost savings are always welcome, applications convergence saves labor costs and improves customer service – offering an even bigger contribution to the bottom line.

In its simplest form, applications convergence happens when computer-based applications like word processing, e-mail, and customer relationship management converge with communications-system applications like telephone calls and voice mail. This technology backgrounder will examine how applications convergence adds significant benefits beyond the cost savings created by network convergence.

Specifically, this technology backgrounder will:

- look at the evolutionary path that some businesses may follow to get to applications convergence,
- propose a logical model for integrating information technology with communications technology,
- briefly discuss the protocols important to applications convergence, and
- offer three case studies that demonstrate the power of applications convergence.

The Evolution of Applications Convergence

The recipe for applications convergence is multi-dimensional. However, just like most recipes, it can be changed to accommodate the tastes and needs of the users. This section will discuss some of the common ingredients for applications convergence and the likely order they will be mixed together to produce the final result.

Voice over IP (VoIP)

Applications convergence happens above the network layer, but it begins with network convergence. So the first step toward increasing productivity and improving customer service begins with a VoIP-enabled infrastructure. While applications integration is possible without VoIP, the costs to integrate legacy communications systems with the contemporary information technology (IT) applications can be cost-prohibitive for small and medium businesses. By contrast, VoIP uses Ethernet and the suite of IP-related protocols – the same packet technology used by most data applications. Therefore, the network layer integration is already built into both data and voice communications systems.

Interactive Voice Response (IVR)

An Interactive Voice Response System is typically included as part of a VoIP communications system. When not included, the IVR system can be easily integrated. IVR systems allow the caller to select the person they would like to talk to or to proceed with an automated task they would like to accomplish. Some IVR systems use touch-tone commands, some use speech recognition, some integrate caller ID to short-cut the automated question menus, and some IVR systems offer all three components. Modern IVR systems use a web-based protocol called VXML (discussed later in this document) to format commands between the user and the communications system.

Unified Messaging

Unified Messaging brings together voice mail, email, and fax onto a single user interface. The interface can be either a graphical user interface or a telephony user interface. When graphical, users can see their voice mails, emails, and faxes on-screen, and they can click to listen or read. With a telephony interface, users can listen to voice mails and, in some cases, emails and fax origination numbers. Note that unified messaging contains non-real-time information.

Unified Communications

Unified Communications and Unified Communications Portals add real-time capability to unified messaging. For example, click to talk (a service that creates "walkie-talkie" communications between cell phones), click to conference, and instant messaging are included in a unified communications portal. Some portals also allow click to collaborate, so documents and applications can be shared real-time. Most of today's unified communications portals are built using a protocol called SIP (discussed later in this document) to show when users are present on the network; their presence can be displayed regardless of their physical location.

Skills-Based Routing

Skills-based routing (SBR) has long been used in call centers, but it is now becoming available for use with ordinary business calls. One example of skills-based routing happens when a caller uses an IVR to key in his account number. The system recognizes the caller as, for example, a priority customer and routes the caller to the priority customer service agent. The skills of the service agent are matched to the expectations (and value) of the customer. More sophisticated systems will match the caller ID with the customer account number to shorten the IVR cycle. Intelligent call routing based on a customer type, status, or service request provides better-targeted customer service.

Data Applications and Information

The ability to access databases and applications depends on a figurative two-way street between the unified communication portal and the applications or application's data. Using web-based protocols like XML (discussed later), data applications like the customer relationship management system and important information like customer account balance can be provided real-time to a unified communications portal. The portal can provide integrated access to back office or desktop data applications just like it can provide communications access. Using IP-based and web-based protocols, these features can be very quickly and cost-effectively integrated onto the user's unified communications portal.

Users benefit because they have a single portal interface to a myriad of applications they need; companies benefit because applications integration onto the portal is simplified by an order of magnitude.

Speech-to-Text and Text-to-Speech

To round out the telephony unified communications portal for wireless and wireline phones, advances in speech recognition have come to the rescue. Whereas legacy IVR systems were mostly driven by touchtone commands, today's systems have begun to integrate speech recognition into the menu selections using speech-to-text technology. Word recognition technology can also allow users to provide key words to navigate through their communications portal, providing intelligent call routing and shortcuts to the decision trees typically associated with legacy IVR systems.

On the other side of the coin, information from data bases like a customer's account balance, their shipment date, or the contents of an email message can now be pleasantly provided by text-to-speech conversion. Experts in the field predict that having a "conversation" with a data application is not only possible but will soon emerge in the next round of applications convergence.

Combined, these advances provide customers alternatives for a faster response to data, services, and intelligent routing of their calls-reducing costs and improving customer service.

Three important protocols

Web--based and IP-based protocols are key to the rapid integration of data applications and information into the unified communications portal. Three primary protocols have emerged with wide acceptance-XML, VXML, and SIP.

XML

Extensible Markup Language (XML) is a family of rules for designing text formats into a specific data structure. XML is not a programming language, so developers don't have to be computer programmers to use it or learn it. XML is also platform-independent, and it has been designed around easy implementation and for interoperability with other web-specific protocols like HTML. XML reduces the time required (in some cases by an order of magnitude) to integrate PBX features, unified message features, and other business applications like document collaboration.

VXML

VoiceXML (VXML) is designed for creating audio dialogs that feature synthesized speech, digitized audio, recognition of spoken and DTMF key input, recording of spoken input, telephony, and mixed initiative conversations. Its major goal is to bring the advantages of web-based development and content delivery to IVR applications. Users benefit because web-based development is easier than traditional programming and because content delivery based in web-friendly formats provides a large range of available content-based services.

SIP and Presence

Session Initiation Protocol (SIP) is a signaling protocol used to create IP sessions. It has been adopted as a leading standard for signaling voice applications across IP. It can also provide signaling – both for and between other applications. For example, a user may initiate a voice call from an instant messaging application using SIP. SIP-based telephony systems are the leading choice for ongoing implementations of VoIP because SIP supports presence and concurrent multimedia sessions between users.

Presence is most easily illustrated with instant messaging (IM) services. IM services use a "buddy list" that shows if the user's registered "buddies" are logged onto their workstation. When a user logs off, the presence registrar shows his departure. The concept of presence can also be extended beyond instant message applications to any other communications portal, including a wireline or wireless phone.

Using presence registrars, users can prescribe how they wish to be found (or not found.) Network intelligence will combine user preferences with network presence, and route the call appropriately. This technique enables real-time communications – directing how and where the called party wishes to be found.
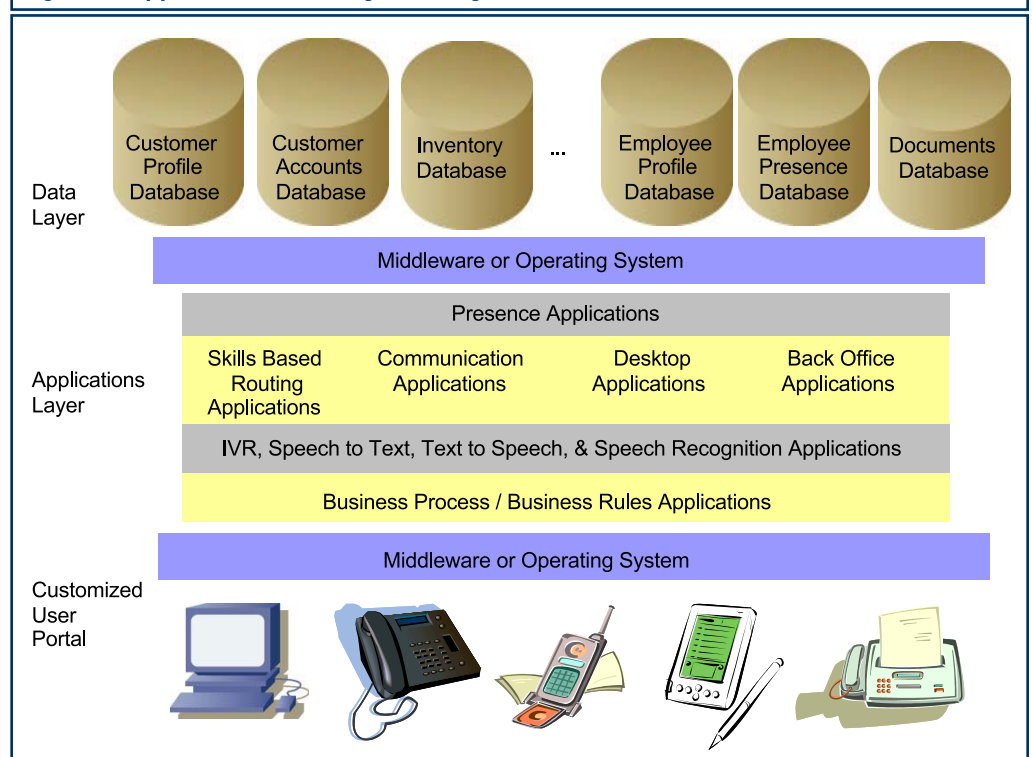
Emerging Enterprise Applications Convergence Model

Based on the development and adoption of the building blocks, a new logical Enterprise

IT model is possible for converged applications. In the model shown below in **figure 1**, three layers are present – the data layer, the applications layer, and the customized user portal layer. This model is a logical construct, but large businesses are building to this model today because the model not only brings efficiency for users, but efficiency to business IT applications.

For example, today, most enterprises rely on server-based applications to keep the data shown in the model's independent databases. While redundant data can be costly, systems integration costs would be more costly to provide the multiple applications with common data access. In the emerging applications convergence model, common data required by multiple applications can be easily stored on data servers and accessed by the multiple applications.

Figure 1: Applications Convergence Logical Model

Data Layer: Customer Profile Database, Customer Accounts Database, Inventory Database, ..., Employee Profile Database, Employee Presence Database, Documents Database

Middleware or Operating System

Applications Layer: Presence Applications; Skills Based Routing Applications, Communication Applications, Desktop Applications, Back Office Applications; IVR, Speech to Text, Text to Speech, & Speech Recognition Applications; Business Process / Business Rules Applications

Middleware or Operating System

Customized User Portal

The customized user portal has three noteworthy attributes. First, presence based on SIP allows the network to understand where the user is "logged in" so that when needed and when appropriate, the user's profile can work with the network to route the email, voice call, fax, or video conference to the appropriate device.

Second, the network middleware or operating system can forward communications in the appropriate "format" to send the call or information based on what device or devices the user has "live" on the network. For example, a user may wish to hear an email read to him (by the text to speech application) on his cell phone, while keeping the original text message stored on his email server.

Third, the user's portal can customize how the network will treat him in three ways: specific to his presence, specific to the calling party, and specific to his skills. These dimensions give the user added control of his communications.

User Case Studies

The case studies cited in this section are real life examples; however the real names of the school district, the coffee supplier, and bank have been withheld.

Central California School District

The Central California School District wanted to reduce the costs associated with assigning substitute teachers and to improve the match of substitute teacher skills to available openings. First, the school district created a skills database listing the substitutes' credentials, the topics and grade levels they were qualified to teach, and the schedule the substitute teachers were willing to work. Next, they mapped the skills and credentials required for every class in the school district. Then they provided an automated mapping so the best available substitute teacher could be quickly matched to any temporary opening.

The school district then integrated an IVR system that allows the permanent teachers to call into the district's phone system, providing the mapping application with dates the permanent teacher is not available to teach. Once the match is found, the IVR system calls out to the pool of available substitutes, offering them the assignment. Once a qualified substitute accepts the assignment, the school principal is sent an email notification about the staff change.

Chicago Coffee Supply

Chicago Coffee Supply has long provided a mail order service to businesses and consumers who want to purchase high quality coffee and coffee makers. The company had a customer service staff to take orders and answer questions for customers who preferred to order by phone. In an effort to extend their reach, the company decided to add a website (reducing publication costs) and to provide on-line ordering capabilities, including direct ordering or e-mail initiated orders.

Not wanting to reduce their high level of customer support, the company decided to extend customer care service to help with online orders. Customers were given the added choices of web chat, instant messaging, email, or "click for a call-back." Customer service agents were trained to use the multimedia system, blending their service skills to include text-driven requests with the existing voice calls.

A work force dispatch system was integrated with the phone system's call director to prioritize voice calls in queue, instant messages and web chat requests in queue, and email waiting for the promised 24 hour reply. Using a VoIP system that supported off-premise capabilities, blended agents were given the option to work at home if they had broadband Internet access; existing management reporting mechanisms were extended to the work-at-home agents as part of the VoIP system.

American Bank

American Bank has extended online banking to their customers for over a decade, and they have provided 24-hour bank-by-phone service for more than 20 years. In an effort to increase personalized service the bank also introduced the option for customers to create their own online personal profile. But the bank observed that not every customer could or would access online banking.

However, customer demand for bank-by-phone was steadily increasing. Since customers weren't always satisfied with the long menu of touch-tone commands needed to navigate the IVR system, many would opt-out to a real person, increasing the bank's cost.

The bank decided to add speech recognition to their IVR system. At the same time the bank introduced customer-specified personal profiles that shortened their speech driven IVR responses since the customer didn't need to reenter data already specified or to face choices that didn't apply to their existing accounts. The completed system now allows customers to complete almost all transaction types with the IVR system that they could complete with online banking or with an agent.

Conclusions

Applications convergence is the next step for businesses that have embraced network convergence. The evolution of application convergence and its component parts has already provided substantial savings in employee time and has improved customer service levels. As businesses move to further integrate their data applications and information with unified communications portals and business process, the effect on business efficiency and customer service will be profound.

Steven Taylor

Steven Taylor, consultant and broadband packet evangelist, is President of Distributed Networking Associates and Publisher of Webtorials. An independent consultant, planner, author, and teacher since 1984, Mr. Taylor is frequently quoted in the trade press and is one of the industry's most published authors and lecturers on high bandwidth networking techniques. He has served as a Contributing Editor for Data Communications magazine, publishes articles in both Business Communications Review and Network World, and co-authors two newsletters – Convergence and Wide Area Networking – distributed by Network World Fusion.

Larry Hettick

Larry Hettick has nearly 20 years of combined data communications and telecommunications experience. A capable and experienced speaker and writer, Larry possesses proven global expertise in product management and product marketing. Larry also writes for industry press, most notably as a co-author of Network World's bi-weekly Convergence Newsletter and as a periodic contributor to Business Communications Review. He is currently working as an independent consultant, specializing in the convergence market.

A word from the sponsor
Nortel Networks

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At Nortel Networks, convergence is more than voice over IP (VoIP) - it is the delivery of voice, video, data, and applications over one network - wired or wireless; it is one of the ways we can help you be a business without boundaries.

We can help you realize your business objectives with convergence solutions that can be implemented at your pace - by adopting a revolutionary or evolutionary approach to best meet your needs.

These solutions are designed to deliver the technology you need today, while preparing your business for tomorrow.

Converged Campus Solution

Nortel Networks Converged Campus solution combines a highly available network infrastructure with proven, feature-rich business telephony features and applications, and provides a strong foundation for innovative converged applications such as IP telephony and multimedia.

Converged Branch Office Solution

Nortel Networks Branch Solution delivers a network infrastructure that enables the branch office to securely access centralized resources and deliver an array of services.

Converged Applications Solutions

Nortel Networks Converged Applications - "Connect Your Employees" solutions leverage IP Telephony and multimedia capabilities enabling you to increase employee productivity and reduce operating expenses.

Nortel Networks Converged Applications - "Connect Your Customers" solution takes the traditional call center, transforms it beyond basic call routing and adds IP Telephony, multimedia, and speech recognition capabilities to enable companies to connect with customers and manage relationships more effectively.

Converged Mobility

Nortel Networks Converged Mobility solutions take the characteristics of the wired LAN but remove the restrictions of individuals being physically attached to the campus. Users are given the flexibility of anytime, anywhere access, no matter if this means WLAN, WLAN IP Telephony, or Secure Mobile Access.

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