White Paper

Emergence of VoIP Telephony in the Enterprise

Abstract

Learn about Voice over Internet Protocol, the new standard for managing voice, data and other forms of information within a larger IT context, allowing convergence of voice telephony to converge with data to achieve new forms of communication within the enterprise.

Bottom Line

An understanding of the new VoIP technology is essential to controlling enterprise telephony costs and services in the future.

Forward

Shortly after the Internet was embraced as a public communications network in the mid-1990s, people realized that voice information could be treated as just another form of data. The concept of IP telephony, or managing voice information using the Internet Protocol (Voice over Internet Protocol, or VoIP), was quickly embraced by hobbyists and others.

While early generations of VoIP technology had serious limitations for corporate use, the potential benefits were always compelling. The development of new standard protocols and improved technology has led to explosive growth in the corporate use of VoIP. With several high-profile installations already in place, many observers believe that in time, VoIP will become the standard platform for voice communication in the enterprise.

Elliot King, Editor in Chief
Database Trends & Applications

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1. Current Situation with VoIP

The architecture for the standard telephone system, the Public Switched Telephone Network – PSTN (http://en.wikipedia.org/wiki/PSTN), is anchored in Alexander Graham Bell's invention of the telephone in 1876. The entire system was created for the one-way transmission of voice sampled in 8-bit bytes, 8,000 times a second, for an aggregate rate of 64 Kbps (thousand bits per second). The PSTN is a circuit-switched network. A single, dedicated circuit is established between two users. Once the circuit has been established, it can be used only by those two users and only for the transmission of voice. The two users consume the entire bandwidth of the circuit even during moments of silence, when very little data is being transmitted.

While the PSTN has many advantages -- at this stage in its development it is reliable and the quality of the transmission is high -- it also has distinct disadvantages:

- Use of bandwidth is inefficient.
- It is difficult to maintain/upgrade the PSTN network.
- It is challenging to add new features.
- Voice data is isolated from other forms of data in the enterprise.

Voice over Internet Protocol – VoIP
(http://en.wikipedia.org/wiki/Voice_over_IP) manages telephone calls using the same technology as the Internet, called packet switching (http://en.wikipedia.org/wiki/Packet_switching) . Instead of establishing a dedicated circuit between two users, data is sliced into packets of information that are moved from the source (caller) to the destination (person called) from one router on the Internet to another.

Packet-switching technology has several advantages. It makes more efficient use of bandwidth, allowing it to cost-effectively support great numbers of users. Moreover, unlike the PSTN, VoIP networks can be developed and upgraded more easily because changes can be made to one part of the network without requiring adjustments elsewhere. Finally, with VoIP, voice data is managed using the same infrastructure that manages other corporate data, allowing for easier integration of voice information into enterprise applications….called *convergence* in the world of telephony.

Two different implementations of VoIP have emerged:

- **PBX** – With an Internet-based PBX, VoIP is implemented using on-premises equipment and is the functional equivalent of a tradition public branch exchange (PBX) network.
- **Centrix –** VoIP can also be implemented on a central office switch, where calls exit the enterprise to be switched. This is the equivalent of a traditional Centrix system.

2. History and Development of VoIP

VoIP was first launched in 1995 by hobbyists who realized the advantages of sending voice data packets over the Internet rather than the standard telephone network. At that time, both callers had to have computers equipped with sound cards and the same software. Because of the way a packet-switched

network operates, voice quality was often poor and the experience cumbersome.

Then broadband Ethernet networks were introduced in the late 1990s and both service and quality improved. A major breakthrough occurred when hardware manufacturers including 3Com, Cisco Systems and Nortel Networks introduced equipment that could "switch" voice data packets. This development allowed many of the functions that had been performed by the computer's CPU in the past to be managed by network equipment. Moreover, VoIP networks could be interfaced with the PSTN network.

Since 2000, availability of VoIP technology has expanded dramatically. At the same time, several different standards and protocols associated with VoIP have emerged as well. Perhaps the most significant new standard to emerge is the Session Initiation Protocol (SIP) standard (http://en.wikipedia.org/wiki/Session_Initiation_Protocol). SIP was developed by the Internet Engineering Task Force (http://www.ietf.org/overview.html and http://en.wikipedia.org/wiki/Internet_Engineering_Task_Force). SIP is used to establish, modify and terminate multimedia sessions, including voice, video, instant messaging and online gaming. The widespread adoption of SIP ensures the interoperability of VoIP technology between a wide array of vendors.

3. The Use of VoIP Today

VoIP is being used in a wide array of applications today. Consumer applications, such as Skype (www.skype.com), which is now owned by eBay (www.ebay.com), as well as Vonage (www.vonage.com), a public company offering VoIP technology, are

perhaps the best known users of VoIP technology. Moreover, many enterprises are adopting VoIP technology. Here are some examples.

- **University:** In the wake of 9/11, a well-known university in the Midwest realized it had no public address system or alternative emergency communication infrastructure in place. Faced with a PBX that was approaching its end of life, the university opted to replace its PBX with a VoIP network.

- **Conglomerate:** A global conglomerate has 20 offices in Europe. For inter-office communication it used private leased lines and the local PSTNs. To cut maintenance costs and to eliminate the need for privately licensed international lines, it moved to a VoIP network.

- **Medical:** A diagnostic medical imaging company wanted to upgrade its telephone system. An initial analysis estimated that the cost of the upgrade could reach $500,000. After extensive research, when the company also upgraded its corporate network, it determined that it could convert to VoIP at around half the cost of upgrading its traditional telephone system; since the VoIP system runs on the Ethernet network, it is easier for the IT department to maintain.

4. Market Growth

VoIP is currently experiencing sharp market growth. According to the market research company In-Stat (www.instat.com), VoIP is currently being used by about 20 percent of all U.S. businesses. By the year 2011, analysts at In-Stat believe VoIP will be in use in around 66 percent of all U.S. businesses.

Some companies are opting for multiple VoIP solutions. In-Stat reports that 36 percent of the companies that are using VoIP have multiple solutions. Larger companies lean towards using VoIP PBX technology and smaller companies tend towards broadband IP telephony. Some observers believe that VoIP will become the dominant mode for voice data in the enterprise by 2009 or shortly thereafter.

5. VoIP Benefits

Some companies are moving quickly to adopt VoIP because they can realize a wide range of benefits:

- **Unified Messaging Platform:** By moving to VoIP, companies can have a single platform to manage all of their communication, including voice, email, instant messaging, fax and more.

- **Integration with Enterprise Applications**: Traditional voice technology cannot be integrated with enterprise applications. Since VoIP uses the same underlying foundation as other applications, it can be more easily integrated into applications like CRM, ERP and Web portals.

- **Consolidation**: VoIP allows data networks and voice networks to be consolidated, making more efficient use of existing bandwidth.

- **Efficient Maintenance**: IT personnel are generally more familiar with the technologies associated with VoIP than they are with traditional telephony networks, making network maintenance more efficient.

- **Lower Costs**: VoIP enables calls to be made on lower cost data networks and can eliminate the need for high-cost, dedicated telephone equipment.

- **Scalability**: Because of the character of Internet technologies, the VoIP network can be expanded and new features added without requiring wholesale changes to the entire network.

- **Support Mobile and Remote Workers**: VoIP allows companies to better support their mobile and remote workforce.

- **Application Convergence**: VoIP enables voice to be more easily integrated with new applications and technologies.

- **High Performance**: The voice quality in enterprise-level VoIP telephony generally equals the quality of traditional telephone networks

6. Convergence: The Secret Sauce in VoIP

VoIP works by turning voice calls into data packets, permitting voice calls to be treated like just another form of digitized data.

Thus, VoIP eliminates the need for separate voice and data networks in an organization. Your company's communications infrastructure can be *converged* using VoIP. This eliminates the need for a second network for voice. One immediate result is reduced costs on everything from voicemail to long distance charges, and new features like unified messaging and remote calling become available.

The convergence capability in a VoIP solution permits combining the following voice and data forms for more sophisticated information-handling applications:

- Calls
- Voicemail
- Email
- Fax
- Conferencing (audio, video, web)
- Call center
- Access to other apps

Careful integration planning to take advantage of convergence requires identifying and addressing all potential combinations of voice and data with a long-term view and considering the potential needs and interfaces involved. This critical planning step can make or brake the success of convergence in a VoIP installation.

"Convergence is the real secret sauce in VoIP," says Pete Elliot, Director of Marketing for Key Information Systems. "It isn't the first aspect of VoIP usually implemented, but once it starts to take shape, some very exciting combinations of voice and data can be realized."

7. New VoIP Solutions

In the Fall of 2006, IBM and 3Com unveiled a VoIP solution aimed at small and mid-sized businesses using 3Com (http://www.3com.com) software and the IBM System i mid-range computer. IBM refers to this solution as **IBM System i IP Telephony** and it uses the **3Com VCX IP Telephony Module.** (http://www.3com.com/other/pdfs/products/en_US/400865.pdf). Unlike other IP telephony offerings that require a separate server of each IP telephony application, the IBM/3Com solution enables companies to implement a complete IP telephony solution on a single easy-to-manage platform.

The **IBM System i IP Telephony** solution is built on the **Session Initiation Protocol** – SIP (http://en.wikipedia.org/wiki/Session_Initiation_Protocol) standard to handle all of the telephone routing, messaging, and conferencing. The VCX software suite runs in a Linux partition on the System i. To implement the solution, an enterprise must have enough capacity on the System i to load the IBM/3Com solution. A company's data network must also be carefully examined to ensure that it is robust enough to handle the projected volumes of voice traffic. Regarding survivability issues, Fault Tolerance is built in as an integral part of the IBM/3Com product.

8. IBM Midrange Case Study – FIDM

The Fashion Institute of Design & Merchandising – FIDM (www.fidm.edu) is a prestigious co-educational, specialized, private college dedicated to educating students for the fashion, graphics, interior design and entertainment industries, with campuses in Los Angeles, San Francisco, San Diego and Orange County, CA. FIDM has 5,500 full-time students and approximately 30,000 alumni now working in areas that include: Oscars, Emmy's, set design, fashion design, interior design. FIDM currently offers an AA in Fashion Design and plans to offer a BS and business management degrees in the near future.

FIDM's telephone system was becoming outdated and running out of capacity. FIDM has zero tolerance for telephone downtime and needed a new system/technology at their four campus locations. They had decided that VoIP was the right technical approach, but had not determined which variety of VoIP to adopt.

For their VoIP platform, FIDM selected **IBM and 3Com's System i IP Telephony software** to run on IBM's System i server. This solution will allow FIDM to implement a complete IP telephony solution on one easy-to-manage platform, the IBM System i. FIDM decided to initially use VoIP internally on their LAN and WAN, continuing to use traditional phone lines for external calls. As a result, FIDM has beefed up some of their network equipment for added protection. The WAN equipment was already going to be upgraded because of changing the network from ATM (Asynchronous Transfer Mode) to MPLS (Multiprotocol Label Switching). FIDM currently has installed a new IBM System i model i5 570 with nine processors

activated and six partitions. Three of the partitions are for Domino, one for a Linux partition for Web applications, and two additional Linux partitions for VoIP.

An IBM iSeries model 520 is used for the Fault Tolerance function that comes standard with the IBM/3Com VoIP software. FIDM plans to eventually implement High Availability protection for their entire System i platform.

While all of the college's core business is on the System i,, FIDM does have 40 Intel boxes which are print servers and run specific applications for courses offered by the college. VoIP was initially implemented only on FIDM's LAN and WAN.

Roxanne Reynolds-Lair, FIDM's Chief Information Officer, reports "When you move from traditional PBX to VoIP, the site planning doc is very important and for FIDM it required upgrades to our network and some of the switches."

Key employed a network assessment tool to look at switches, routers and wiring in FIDM's networks.The result was a **Voice Readiness Assessment** to help plan the best VoIP implementation strategy.

FIDM realized significant cost savings in the tens of thousands of dollars upon going to VoIP. A lot of that came with the conversion from an ATM network to the MPLS network and the elimination of maintenance contracts on PBX systems. "There is also a business continuity benefit: if one of the telecom sites goes down or even if one site is overwhelmed with calls, we'll be able to switch over and have another location answer those calls

without the caller ever knowing that there was a problem," says Reynolds-Lair.

9. Key VoIP Webinars

Key's Webinar Program has produced a number of Internet-based seminars focusing on topics related to this paper. The most recent ones to present valuable information in a 1-hour audio and PowerPoint format are:

July 26, 2007 – VoIP on System i to Cut Costs, Increase Reliability and Enable Unified Communications

Terry Boulais, Director of Business Development, *Key Information Systems*

Allan Scott, Director IBM Alliance, *3Com*

Roxanne Reynolds-Lair, IT CIO, *The Fashion Institute of Design & Merchandising*
https://keyinfo.webex.com/ec0509l/eventcenter/recording/recordAction.do?theAction=poprecord&confViewID=20956882&rnd=6079567836&siteurl=keyinfo&servicename=EC&recordKey=3D4183481DB4D6DA573C6769713F374BCA1F365867710DA6955323DF9D7BAFBA&RecordingID=20956882&AT=VR&needFilter=false

May 10, 2007 – VoIP on the System i to Cut Costs and Increase Reliability

March 29, 2007 – VoIP on the iSeries for Increased Reliability and Security.

The location on Key's Web site for all archived Key webinars is:
http://www.keyinfo.com/resources/web_arch.shtml

10. Conclusion

First the telephone network and now telephony have revolutionized every aspect of human and enterprise interaction. The old circuit-switched architecture is being replaced with VoIP in at least two forms: PBX and Centrix. The move to VoIP promises to revolutionize telephony in many ways. VoIP-based telephone systems can greatly reduce costs, are far easier to manage, make it easier to add and change services, and open the door to as-yet unimagined improvements in the way that voice and data can interact. With voice being treated as just one more data type and integrated with email, fax, documents and reports through convergence, innovative ways of handling information are occurring that are simply not possible with a traditional telephone system.

VoIP implementations must be high-quality and high-service solutions consistently … that is expected and the bar that must be reached to get into the telephony game. IBM iSeries and System i servers, in combination with hardware and VCX IP Telephony software from IBM's partner 3Com, provide a safe and sure pathway to reliable VoIP capabilities. Elliot King, Editor in Chief of Database Trends & Applications, has written, "With the 3Com VCX IP Telephony Module running on the IBM iSeries and System i, enterprises can reap the benefits of a state-of-the-art scalable, extensible and ultra-reliable VoIP platform."

In the IBM world, smart users will choose to work with experienced technology providers like Key Information Systems who know the breakthrough methodologies and proven roadmaps to on-time VoIP networks and convergent applications.

11. Relevant Links

VoIP Solution Center

Collection of VoIP reference links on Key Information Systems Web site.
http://www.keyinfo.com/products_solutions/solutions/voip.shtml

Adoption of VoIP Tied to Relief from Phone Expenses – Part 1 in The Four Hundred
Important insights into ensuring a successful VoIP implementation by Key Information Systems Director of Business Development Terry Boulais.
June 18, 2007 *IT Jungle*
http://www.itjungle.com/tfh/tfh061807-story03.html

VoIP and the Search for Single Points of Failure -- Part 2 in The Four Hundred
A discussion of potential points of failure, fault tolerance, high availability, disaster recovery and bandwidth considerations for VoIP implementations by Key Information Systems Director of Business Development Terry Boulais.
June 25, 2007, *IT Jungle*
http://www.itjungle.com/tfh/tfh062507-story03.html

Project Costs Tell the VoIP Story – Part 3 in The Four Hundred
A detailed, real-world look at the potentially dramatic cost savings that can be achieved with a successful VoIP implementation, as well as cost pitfalls that can result from a lack of thorough project planning, by Key Information Systems Director of Business Development Terry Boulais.
July 9, 2007, *IT Jungle*
http://www.itjungle.com/tfh/tfh070907-story02.html

Is Your Company Ready to Merge Voice and Data onto a Single Network?
Terry Boulais.
MC Press, MC Showcase Online

June 21, 2007
An overview of the evolution, current state of the technology and convergence benefits of VoIP by Key Information System Director of Business Development.
http://www.mc-showcase.com/mcpress/showcase.nsf/Focus/000E51D866DE71638625730100066E7B

VoIP Running Under Linux Debuts on System i
Pete Elliot
MC Press, MC Showcase Online
April 3, 2007
Key's experience with VoIP at FIDM
http://www.mc-showcase.com/mcpress/Showcase.nsf/BackIssues/CEB8FD5505B2733C862572B10081994B

System i IP Telephony at FIDM
COMMON Connect
April 2007
Authored by FIDM
http://www.e-clipse.ca/CONNECT/Volume4/C-V04N2/C-V04N2_19-21_Latif.pdf

VoIP Glossary: Terms and Definitions
http://www.patton.com/manuals/VoIP_Glossary.pdf

VoIP for iSeries Now Available
By Mark Fontecchio, News Writer, Search400.com, October 24, 2006
http://search400.techtarget.com/originalContent/0,289142,sid3_gci1226149,00.html

3Com, IBM are Porting VoIP Suite to the System i5
By Timothy Prickett Morgan, Publisher, The Four Hundred, April 3, 2005
http://www.itjungle.com/tfh/tfh040306-story02.html

Join IBM's i Society
http://www-03.ibm.com/systems/i/

Overview of iSeries (OS/400) architecture
http://www-03.ibm.com/servers/enable/site/porting/iseries/overview/overview.html

Why now is the time to integrate VoIP in SMB networks
http://www-304.ibm.com/jct03004c/businesscenter/smb/us/en/contenttemplate/gcl_xmlid/71173/&ca=SMBFVVoiptext&tactic=&me=W&met=inli&re=SMBINDcrossareafeat2

UT University becomes the first New Zealand University to move to a VoIP phone system
http://www-935.ibm.com/services/nz/index.wss/summary/itsn/a1022810?cntxt=a1011308

Business VoIP Shopping Guide
http://www.voipreview.org/Business_Telephone_Systems/business_voip_shopping.aspx

Internet Engineering Task Force from Wikipedia
http://en.wikipedia.org/wiki/Internet_Engineering_Task_Force

FCC VoIP Page
Official VoIP page of U.S. Federal Communication Commission
http://www.fcc.gov/voip/

Understanding VoIP
Mel Beckman
System i NEWS
August 2007
http://www.systeminetwork.com/artarchive/20976/index.html

My Journey into VoIP
Sean Chandler
System i NEWS
August 2007
http://www.systeminetwork.com/artarchive/20967/index.html

12. About the Author

Terry Boulais serves as Director of Business Development at Key Information Systems. Key has been an IBM Premier Business Partner since 1999. At Key, Terry manages the highly sophisticated technical evaluation and design services that Key provides to its clients.

Terry has been creating computer solutions in the IBM midrange industry for 20 years. Before he joined Key, he was Chief of Solution Architects at Vision Solutions. There, he managed a group of specialists who designed and implemented sophisticated client solutions. These solutions included high availability, workload distribution, network and application design, performance tuning, and backup/recovery strategies.

During his earlier careers, Terry managed the IT services for three hospitals and developed highly successful reservation systems for the travel and health care industries.

Terry is married and has three children. His personal interests include all sports, home theater as well as woodworking. He is based out of Key's Orange County office in Newport Beach, California.
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13. About Key Information Systems

Key Information Systems, www.keyinfo.com is a leading technology firm in the western United States, specializing in solutions for corporate infrastructure, business continuity and storage. Key is an IBM Premier Business Partner, AVNET Premier Business Partner and Microsoft Certified Partner. The company

also represents major IT solutions from Brocade, Marathon Technologies, Novell and VMware.

Key's high-availability and fault-tolerant solutions are backed by a complete range of professional services, including critical assessment, financing, systems integration, installation, training and maintenance.

With one of the most knowledgeable and best-trained teams in the industry, the company has been listed as one of Inc. magazine's Fastest Growing Privately Held Companies in Los Angeles and has received Leadership, Beacon and Fast Track Awards from IBM as well as a Top Partner Award from AVNET.

Corporate headquarters are in Woodland Hills, CA, with additional offices in San Francisco, Newport Beach and Phoenix, AZ. An IBM-authorized Business Partner Innovation Center is maintained at the Woodland Hills location.

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For more information about anything in this Key White Paper and Key's perspective on VoIP, contact:

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