ACUTA Journal of Telecommunications in Higher Education

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ACUTA's Core Values are:
- Encouraging and facilitating networking and the sharing of resources
- Exhibiting respect for the expression of individual opinions and solutions
- Fulfilling a commitment to professional development and growth
- Advocating the strategic value of information communications technologies in higher education
- Encouraging volunteerism and individual contribution of members
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From handheld VoIP applications to desktop videoconferencing, all signs suggest that the broadband network is the new frontier for digital communication, replacing legacy PSTN connectivity more rapidly than ever.

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The ACUTA Journal of Information Communications Technology in Higher Education

Published Quarterly by
ACUTA: The Association for Information Communications Technology Professionals in Higher Education
152 W. Zandale Drive, Suite 200
Lexington, KY 40503-2486
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Submissions Policy
The ACUTA Journal welcomes submissions of editorial material. We reserve the right to reject submissions or to edit for grammar, length, and clarity. Send all materials or letter of inquiry to Pat Scott, Editor-in-Chief. Author’s guidelines are available upon request or online at www.acuta.org.

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The ACUTA Journal is published four times per year by ACUTA, a nonprofit association for institutions of higher education, represented by communications technology managers and staff.

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ISSN 2151-3767

POSTMASTER, send all address changes to:
ACUTA
152 W. Zandale Drive, Suite 200
Lexington, KY 40503-2486
Postage paid at Lexington, Kentucky.
Visit the ACUTA site on the World Wide Web:
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Membership and Subscriptions
Subscriptions are provided as a benefit of membership. The publication is available to members for $80 per year or $20 per issue. For information, contact Michele West, Membership Services Manager, 859/278-3338, ext. 222, or e-mail mwwest@acuta.org.

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Halfway through another academic year, it's a good time to stop and take a look around us. How is the technological landscape changing, and how do these changes affect those of us charged with designing, installing, and maintaining communications services for our campuses? We all know that both our 802.11n and mobile wireless usage continue to grow. Students today possess multiple devices capable of connecting to the university wireless backbone:

- Laptop, notebook, and netbook computers
- Smartphones
- Xbox 360, Playstation 3, and other gaming devices
- Kindle, Nook, or iPad/tablet devices
- Wireless printers
- Smart TV, Blu-Ray disc and TiVo all with built-in Wi-Fi

How is your IP address space handling all of this? How is all that gaming and video affecting your Internet bandwidth?

Forrester Research recently predicted that tablet PC sales will surpass netbook and mini PC sales by as early as 2012. Figure 1 shows the trending of this data. At our campuses, the majority of students arrive with laptops. Forrester's research suggests that soon many more will be bringing both laptops and tablets. At least initially, these tablet devices will be in addition to and not instead of traditional laptops. Add these two devices to the smartphone, and many students will have a minimum of three Wi-Fi capable devices.

In late June 2011, the FCC published its 15<sup>th</sup> annual Mobile Wireless Competition Report. The report is intended to benchmark and annually compare competition in the wireless industry. It is interesting to see the market share data relative to smartphones. Figure 2 shows that between December 2009 and August 2010 the percentage of smartphones in use moved 14.4 percent in favor of the Google Android Operating system. All other OS types showed declines.

![Figure 1: Forecast: Share of US Consumer PC Sales by Form Factor, 2008 to 2015](source)

![Figure 2: Share of Smartphones in Use by Operating System (U.S.)](source)

We might expect this same trend to occur soon in the tablet computer market. According to ConsumerReports.org, 50 new tablet devices were unveiled at the Consumer Electronics Show this past January. All of these devices will be competing for the dominance that Apple has had in...
the tablet space. Colleges and universities should expect to see an onslaught of these devices looking to connect to our networks.

New applications are being developed and downloaded for the Apple iPhone and iPad at a remarkable rate. From April 2010 through January 2011 alone, the number of available iPhone applications more than doubled. Figure 3 shows this exponential growth. It's clear that mobile users have an insatiable appetite for these types of applications.

Last summer it was widely reported that Apple iPads were responsible for 1 percent of the total Internet traffic. For a device that didn't exist until last year, that's a pretty impressive statistic. Tablet devices in general are poised to explode in sales. Many of the devices will work on both 3G/4G and Wi-Fi networks. The industry trend to imbed both types of network radios is something we should watch as we do our long-term network planning.

In early October, Amazon entered the fray with their Amazon Kindle Fire tablet, retailing for just $199. Rumors were that Amazon would be making a deal with HP to buy their webOS architecture. This product is different because of Amazon's ability to host the storage of video, e-books, and music in their cloud. The low cost of the device has to do with how easily it integrates with the rest of the Amazon enterprise, allowing customers to shop more easily.

So what does this all mean?

Two summers ago, Boston College installed 802.11n wireless throughout sixteen of our residence halls. We maintained older 10/100 switches in place for one year while we completed designs for switch port replacement. This past summer, in eleven of those buildings, we are replacing network switches with 50 percent fewer wired Ethernet ports. Instead of a port per pillow, we installed one per bedroom and will strongly encourage the use of wireless. At the same time we upgraded the building feeds from the distribution router to each building from 2G to 20G, and increased the bandwidth to each floor from 1G to 2G. All edge ports are now 10/100/1000.

Over the coming months we will also be installing a "neutral host" distributed antenna system (DAS) to greatly enhance cellular coverage and capacity throughout the residence halls and the rest of campus. Our intent is to provide lots of bandwidth to our community members on either the Boston College IP backbone or the carrier cellular network. This approach should provide our community the flexibility to use any device they own on the network of their choice.

Joe Harrington is director of network services at Boston College. Reach him at harrington@bc.edu.

When I'm faced with getting critical, accurate, resource information necessary to do my job as well as possible, my first instinct is ACUTA. I can't imagine why every campus isn't a member.”

—Carmine Piscopo, Providence College

Do a friend a favor:
Invite a colleague to be a part of the ACUTA network!
I think this is the most exciting time in the history of voice communications since the advent of proprietary telecommunications systems. The terrain is undergoing revolutionary transformation as we watch the chrysalis emerge and as we play active roles in its redefinition.

The winter issue of the ACUTA Journal reveals the various courses that college and university IT professionals are charting with new business models. ACUTA president Joe Harrington provides a glimpse of the wireless demands and subsequent plans for growth at Boston College. The recurring themes are the need for campus flexibility to support any device on the network at any time and the need to adapt to our changing campus cultures, as Arthur Brant, Abilene Christian University, observes.

Curt Harler juxtaposes Arizona State University's dramatic voice outsourcing approach with the University of Arizona's in-house management choice. It is noted that each model works well for each school.

In this era of VoIP, Chuck Brady, CEO of Apogee, shares insights into the advantages of cellular convergence on the campuses of Apogee's university partners, emphasizing the prerequisite of having the right network in place.

Mick Doran from Code Blue Corporation helps us navigate the legislative aspects and heightened expectations for the successful management of an emergency communications system on campus.

Penn State recognizes that more than one voice communications option exists that will satisfy the university's future educational and business requirements and is undergoing the development of a multiyear collaborative plan that will ultimately ensure flexibility, mobility, and self-management.

Mark Reynolds, University of New Mexico, shares a bit of telecom history in which he continues to play a major role in his article "Where Are We Now ... Where Are We Going?" And since change, indeed, keeps happening, it is a very good thing that we all accept the challenge!

Mark also reflects on the university's experience with VoIP and points out that the user base is changing with us. His vision of the future is bundled services that require more user intervention. More user intervention requires ubiquitous customer service support. Ubiquitous customer service support requires an even greater depth of understanding of requirements and the anticipation of needs to provision the self-service environment for the new and evolving services.

Dave Wirth helps us prepare for the future as an information communications technology (ICT) professional by describing the skills required for the ICT positions most in demand today. Flexibility and adaptability are key. Does that sound Darwinian? Perhaps, and I heartily agree with Dave that we must continue to embrace change.

Also interspersed among the pages of the winter ACUTA Journal are some brief in-the-trenches reports we've called "Back to the Future" from Jeanne Jansenius, The University of the South; Riny Ledgerwood, San Diego State University; Jana McDonald, Texas A&M; Diane McNamara, Union College; Kathleen Murphy, University at Buffalo; Carmine Piscopo, Providence College; and Mark Reynolds, University of New Mexico. They affirm that mobility is our future as voice communications bleeds into other technology facets, placing greater demands on all our networks. The ramifications are seemingly endless and create even more opportunities for us, as
the theme of our 2012 Annual Conference resonates: Faster . . . Better . . . Now!

From a professional standpoint I admit that I felt less than challenged in the voice world approximately 10 years ago. It was only when I was provided the opportunity to learn what I call “the other side of the mountain,” or the networking, programming, and standardization facets of ICT, that I was, once again, exhilarated by learning and was rewarded each day by my work environment. I delved into the practices of the client relationship manager, the business analyst, the project manager, and the change manager and observed much more closely the application developer, the systems administrator, and the database applications manager. We taught each other, and our respect grew immeasurably.

Dave Wirth enumerates a number of different ways in which we may take advantage of continued learning that are easily within our reach, and the list includes associations such as ACUTA. I would add that no matter what we do, how we get there, whom we contract, and when we arrive are all contingent upon “where” we are now, and that no matter “where” you are, the ACUTA Winter Seminar planned for January 22–25, 2012, with its two tracks, Everything IP and 21st Century Skills for IT, will help you “get there” from here.

The new year heralds great promise for voice communications as it transforms the enterprise with communications-enabled business processes, says Paul Korzeniowski on page 34. New applications, he suggests, offer the ability to integrate voice into specific business functions.

The insights shared in this issue of the ACUTA Journal underline the increasing need for professional development and continued networking to stay abreast of what our colleagues are projecting. I hope you’ve also placed the ACUTA 41st Annual Conference, April 29–May 2, 2012, on your calendar to enhance your IT knowledge. We specialize in creating a friendly environment that makes it easier for you to excel!

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The Future of the University Telephone System

Arthur Brant
Abilene Christian University

In 2001, Abilene Christian University (ACU) purchased and installed a new telephone system. The previous phone system was installed in 1985, and prior to this system, the university had centrex lines provided by the local telephone company.

From a technology perspective, 10 to 15 years is an eternity, and systems just don’t run continuously for that long. Although periodic upgrades and maybe several feature enhancements have come along every couple of years, for the most part our telephone system has functioned as it did upon installation. When a user picks up the desk phone’s handset, he or she still hears dial tone. To call another extension on campus, the user dials four digits. To make a call to an off-campus destination, a user dials the number 9, followed by the seven-digit number for a local call or one plus ten digits for a toll-free or long-distance number. If a caller dials 911, the call is routed to the local public safety answering point. Finally, if a user has a voicemail waiting, a light is illuminated on the phone (or he or she hears “stutter dial-tone” if the phone doesn’t have a message-waiting light).

Potentially the most significant change observed with the operation of the university’s phone system is simply the frequency with which the system is used. Since 2007, ACU has seen a 30 percent drop in the number of calls the system handles per month. The voicemail system has seen a 41 percent drop in the number of messages deposited per month and a 15 percent drop in the number of active voicemail boxes.

Changes, Changes

The enterprise telephony industry as a whole has seen some significant changes in the last five to ten years. For the most part, Internet Protocol (IP) is now the dominant communication method for voice communications, replacing time-division multiplexing (TDM) that systems in the 1990s were based on. Unified communications has morphed from message notification via e-mail into functions such as presence indication, communicating via chat, and multiple messaging vectors. Connectivity to the public switched telephone network (PSTN) is now available over session initiation protocol (SIP) trunks via Internet connections, as opposed to ground-start circuits, ISDN, or PRI trunks.

More than these, the infiltration of products initially targeting the consumer market has laid waste to the enterprise telephony market segment. Cellular phones, consumer Internet telephony solutions like Skype, and even Google Voice have challenged the solutions that enterprises offer their users in terms of flexibility, management, and installation by the users themselves.

It should also be noted that the culture of the university has also changed in recent years. Mobility has moved from a convenience or nuisance into a differentiating factor—especially for those institutions that have adopted a mobile learning mindset. Couple this with leveraging multimodal means of delivering messages, including social networks and new media outlets like...
YouTube, live streaming, and podcasts. At ACU, we’ve also seen an increase in the number of faculty and staff members who telework, rarely—if ever—actually setting foot on campus. Finally, we’ve seen a significant push by the administration to evaluate data and allow figures, patterns, and trends to help drive decisions.

What’s Next?

So what does university telephony look like in the next couple of years? First and foremost, I believe universities will not provide the same level of funding to simply replace a telephone system that offers the same relative functionality. Future telephony services will either have to be seen as cost-saving agents for the university or as a capital avoidance. If this can’t be met, then future telephony solutions will have to tie to the business drivers or offer feature enhancements that are a delta change from current operations.

One delta change is that future telephone solutions for the university will be made up of many smaller tailored systems that are woven together by a common dial plan and shared connectivity to the PSTN. In this way, the large thousands-of-lines telephone system will be replaced by smaller systems that meet specific departmental objectives. The department that needs call-features will have a system that is designed to their specification. The academic department that wants to leverage the faculty members’ cell phones will have a system that integrates with cell phones. Some departments will have traditional multi-line, multi-function sets while others will have soft-phones that reside on their computers, and still others will have just their cell phones. This complexity of disparity associated with multiple systems will be the driver for universities to maintain telecommunication departments that support these various telephone solutions.

Arthur Brant is director, enterprise infrastructure, at Abilene Christian University. Reach him at branta@acu.edu.

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Two Approaches to Communications in the Desert

Curt Harler

Voice communications remains the heart-beat of any campus. While data networks are increasingly important and data traffic represents the bulk of on-network communications, voice remains the default setting for issues ranging from simple communication to E-911 services.

When faced with the need to upgrade voice communications on campus, the two major colleges in Arizona took different—but equally valid—approaches to the challenge.

At Arizona State University, the project started with defining what was core to the educational and research efforts of the 70,000 students and 10,000 faculty and staff. The rest was considered “context”—functions that supported the core mission but were not part of the direct purpose of the school. So, ASU outsourced its voice.

The University of Arizona took a different approach for its 38,500 students and 4,500 faculty and staff. With extension staff in every county, the U of A kept the management function in-house and oversees every aspect of its $85 million to $89 million IT budget.

ASU Chooses to Outsource

“We saved $1.4 million per year,” says David McKee, senior director of network communications managed services at ASU.

ASU was fortunate to have a greenfields project on the boards where it could do a proof of concept of the outsourced model. This new campus required 2,500 connections with converged voice and data. Avaya, Cox, and CenturyLink bid on the project, and ASU chose CenturyLink (formerly Qwest).

Next, a block of dorms in Tempe were slated to go with Ethernet wireless throughout. “CenturyLink pulled that off with a lot of help from ASU,” McKee says. “We both learned a lot.”

Four more buildings were added, and by July 2008, ASU was ready to “go big” at the Polytechnic Campus. “There was still ASU assistance in the collaboration,” McKee says. However, it was obvious that CenturyLink was getting the hang of operations around the ASU campus.

After those couple of test outsourcing ventures, in July 2008, ASU went for RFPs for the entire network. Although many companies voiced interest, in the end only CenturyLink submitted a proposal.

An internal team built a “competing” proposal evaluating technology and cost. It turned out that CenturyLink’s proposal actually offered a lower-cost solution than the in-house team had developed. So, in July 2009, ASU signed with CenturyLink.

“Things did go fairly smoothly,” McKee says. There were some billing issues and the usual minor disagreements over the contract. One issue was “blue staking” (locating utility lines)—something that, it turns out, was not in the contract.
The changes in the ASU IT offices are dramatic. Before the outsourcing, they had 28 employees, seven student workers, and a couple of contract employees. About 16 percent of the network was converged voice and data.

Immediately after the contract was let to CenturyLink, 12 employees transferred to the CenturyLink payroll.

A year later, the annual spending of multiple millions by ASU was replaced by a single bill. In addition to the convenience factor, CenturyLink added $1.2 million of value-added service to the school. The contract is good for five years and will be reevaluated.

Therein lies a challenge. “You have to have clear measurements to be sure performance is there,” McKee says. “We trust but we want to verify.”

To that end, ASU is part of a peer institution benchmarking study that compares such basic metrics as availability, network speeds, wireless pervasiveness, redundancy, and convergence.

McKee indicates he is pleased with the outsourced relationship. However, there were challenges. “The big thing was institutional bureaucracy—on both sides,” he says. “It takes time to get through the mess.”

One of the things that most pleases him is the single bill that comes from CenturyLink every month. Like many other colleges, they used to get boxes and boxes of bills. Now, there is just one big, converged bill to analyze.

For a while, there was a perception at the faculty department level that IT was nickel-and-diming them to death. This was mainly due to the growth of the network. Now, departments pay by FTE (full-time equivalent). There is also a cleaner audit process, both up and down the chain of service, McKee says.

McKee likes the significant “bench strength” that CenturyLink offers. While the telco has workers assigned to ASU, should something happen—say a vacation or maternity leave—they have the people to step into the gap. CenturyLink also brings great and diverse engineering knowledge to the table.

It was not all a bed of roses. McKee found that more frequent reports on provider performance are critical to successful management. They do get quarterly reports. “More frequent reports would be better,” he says.

McKee’s job is completely different today than it was when the school did all the work in-house. “I’m not so much managing people as I am interfacing with a vendor,” he says.

MACs (moves, adds, and changes) are simply a matter of submitting a change order to the vendor and verifying that the work was done.

U of A Builds a Plan

“Our priorities are the communications infrastructure, the computing infrastructure (consolidating servers and bolstering the environment), increasing administrative effectiveness, helping student learning, and information security,” says Michele Norin, chief information officer at the University of Arizona, Tucson. She controls central IT resources as well as all the ancillary services.

“We are looking for efficiencies with as little redundancy as possible,” she says.

To that end, several years ago U of A developed its Network Master Plan with the help of WTC Consultants (www.wtc-inc.net) in Los Angeles, California. It took a 10-year look at all aspects of U of A’s network.

“Wireless was to be the standard. We assumed video would be a standard form of communications,” Norin says.

They hit it well on both accounts: mobility seems to grow by the hour. Video, if not prolific, is more popular.

“We didn’t want to be catching up. We wanted to shoot for ‘six nines’ availability—if there is such a thing,” Norin says.

Like many other colleges, U of A had a lot of installed Category 3 cable. The goal was to converge all services on the network. However, there were plenty of wildcat systems owned by various departments and interest groups. Norin planned to make them an offer they couldn’t refuse: as their technology became dated, IT would buy them out and install state-of-the-art technology—but U of A’s IT department would own it.

One of the first messes she had to clean up was to standardize IT’s own telecom rooms. Admittedly, they were a mess—some were not even rooms or closets.
The goal was to bring the core to 10 gigs and later to 40 gigs. They wanted IP-TV, ACDs, campuswide wireless, VoIP, videoconferencing—all with access to local, statewide, and even regional and national networks.

U of A’s total capital budget was $118,292,000, including a separate research network that ran $5 million.

“We shaped our business to this plan. We took a plan with goals, costs, and targets and shaped our daily work to that plan. Planning works,” Norin declares. While there has been some compromise over the years and some things that had to be dropped, the goal remained to stay aligned with the Master Plan.

Today, wireless covers 80 percent of the U of A campus. It was not cheap and, in the early days, was a source of student dissatisfaction. In fact, some student government candidates ran on platforms promising to work for better wireless. Norin told the students that U of A could provide better wireless if the students would agree to a student IT fee. Students agreed. IT delivered.

VoIP is present in 22 buildings on campus. “As we upgrade or build new, we go to VoIP,” Norin says. Today, they are about one-third of the way to universal VoIP.

The network core has gone from 1 gigabit (Gb) to 10 Gb throughout. There even is some Gb service to the desktop in certain locations.

As McKee found, charging for services was a challenge at U of A. U of A uses a similar FTE-based fee model. They started charging a set fee per full-time worker about three years ago. That number was based on the whole array of phone, voice-mail, video, and other network services. Realizing that people come and go, IT takes departmental snapshots several times a year to ensure that each department is paying its share.

A peer committee was formed that sold the idea to the various business units and departments at U of A. That group is still active as an advisory panel and an internal sounding board—a program Norin is happy to have implemented.

The FTE fee has remained steady for a while, and she hopes it stays constant for the next few years due to overall budget constraints.

The network changes, too. Among the new trends being faced are the move to 802.11, video surveillance, MPLS (multi-protocol label switching) for managing firewalls, and other unanticipated things that pop up every so often.

There still are Wildcats to tame. For one thing, Norin says she wants to get the college out of the device business. Some departments have the Cadillac of multiline phones. Others plug $10 Walmart phones into the university-provided jacks.

That’s not so bad when you consider that Norin faces 213 e-mail systems on campus and a hodgepodge of tool sets.

“Our goal is to have one e-mail and calendaring system used by all 13,000 clients,” Norin says.

New building cabling and switch costs are included in the construction cost. When a department moves into new building space, they have Gb access and all of their jacks are lit. “You plug in your VoIP phone and it will work,” Norin says. They use Cisco Emergency Responder to get emergency personnel to the scene of any 911 call.

The Analysis

Both solutions have provided sunny results for the IT departments and for the student and staff clients at these two Arizona colleges.

“Our relationship with our vendor CenturyLink is working well,” McKee says. ASU continues to monitor, benchmark, and verify the terms of the contract. To date, he is pleased.

“What we don’t know for sure is whether everything is going as well as we think it is,” he says with a rueful smile. The date for the major verification is not too far out. At that point, with the help of the institutional benchmarking ASU is doing, he should be able to pinpoint the success of the relationship.

Today, however, he is bullish that everything is working out just as expected with the outsourced solution.

At U of A, Norin is just as pleased with their in-house solution. “We wanted to be a bit ahead of the curve,” she says.

She recognizes that any plan is a work in progress. “There is no way we are going to get through 10 years without tweaking something,” Norin says. “And we have made changes.” Items were added. Others were pulled. They have about $73 million of the $300 million planned for the network yet to complete. And, Norin says, the Board of Regents is quite interested in where that number is—on a frequent basis. Since the plan was implemented in 2007, they are just shy of halfway through the time frame.

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Winter 2011  ACUJT Journal of Information Communications Technology in Higher Education
Dual-Mode Smartphones Are Shaping the Future of VoIP

Chuck Brady, CEO
Apogee

Today’s college students are increasingly learning from settings that don’t meet the traditional definition of a classroom. The new educational reality takes the lecture hall and makes it available as a real-time video stream or an on-demand download, while the ubiquitous availability of conferencing applications—many with video and voice capabilities—has enabled students to collaborate across the data network as easily as meeting for a study group. As innovation in classroom technology rapidly moves student learning onto the Web, lecture streaming and other academic advancements are joining the already media-rich landscapes of entertainment and social media vying for valuable bandwidth on the campus network. Now a new take on the traditional application of voice over IP promises to bring the services of yet another industry onto the residential network as advances in mobile VoIP technology allow many users to bypass cellular carriers and use their existing phones and phone numbers to make and receive calls over the wireless network.

The Proliferation of Smartphones

Telecom pundits have long forecasted this democratization of communication services, but it’s interesting to note how we arrived there. The catalyst is actually clutched in the palm of almost every student’s hand—the now-ubiquitous dual-mode smartphone. Dual-mode devices enable students to automatically roam between cellular data networks and campus Wi-Fi networks.

This ability to switch from cellular data to Wi-Fi has become standard fare on most smartphones today. Research firm In-Stat projects that by 2013 there will be well over 400 million smartphones in active use, capable of utilizing both cellular and broadband wireless networks. This rapid adoption will enable more people to use VoIP over wireless technology, leading researchers to forecast that more than 50 percent of users will use VoIP services to send and receive telephone calls instead of relying on their mobile wireless carrier (projected to soon account for less than 30 percent of voice communication).

Mobile usage of the network has grown rapidly on university campuses since the introduction of the Apple iPhone and Android phones. Students are sophisticated users of multiple platforms, interfaces, and devices, and at any one time, they can use a complex combination of online VoIP providers, traditional cellular plans, online chat, text messaging, mobile VoIP applications, and voice-enabled apps to communicate. We expect this trend to continue and are planning accordingly to support the additional demands on our campus and residential networks.

The Advantages of Cellular Convergence

For IT decision makers already challenged to keep up with skyrocketing bandwidth and mobility demands, the latest trend in a seemingly endless series of "game-changers" may not seem like a welcome development. With a strong network in place, however, the convergence of cellular and VoIP can bring welcome amenities to students frustrated by poor service or restrictive minute allotments. Many college residence halls receive weak cellular reception, creating enormous day-to-day
frustrations for students, almost all of whom use a cell phone as their only means of communication.

The ability to switch from cellular to network communication eliminates the problem of poor in-building cellular coverage, thereby significantly improving resident satisfaction. VoIP communication also bypasses minute limitations imposed by cellular companies, effectively providing unlimited voice calling. Residents can now receive a consistent user experience for their voice and data services as they transition between networks. In addition, students will be able to avoid the significant expense of skyrocketing cellular and international call charges by routing their calls through the lowest-cost devices/applications.

Rapid Adoption Rates for Mobile VoIP
Mobile VoIP's popularity among students indicates a larger trend embraced by enterprise markets. From handheld VoIP applications to desktop videoconferencing, all signs suggest that the broadband network is the new frontier for digital communication, replacing legacy PSTN connectivity more rapidly than ever. Infonetics Research predicts that mobile VoIP subscribers will grow from 47 million in 2010 to almost 410 million by 2015. Indeed, there's been a corresponding boom in the spectrum of mobile VoIP players, including startups, online VoIP providers, and the mobile carriers themselves. Thanks to the convergence of Web 2.0 architecture and ever-increasing bandwidth, new VoIP and IM providers are now jostling for dominance with legacy carriers. Unlike traditional telecom operators, these new knights of conversation come armed with an arsenal that includes global capabilities, "always-on" accessibility, and business models unimaginable just a few years ago.

Another key driver of mobile VoIP proliferation within the student population has been the blending of mobile and Wi-Fi experiences: Voice, text, and chat are now add-on or embedded services in popular applications such as Facebook and games, as well as in newer mobile video and location-based services, such as ChatSquare (for foursquare). With the release of iOS 5, Apple's new operating system for the iPhone, users are further able to bypass the traditional text-messaging components of their cellular plan and send unlimited "iMessages" across the data network.

And the potential for application development doesn't end there. As the commoditization of VoIP services (such as basic Skype) continues, providers will explore additional revenue streams from enhanced abilities such as HD voice, video, voice recording, and voice/video conferencing.

Potential Risks for VoIP over Wireless Networks
IP-enabled voice applications are now pervasive throughout campuses and bring the promise of greater interactivity and collaboration at faster speeds than ever before. However, there is a price to pay for "anytime-anywhere" connectivity. Dangers include no call logging or integration with resnet security and compliance capabilities. Like all VoIP services, these applications can also expose the resnet to security breaches such as brute-force attacks on passwords using botnets and cloud-based services; viruses; call or data snooping; spoofing student identities and using illegal accounts; "vishing" (the VoIP version of phishing); and denial of service attacks. There is also generally little coordination or integration with emergency services. When students dial E-911 services, they must be able to identify their locations because it is difficult to keep track of and pinpoint exact user locations. To address these concerns, there will be a need for formal education at the institution to ensure the safety of the network and its compliance with emergency requirements.

Maximizing the Wireless Network through Fixed Mobile Convergence
So what's today's IT administrator to do? Banning the use of these applications is not a viable long-term solution. Whether your resnet provides wireless voice capabilities or not, students will seek these services out on their own. The goal is to make it easy for students to connect with the right person at the right time, and then use the best form of communication to collect information and collaborate in real time. This requires a stable, robust, and scalable resnet infrastructure that meets the demands of high-bandwidth applications and rich media-hungry devices.

IT administrators should consider voice over WLAN (VoWLAN) an increasingly popular FMC (fixed mobile convergence) solution, as a competitive differentiator and enhancement to core resnet services. Research firm Frost & Sullivan defines an FMC solution as "any feature, service or product that allows a mobile device to connect with the corporate PBX or WLAN to extend telephony features and applications and deliver cost related benefits through the integration of wired and wireless networks."

In addition to maximizing existing resnet investments such as WLAN infrastructure, VoWLAN enables resnet administrators to better manage, monitor, and integrate VoIP usage with existing data stores or back-end applications.

At select schools, IT administrators have worked to strengthen weak cellular coverage by deploying distributed antenna systems (DASs) to extend cellular signals across campus. While these DAS installations may well meet that goal in certain
campus environments, even a perfect DAS deployment is significantly more costly, not to mention frequently carrier specific, than the route of FMC. Even then, while coverage may no longer be an issue, the limitations of bandwidth capacity often remain. Too many mobile devices using bandwidth on a cellular data network will still overload capacity, regardless of how many different ways it is distributed.

An investment in a robust mobile IP network will accomplish the same goal and also create an exponential return on that investment down the road. Being able to rely on high-capacity, high-density wireless coverage throughout the residential community adds value across the entire spectrum of academic use, entertainment, resident retention, and student satisfaction.

Having a reliable Wi-Fi network is no longer a luxury but a necessity in student residences. Integrating FMC into the existing wireless network resolves coverage issues, bypasses minute and data caps on student cellular plans, and introduces an attractive, leading-edge amenity to the residence hall.

To gain further perspective on the best complement to the cellular data network, we need only look as far as the cellular carriers themselves. According to DSL-Reports.com, several major carriers have begun investing heavily in “massive free Wi-Fi zones” in New York City and other high-traffic areas like hotels, stadiums, and public parks, “in order to help take some of the [data burden] off of their historically-strained 3G network.” An article in the July issue of Forbes further acknowledged this practice by cellular carriers. “The idea of automatically connecting smartphones to Wi-Fi, when available, appears to be gaining support,” wrote staff writer Elizabeth Woyke. “The appeal, to telcos and other companies that offer cellular service, is the ability to move costly traffic off their networks while still providing good connectivity to customers.” She continues, “It’s an issue of growing importance as mobile devices chew up an increasing amount of bandwidth.”

Building a Successful VoWLAN Strategy

Nationwide, an increasing number of higher educational institutions have successfully set up, or are considering setting up, VoWLAN systems for their residential
networks and academic buildings. Before deployment, administrators should conduct a site survey and determine if their current resnet/WLANs are able to provide and sustain voice traffic while taking into account facility constructions and potential obstacles to signal coverage. The next step is to determine the requirements for performance, security, implementation, testing and compliance. ROI evaluation is also a must, and both capital and operational costs (including installation, training, and ongoing maintenance) must be balanced against the possible benefits. The project phases and milestones should be clearly laid out and agreed to by all stakeholders, and regular coverage testing should be conducted even after installation.

As with most major technologies, VoIP arrived with much celebration and then receded to the background, a technology still seeking its niche. Now, with the ubiquity of dual-mode smartphones on campuses nationwide, voice-over-IP may have finally found its place through a technology so subtle most people won't even realize they're using it. If history is any indication, we're likely to see VoIP slowly and silently gobbling up its predecessors until we look up one day and realize that it's suddenly become a dominant form of digital communication. The key for college administrators is to ensure that their mobile IP infrastructure is ready for this quietly advancing technology. As lectures, television, movies, and videoconferencing all move onto the wireless network, fixed mobile convergence is only the latest trend on the horizon to demonstrate the absolute necessity of deploying tomorrow’s robust wireless network today.

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Back to the Future

Riny Ledgerwood
San Diego State Univ.

Voice communications used to be simpler. It was self-contained, separated from other services on campus. We only needed to learn voice stuff and dealt with voice vendors only.

Convergence changed everything. Voice services are now riding over the IP network, which means for every application we implement (including voice processing, voicemail, speech recognition, call center, ACD, and billing/work order system, etc.) we need to work with other departments within our organization as a team. This normally involves working with network services, computer operations, and the security office at a minimum, and a diverse vendor community as needed.

Project management has become more complicated. Voice and network personnel need to cross-train, and other skills such as security, systems administration, and database management need to be incorporated as part of the staff skill set.

Our hot topics expanded from TDM upgrades and protecting long-distance revenues to VoIP, mobility, wireless, cloud computing, virtualization, social media, reverse 911, security, bandwidth, power, unified communications, and more.

Technology has changed our culture. Convenience now seems more important than quality of service. Cell phones replaced landlines, and wireless replaced wired networks in the dorms. As our end users expect instant access anytime anywhere, we are changing the way we do business. Budgets continue to be tight, so we’re still expected to do more with less.

Our processes are more automated and our communications online. The old chargeback model needs to be reviewed and updated as IT services are now considered a commodity.

Adapting to change is the name of the game. A couple of years ago San Diego State reorganized its IT organization to fit this new model. We recently outsourced our e-mail to Google. Next we’ll be migrating our calendar and other applications to Google as well. As we are making changes with our services and how we do business, my position is also changing. I must be flexible and willing to learn new things if I want to continue to be relevant in my job.
The Future of the Managed Emergency Communications System

Mick Doran
Code Blue Corporation

Security/IT and telecom professionals of today are facing a significant dilemma regarding the design and selection of emergency communications systems for their organizations. Mass notification systems are being forced by government regulations to play a growing role in securing the safety of the higher education population. With communications technology, systems design, and governing regulations changing significantly, it is difficult to obtain clarity in the marketplace to prudently select and implement systems today and be assured you are in compliance for the future.

So if you are presently planning a system, or will be in the near future, the following considerations will provide you with a better understanding of the events and legislation shaping the industry, the current and proposed standards and regulations you are governed by, the system design and system selection issues you should be considering, and finally a list of key questions you can use to help navigate your way to clarity in your decision making. In addition to addressing compliance issues, the following information will also help you design a system that extends the life of your existing equipment investment and stretches your future budgets.

Legislation and Higher Expectations Are Shaping the Industry

The events surrounding the September 11, 2001, terrorist attacks and the Virginia Tech shootings in 2007 made us realize that coordinated and comprehensive emergency plans and implemented systems for the most part either did not exist or, when tested, were woefully inadequate. In an effort to remedy the situation, laws were passed to provide as much protection to the campus populace as possible.

Code Blue Provides Authentic Solutions

Code Blue provides comprehensive authentic solutions to end users through OEM’s or systems integrators that are 100 percent designed, developed, and factory tested by Code Blue, yet able to be customized and tailored to meet your needs. Whether it says “Code Blue” on the label or it has Code Blue inside, you can rest assured you will receive highly technical factory support during the planning stage or to resolve any implementation issues regarding electrical, communication line, and IT infrastructure problems. We also offer the Authentic Third Party Certification program, which is a rigorous vetting process to ensure a third-party device or system integration meets Code Blue quality performance requirements, assuring the end user of a comprehensive managed emergency communications system solution. Visit us at www.codeblue.com.

For a comprehensive demonstration via webinar or a live demonstration on your campus, call 800-205-7186.
possible and improve the response to these threats.

Many of the government regulations that have been adopted over the past several years hold higher education organizations accountable for the protection and notification of their population in the event of an emergency. As a result, there is not only an increased need for notification systems, but also increased expectations that emergency notification systems provide more intuitive directions and instructions on how to respond when a notification of an event occurs.

Although laws and regulations are being adopted to address the need, products and systems have been lagging in providing the clarity required for IT and security personnel regarding system design and selection of systems that meet these anticipated standards and regulations. Mass notification systems (MNSs) will be a critical component under the broader managed emergency communications system (MECS) umbrella.

The MECS umbrella encompasses, among other things, mass notification systems. It is the industry classification that describes the connection and integration of various technologies to provide enhanced communication capabilities to assess and respond to events that threaten lives, property, or reputation.

Successful MECS solutions must provide centralized control—first for mass notification, and then, even more important, to tie disparate systems together that will enable system operators to respond with confidence and ease.

How Code Blue Can Help

Code Blue is the original innovator of the “Blue Light Phone” that integrates multiple devices into one vandal-resistant, highly visible help point. For more than 20 years Code Blue has continued to improve emergency two-way voice communication systems, and over the past several years has added its most innovative solution, ToolVox®, to its product line. ToolVox® provides a robust, highly available IP and analog communications system that serves as the core communications platform for managing emergency communications, centralizing system control.

Code Blue has also developed new, 100 percent self-monitoring, analog and VoIP phones and customizable software solutions that seamlessly integrate legacy analog and IP systems and devices. Through this and other new solution-based products, Code Blue is emerging as a leading manufacturer for the next generation of managed emergency communications systems.

Because system components and system solutions can only truly be designed and tested at the factory level, Code Blue can provide you with a comprehensive understanding of how its standard product offerings can be customized to meet your needs, and help you comply with the current and proposed standards and regulations.

Current and Proposed Standards and Regulations

The following are the primary proposed regulations, standards, and agencies that will affect compliance, design, and decision making regarding mass notification systems, and will ultimately apply to MECSs for the higher education campus.

You can reference the links to obtain additional information on each and check on the changing status of the proposed regulations as they occur.

- Department of Defense UFC 4-021-01 Google search for UFC 4-021-01
- NFPA 72 2010 Chapter 24 ECS http://www.nfpa.org
- UL 2572 http://www.ul.com
- ANSI/NEMA SB 40 http://www.nema.org/standards/sb40.cfm
- NFPA, UL, ANSI/NEMA, FEMA, and other organizations clearly define elements of an emergency mass notification plan, systems requirements, and integration requirements. Obtaining and reviewing a copy of the standards will provide you with an understanding of the current and proposed requirements, and ensure that the products and services you select today for a mass notification system will be compliant or require few modifications in the future when these standards are adopted and enforced by the local authority having jurisdiction.

FEMA has published the IPAWS standard, which should also be reviewed as it is the system that will replace the current emergency alert system (EAS) used by national, state, and municipal governmental units. The small cost associated with obtaining and using what is being written and anticipated in future standards is likely to be insignificant compared to the potential high cost of replacing thousands of dollars’ worth of equipment improperly selected. The challenge is that the lack of adopted standards has allowed a myriad of manufacturers, software developers, and integrators to piece together products to capitalize on initial market demand and claim compliance, when in fact, as of today, none can claim they are compliant to standards that have not yet been adopted.

Key System Design and Selection Considerations

The Code Blue ToolVox® is at the core of the managed emergency communications system. It supports the software applications of Unit Programming and Diagnos-
tics, Event Management (Public Safety Answering Point), Blue Alert® Mass Notification Systems, and our IP Audio Interface, providing a clear, easily implemented solution. Our MECS natively ties all of the unique legacy systems together, greatly extending the life of the initial investment in legacy systems, reducing maintenance cost, and providing a pathway to the future.

Code Blue systems operate over existing wiring infrastructure as well as wireless, which provides lower-cost, flexible options for communication pathway redundancy and migration, especially from analog to IP. Integrating existing legacy systems, which may include fire panels, 25/70-volt paging systems, stadium/auditorium public address systems, and PBX integration systems that allow you to leverage desk phones as both control and notification end points, can greatly reduce the implementation cost and complexity while providing a robust, highly available, centralized system that supports long-term migration plans.

Developing a MECS that centralizes the control of all of these systems should be the goal of any organization. With ToolVox® connected to your existing PBX platform, or acting as your PBX, any connected desk phone, cell phone, and smartphone becomes a potential control point. This also provides instantaneous access to send out mass notifications and initiate system commands. A single system that ties into legacy analog and new IP systems is all part of the future of the MECS concept.

No single vendor will provide a total solution for your campus communications needs, but the Code Blue Managed Emergency Communications System provides the systems integrator a powerful and customizable communications platform that can be tailored to meet your needs.

The following checklist of key questions will be useful as you are planning your new system or modifying an existing one. These questions include those taken from NFPA, UL proposed standards, and other industry-driving legislation and opinions.

**Systems design questions**
1. Does the system provide a seamless and highly functional integration with existing legacy systems?
2. Can the system provide a clear migration path from legacy analog to IP-based platforms utilizing existing infrastructure?
3. Can the system utilize multiple infrastructure types to provide a highly available, redundant system?
4. Is the infrastructure capacity and scalability of the proposed system adequate for the anticipated future growth?

**Features and functionality questions**
1. Does the system provide an intuitive, user-friendly, centralized control for all layers?
2. Does the system intuitively leverage these systems with a centralized dispatch system?
3. Is the system intuitive, simple to use, and easy to learn?
4. Are there flexibility and redundant control points and methods by which pre-determined alerts can be disseminated?
5. Are the products self-monitoring for faults or communication errors?
6. Does the system provide high voice intelligibility through distributed amplifiers and speakers?

**Compliance questions**
1. Are the products tested and UL listed to Life Safety Code requirements?
2. Is there a plan to test these systems and products to the proposed UL 2572 and NFPA 2010 Chapter 24 ECS standards when adopted?
3. Is the system authorized to be connected to the Department of Homeland Security IPAWS system?
4. Will the proposed systems be compliant when the regulations and standards are adopted as anticipated?

**Ownership questions**
1. Are the components 100 percent self-monitoring, eliminating the risk of having a life-safety device inoperable?
2. What is the total cost of ownership in the long term?
3. Does the system solution depend on a single proprietary company or is it open architecture?

As many systems have evolved over time, organizations have purchased multiple systems to create a layered MNS approach but have not adequately assessed the entire landscape of how they will manage their overall emergency communications. The biggest problem created by using multiple and layered systems has been the complexity when delivering timely alerts. To alleviate this problem and accelerate notifications when seconds count, Code Blue’s authentic solutions can be tailored to give you a good answer to all of the above questions.

**Moving Forward**

Methodical, comprehensive research and education on technologies, regulations, existing systems, and supporting infrastructure will ensure that your systems will perform and provide a scalable comprehensive MECS for your organization. Code Blue can provide a MECS that provides seamless integration with disparate systems, centralized control, and a migration path to support legacy systems while looking to the future. Code Blue is dedicated to creating a highly available, robust, and comprehensive managed emergency communications system ensuring a strong partnership moving forward to support the ever-changing needs of your organization.

Mick Doran is the product development manager for Code Blue Corporation. He has been in the IT/telecom and security industry for over 20 years. Mick can be reached at mdoran@codeblue.com.
Penn State’s Voice Services: Roadmap to the Clouds

Jerry Krawczyk
Pennsylvania State University

Voice services and other forms of communication provided by universities and colleges to their faculty, staff, and students are experiencing a significant evolutionary change in what is being provided and how it is being delivered. Colleges and universities have traditionally provided telephone services to the desk of their faculty and staff, along with telephone services to the residence halls for students.

However, given the advances in technology, today’s mobile user has vastly different needs and expectations. These expectations may best be summarized as the need or desire for flexibility, mobility, and self-management. One only has to look at the commercial market to see how the cellular service providers are setting these expectations. The playing field has changed with the convergence of voice and alternative communication services (text messaging, instant messaging, e-mail, social networking, etc.) onto a single mobile device with enhanced upload and download speeds connectivity (4G and LTE), powerful mobile smart devices (iPhone, Android-based devices, etc.), along with Internet-based voice services and applications (e.g., Skype, Google Voice).

From a voice-service provider’s perspective, there has been a growth in the deployment of VoIP systems, unified communications applications, and SIP-based services. As the technology continues to evolve and user expectations grow, universities are faced with the challenge of how to deliver more flexibility, mobility, and options to their customers while still meeting the business, security, and safety requirements of the university in a cost-effective manner.

The following roadmap for Pennsylvania State University proposes how Penn State can position itself to adopt emerging voice services in the cloud and leverage the opportunities from evolving communications technologies and services. This roadmap was created to facilitate discussion and an exchange of ideas, not to create the expectation that it is set in concrete.

The Landscape Today

As with any planning activity, it is important to understand the current landscape (knowing where you are) before laying out the roadmap for the future (determining where you want to be).

Penn State serves approximately 95,000 full- and part-time students, as well as approximately 33,000 full- and part-time faculty and staff at 24 campus locations (Figure 1) throughout the state. Penn State’s approach to the provisioning and delivery of voice services is diverse, with each campus independently deciding how to provision voice services for its specific location.

Figure 1. Penn State campuses
However, common to all campuses is the mandate to provide for voice transport, voice systems, and end-user support.

As recommended by the Information Technology Infrastructure Library version 3 (ITILv3), the educational and business requirements of a university are the foundation of the "what and how" of voice services. Based on the educational and business needs of Penn State, a broad set of requirements shapes the current provisioning of voice services and will also shape how voice services are delivered in the future.

• Student requirements

For this discussion, the focus is not on the delivery of voice services to students. As a transient group, students are on campus for a limited time, and they self-select/self-manage their own voice services. According to the ECAR Study of Undergraduate

Students and Information Technology, 2010,1 over 60 percent of students are carrying Internet-capable handheld devices. Additionally, based on a 2009 and 2010 Penn State student survey, more than 91 percent of students own a cellular phone and more than 61 percent have a smartphone.2

Penn State’s role in supporting student voice and other communication needs is through negotiations with cellular service providers for coverage and preferred plans, as well as building a robust campus infrastructure.

• Business/educational requirements

The assessment of the educational and business requirements for Penn State led to the identification of two different customer types, with distinctly different requirements: Penn State faculty and staff and functional customers.

The faculty and staff at Penn State support the overall role and mission of the university, from education to research to community outreach. The growing expectation by many Penn State faculty and staff is to have flexibility, mobility, and options when it comes to voice and communication services. However, it is challenging to define how the university will meet those expectations while ensuring that the services are developed around the educational and business requirements of the university since there is blurring between the business use and personal needs for voice services. A fall 2010 Penn State Faculty Advisory Council for Academic Computing survey of staff revealed that approximately 37.1 percent of faculty and staff used their personal cellular phone for work-related activities.

The other customer type is the functional/organizational customers: Penn State academic and administrative departments. The educational and business requirements for an academic or administrative department differ from those of an individual.

One key differentiator is that the callers aren’t usually looking for a specific individual; they want to speak with someone who is equipped to address their issue. Examples include the network operations center, the admissions office, student health services, and the college of engineering.

• Security/health and safety

In addition to educational and business-driven requirements, there are a number of university security and health and safety policies and requirements. For example, the university is required to comply with local, state, and federal laws, including e-discovery requests, and to ensure that voice systems comply with IT security policies and best practices. The caller also must have the ability to contact public health and safety services (such as the county PSAP or university police) with the system providing the 10-digit telephone number from where the call was placed in order to dispatch a first responder to the correct location. Also to be considered are special-use applications such as elevator phones, emergency phones, and alarm circuits.

The Destination

In simple terms, the proposed destination for voice services at Penn State is a hosted cloud-service provider with delivery of services through the Penn State WAN to all campus locations. Through the cloud-service provider, common and unique user or departmental requirements should be met and all security/risk and health and safety requirements satisfied. In addition, the university’s faculty, staff, and departments
will have the flexibility, mobility, and options they are seeking, both in compliance with university policy and in a cost-effective manner.

Roadmap

Following is a roadmap of how Penn State can define the requirements and leverage the evolution in voice transport, voice systems, and end-user support.

- **Defining the requirements.** The task of defining, documenting, and validating the university's educational and business requirements is complex and challenging but crucial to making effective decisions. To address the documentation of university voice requirements, the Penn State Voice Advocacy Working Group (VAWG) was formed. The VAWG is composed of a cross section of the university with staff from:

  1. The central IT organization: Information Technology Services
  2. The Risk Management/Privacy Office
  3. Six campus locations (Altoona, Behrend-Erie, Harrisburg, Hazelton, Mont Alto, and York)
  4. Administrative, academic, and research units at the main University Park campus (Outreach, the Applied Research Lab, University Health Services, and the College of Information Science Technology)

  The current objective of the VAWG is to “provide flexibility and options in the provisioning of voice services to university units and campuses which meet the university’s requirements and educational needs in a cost-effective manner.”

  The initial effort of the VAWG is to document the university’s business and functional requirements and validate them. As part of the requirements-gathering effort, VAWG participants will act as ambassadors by discussing and socializing the requirements with the other campuses, academic units, administrative units, and

  more. This effort will provide the foundation for any future procurement activities such as the replacement or consolidation of existing Penn State voice systems, contracting for a vendor’s cloud-service offering, or a hybrid solution where voice services are provided jointly by a vendor cloud-based service and the university.

  - **The university landscape—voice transport.** Currently there is no direct voice connectivity between the Penn State campuses. However, Penn State does have a state-wide, high-bandwidth IP network (Figure 2) that carries data and video traffic between campuses and the Internet (e.g., Commodity Internet, Internet2, and the National Lambda Rail) through demarcation points in Pittsburgh and Philadelphia.

One limitation with the current architecture to carry voice traffic is that it is based on a hub-and-spoke framework with a single connection to most campuses. Today’s architecture does not offer the resiliency and redundancy needed to support the transport of voice traffic. Fortunately, as the result of an independent project within Penn State to improve the resiliency of the university’s WAN, opportunities to move voice traffic onto this network will emerge.

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Currently there is a three-year plan to build out the Penn State WAN so that each campus will have dual, high-bandwidth IP connectivity (Figure 3) with points of presence in a carrier hotel in Philadelphia (Switch and Data) and Pittsburgh (the Allegheny Center Mall). Once completed, the Penn State WAN will have the desired resiliency to carry voice traffic by having dual connection points at each campus and dual Internet connection points.

A second initiative, also under way, is to procure services from an Internet telephony service provider (ITSP). The objective of this initiative is to provide IP-based transport of voice traffic off of the Penn State WAN through the two points of presence in Pittsburgh and Philadelphia. Since both of these locations are in carrier hotels located in major metropolitan areas, it is anticipated that a competitive procurement will generate savings and cost avoidance to the university. It is envisioned that an ITSP will transport all inbound and outbound IP voice traffic to the University Park campus and, through a phased approach, to other on-network campuses. In other words, this will move the transport of voice traffic into the cloud.

- **Voice systems.** The roadmap for the future of Penn State’s voice systems is less clear. That future will be heavily determined by the university’s educational and business requirements. The many possible options include (1) not changing the current architecture of one voice system per campus, (2) a geographic consolidation of voice systems, (3) the consolidation of multiple voice systems into a single voice system, and (4) ultimately outsourcing the services provided by a voice system to an ITSP.
  - *End-user support.* This last aspect of the voice services roadmap, end-user support, is less ambiguous than for the voice systems, but still not as clear as the roadmap for voice transport. End-user support, which will become a key factor in the evolution of voice services, will best be provided locally for locally administered services and centrally for centrally administered features and services. Since voice services are IT based and dependent, some campus, academic, and administrative units may need to train/retrain staff to strengthen their IT competency and knowledge.

**Conclusion**

Much work remains in order for Penn State to prepare for and manage the delivery of the next generation of voice services. Many opportunities will be provided through the commercial marketplace, which will be setting the expectations from the end-user community to provide mobility, flexibility, and self-managed options. Penn State is now assessing and laying out this plan. In the short-term, the build-out of Penn State’s WAN will afford increased opportunities to collaborate and possibly consolidate voice systems throughout the state. Ultimately, if the commercial marketplace offers services that meet the university’s requirements, Penn State may not be running any voice systems but receiving voice services meeting both university common requirements and customer unique requirements through the cloud.

Jerry Krawczyk is director of telecommunications at Pennsylvania State University. Reach him at gak13@psu.edu.


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**Back to the Future**

Carmine Piscopo  
Providence College

Today I interact with the data networking and server people almost on a daily basis where five years ago that might have been once a week.

I have become more involved with cellular and wireless technologies than with traditional wired technologies. I firmly believe that in the next five years we will be delivering services to the end user’s “device of choice,” whether it be college owned or personally owned instead of the traditional desk telephone.

Voice messaging services used to be the medium of official college communication, but that has now been replaced by electronic mail and text messaging. The interesting thing about it is that we now get more information to forget or outright ignore due to information overflow.

The economic climate has had an effect on capital budgets. I find myself having to justify basic technology needs in addition to wants.
Where Are We Now...Where Are We Going?

Almost every day of every month of every year we are challenged to predict the future of voice communications. Other questions are regularly posed, such as, why do we need the “same old” voice services and their associated cost model? When is everything going to be wireless? Why can’t I just use my cell phone? Why don’t you provide a more robust, cost-effective bundled package like I get at home? Many of us have spent countless hours attending dozens of webinars and conferences and browsing social media as we evaluate, debate, and embrace the plethora of ideas that our peers provide for us to consider as the future of voice communications.

As a baby boomer, I have witnessed most of the changes in our industry, transitioning from an acoustic modem with couplers at the amazing speed of 75 baud to reliable RS-232 hardwired connections and all the way up to today’s WAN, LAN, and the new social media craze.

“Dial tone” has been the tried-and-true standby. From before my years in telecommunications with Watson to today’s soft phone, we have always had dial tone to prompt us to continue connecting our call, even if it is a placebo. New forms of communicating will prompt us in other ways, eliminating the “buzz” of dial tone. Are we ready for these changes?

With social media, just-in-time information, and less face-to-face communication already a part of our culture, exploring the future of voice communications is a valuable and important exercise. How important is it to have voice in our conversations for the future? Or is it, to some extent, blended with the social experience? The growing number of acronyms in our working vocabulary confuses us: LTE, IPv6, VPN, VLAN, NAT, VoIP, 802.11x, standard SIP, extended SIP, and proprietary SIP, just to name a few. All these apply when deploying and supporting a voice solution. Are we unclear, bewildered, perplexed, confused? Have we lost our direction?

Change Keeps Happening

The world according to telecommunications is different in 2011 from what it was in 1996 (remember deregulation?), and even different from 2010. Our partners from IT have a new set of challenges, refresh, and overhead. Many people may have seen it coming but were not exactly sure what “it” was and how to plan accordingly. Today’s long-distance rates are next to nothing. Dorm phones are out, smart devices are in. Departments are embracing social devices such as Skype, magic jack, or smartjack technology or off-premises hosted SIP solutions including Google Voice, IP Centrex, and cellular with dual-mode technology. Where does the university-provided solution fit in? At the University of New Mexico (UNM), our revenue stream is collapsing quickly from many angles. We have experienced a 2 to 4 percent reduction in services each month. This doesn’t seem like a large number, but when you lose $30,000 to $40,000 a year, you must either outsource or find another resource, a less-expensive, better-bundled package, to hold on to your customers.

To offset this we are embracing the new IP technologies with SIP-based solutions (PBX hybrids, IP-hosted solutions, or eventually cloud based). If an outsourced
Today's Challenges

Will this list of some of today's challenges be current in five years? No, we'll have a whole new list.

- Number portability
- Dial plans
- Pickup groups
- Hunting groups for rollover
- Conferencing
- ADA compliance as in TTYs
- TDDs
- Line appearances within groups
- Different class of services for different business needs
- 911 services
- IVR (interactive voice response) services
- Ring-down devices
- Trunk connections to the carriers (SIP or TDM)
- Presence
- Federation
- Find me–follow me
- Integration within these applications
- Voice to text
- Text to voice
- Single-number reach
- Contact lists
- Mobile to desktop
- Desktop to mobile
- Cellular to Wi-Fi/Wi-Fi to cellular
- Netbook
- Smartphone
- Apple devices
- Google applications
- BlackBerry options with/without RIM
- Fixed mobile convergence

Out with the Old, In with the New

Another complexity for the future is how quickly we can transition our security systems (emergency phones, fire-alarm panels, burglar-alarm panels, intercom systems, paging systems, dictation) so we can rely less on analog technology and the copper infrastructure.

As for infrastructure, the future is bleak for copper, which is good because of its increasing cost. The practice today is less multimode fiber being installed, except for inner building, and single-mode fiber being the norm with minimal copper installation for security devices. The reduction of conduit and pathways then becomes a viable design, putting more emphasis on redundancy.

As the network continues to be the backbone for all applications, sharing these protocols adds more complexity to the delivery and expectation, which may or may not be in your control. Internal versus external network connections, quality of service, virtual LANs, encryption, denial of service, power outages for end devices, and power outages for routers and switches are all pathways that one would expect to be in place, although it may not cover end device to backend server.

How do you keep your frontline customer support staff trained and versed on these ever-changing products and applications? As we continue to morph into diverse methods of delivering voice, we know that the frontline agents may or may not be in step to support our business or our customers' needs efficiently. Understanding the smartphone, tablets, and other applications increases awareness and gives the customer support staff a head start on the direction of voice in our communities.

IP-Based Voice

The savior for voice moving to an IP-based technology is that the cellular industry and its inability to penetrate all or anywhere set
the baseline for poor to medium service; but as technology has changed, we are delivering reliable voice service along with the data service applications and features, and a new baseline of business continuity has been established. Our users have come to expect better than five nines reliability; they are so reliant on the network and the ability to connect to anything from anywhere that any outage is considered a failure.

Additionally, our users have come to expect better than five nines reliability; they are so reliant on the network and the ability to connect to anything from anywhere that any outage is considered a failure.

In reality, in many organizations today, the desk phone could be easily removed with little or no impact on the performance of the individual. Smarter knowledge workers recognize that they are no longer using their desk phones and will remove them, eliminating any costs associated with operating and maintaining them.

Because of the complexity of IP-based voice delivery, the reliance on voice professionals continues to be a requirement. Understanding the delivery and support of ACD (automatic call distribution), auto attendants, voicemail services, and e-fax are just a few examples. E-anything delivery still needs a connection to a standard telephone system today. Emergency services are still more reliably served with analog.

It should be noted that IP-based voice solutions are not, in most cases, an exact replacement for the existing voice PBX system, and there will be an outreach either to make this more like the PBX environment or to let the technology solution change how the customers work in their environments.

The migration to an IP environment has amplified what the term "unified communications" can deliver for a more technologically robust and diverse audience. We can now tweet, text, IM, chat, tag, FaceTime, Facebook, follow, be followed, have a video call, or federate in a mobile environment and yet never make a phone call or have a face-to-face conversation.

The challenges faced with mobility include cellular coverage, penetration, DAS (distributed antenna systems), dual mode using guest Wi-Fi network, 911 triangulation, and running multiple applications while your battery life quickly fails—then running to the nearest charging station to feed the hungry device. Voice may be the least used of these applications, but as long as there is 911, we will still need to talk.

Looking Ahead

Few of us who have grown up using various communications devices would ever have thought e-mail would replace face-to-face conversations. For the past few years, e-mail has been welcomed as a way of doing more with less, although today many people consider it outdated.

Bridging the gap between the way baby boomers prefer to communicate and what the younger generation expects or prefers will continue to be a challenge. We must be able to provide services that reflect the ever-changing ways that people communicate and continue to meet business requirements for security and privacy.

The best part of being a voice professional is that we have bent, molded, changed, and morphed with these changes in the way our customers want to communicate and the technologies used to support them. We continue to make our business decisions and adjust our business cases to provide more robust delivery of bundled packages to meet our customers' demands.

Voice is alive and well, and in the days and years ahead, we will continue to change, just as we always have. We will embrace our new roles and directions for the multitude of vertical markets we represent. Whether this is a hosted solution or on-premises solution, carrier-provided or cloud-based, we will be a part of this. I for one am ecstatic about being in the throes of these challenges and bringing my knowledge to the fearless Y and Z generations who expect immediate, just-in-time information transfer with little or no voice component.

We accept the challenge.

Mark Reynolds is associate director of IT (voice, security) at the University of New Mexico. Reach Mark at reynolds@unm.edu.
Preparing for the Future as an ICT Professional

When the economy tanked in 2008, the impact on higher education was swift and sure. Budgets were cut, and the high unemployment rate in the country included even many information communications technology (ICT) pros. Positions were consolidated or eliminated with the advent of new technologies that have changed how communication technologies are delivered. It is no surprise that many in voice communications are quietly wondering what they should do to avoid becoming a member of the unemployed.

How Did We Get Here?

Changes in recent years provide insight into the challenging job market. Universities are asking more of their IT staff: In some cases, workloads have been increasing by 20 percent or more annually, according to research from International Data Corporation. But funding has not matched such ambitious initiatives. IT departments were plodding along with flat growth in 2008 when the banking crisis hit. In early 2009, budgets were slashed, and Gartner reported that IT spending fell more than 6 percent that year.

As academic institutions sliced budgets, staff was one area that took a hit. Salary increases for IT professionals dropped from 3.9 percent in 2008 to 0 percent in 2010, according to the College and University Professional Association for Human Resources. To curb costs, colleges replaced permanent positions with temporary employees in some cases, and in other instances, they eliminated certain positions altogether. Not a pretty picture for ICT professionals, who now need to proactively make themselves attractive to their current—and possibly future—employers.

Voice communications has been hit very hard. The development of new technologies has resulted in mergers of once disparate departments, such as the telecommunications department and the data processing area. At one time, these groups were autonomous and viable, both from a technological and a business perspective. But recently these groups have evolved so their functions, services, and customers have become quite similar. They often have installation functions, a repair unit, a trouble or help desk, purchasing and billing functions, and possibly application development. As the differences between the technologies used by the different groups began to overlap, universities started combining them to save resources and give the customer a single point of contact. The end result is a reduction in staff positions.

The nature of business communication has also changed. The advent of unified messaging blurred the differences between once autonomous voice-mail and e-mail functions. Unified communications combined these services with others like instant messaging, and the onslaught of mobile devices and soft phones further accelerated the overlap and consolidation occurring among various communications channels.

The dramatic rise of wireless communications also had an impact on career opportunities. At one time, almost every household had at least one telephone line from the local operating company. Today, many are abandoning their landlines in favor of mobile devices. Landline use has been dropping at a rate of approximately 20 percent per year. In fact, In-Stat found that in 2008 the number of cell phones passed the number of landlines. The proliferation of mobile devices has had a profound impact on the number of students using campus residence hall telephone services. Few students now use those services, so what was once a solid source of IT revenue has dried up. In response, the number
of colleges and universities that provide telephone service to their dormitories has dropped precipitously in the last few years, further constraining tight budgets.

The end result is that telephone systems purchased today are more likely to be VoIP based than traditional PBX systems. In the past, the typical telecommunications worker did not have to know much about data networks but was well versed in areas like POTS, ISDN, trunks, DSL, and feature interactions. Now the technology has changed to VoIP. The new telecommunications model requires knowledge of data networks, servers, quality of service (QoS), and edge devices that were once the sole domain of the data technologist. As a result, many voice communications workers have outdated skill sets. New applications and technologies come with a significant learning curve, and veteran voice communication professionals often find themselves lacking the necessary skills and knowledge.

**Hard Skills, Soft Skills**

So how do today’s technology workers ensure they will remain attractive and employable in the future? What are employers looking for in an IT professional? The attributes needed by new or current IT workers fall within two main categories: hard skills and soft skills.

- **Hard Skills.** What is hot in IT right now? What tech skills do you need to acquire right now to be prepared to tackle the latest technologies and those looming in the near future? Voice professionals need to have an understanding of data networking and basic concepts. At a minimum, you should understand the open systems interconnection (OSI) model, which defines the different layers in a communications system. You also need to understand different communications protocols such as TCP and UDP, how network addressing works, and how SIP and VoIP function. You should be familiar with common acronyms and have some understanding of IP networking functions, DNS, DHCP, ARP, and MAC address. You should also have an idea of the way hubs, routers, and switches work as well as understand firewalls and session border controllers. With the move to mobility, you also need to understand how wireless technology, both LANs as well as cellular services, operates. Terms like Wi-Fi, 3G, 4G, hotspot, 802.11, and WiMAX and knowledge about smartphones and tablets can also come in handy.

Looking at the listings for technology management positions, the skills most often desired include project management and business analyst, business intelligence, data mining, change management, and application development, especially for mobile devices. The technologies most often mentioned are social media, cloud computing, Net 2.0, Web development, unified messaging, network administration, system integration, cybersecurity, gaming, mobile apps, healthcare, and novel ideas on how to apply the technology to enhance business performance. Software knowledge of Ruby on Rails, HTML5, CSS, Flash, Java, C#, PHP, mobile apps, multiple platforms, MySQL, and SAS are all popular listings.

- **Soft skills.** Recently, IT support has been shifting from a technical to more of a business focus. The department is spending less time figuring out how to set up a router port and more on how to leverage technology for competitive advantage. Increasingly, colleges expect information technology workers to have both hard and soft skills.

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Learning Tree International, in business since 1974, develops hands-on management and IT training courses. The company delivers 245 standard and 600 custom IT, business skills, and management courses that are taught by more than 625 instructors worldwide. The vendor operates learning centers in many major cities, including Boston, Chicago, Dallas, New York, Los Angeles, Philadelphia, and Washington, D.C. In addition, the training supplier conducts classes on customers' sites. While focusing on IT skills, Learning Tree also has courses in communication, leadership, time management, and writing. More than 2.1 million Learning Tree course participants from more than 65,000 organizations across the globe have taken its courses.

Operating since 1982, New Horizons Computer Learning Centers is an independent IT training company. It offers courses online, mentored, and in traditional classroom settings. The training courses range from basic application and desktop productivity tools (i.e., Project, Excel, PowerPoint) to complex business systems (i.e., information security, ITIL, Microsoft, Cisco, and Novell). In addition, New Horizons Computer Learning Centers offers various business classes: advanced interpersonal communication, business ethics, having tough talks, and leading a virtual team.

Technology departments to lead business change. Merely being a support group is no longer adequate. Knowing how to use the capabilities of the IT department to enhance other efforts through creative use of technology, such as increasing marketing programs or enhancing classroom capabilities, makes the professional an integral part of the university leadership.

To make meaningful contributions, people must understand the organization's vision and how other groups contribute. You want to be part of that effort and pick up the skills and experiences that enhance your ability to offer meaningful contributions. An advanced degree is not necessary, but if you have an opportunity—even just to audit classes at your school—take business courses in accounting, economics, marketing, finance, human resources, or general administration. The new insight will be a great help. Because there is not a simple or quick way to acquire these soft and business skills, sometimes they are the traits that hiring managers covet the most.

Soft skills are not as easy to learn or define as hard skills. For instance, some are social in nature, such as communications, collaboration, and people skills. Others are more action based: problem solving, team building, creativity, change management, business development, having a "big picture" view, problem identification, community involvement, writing ability, and presentation skills. A third area encompasses your overall attitude toward technology: having passion for the job, entrepreneurship, eagerness to contribute, genuine curiosity, and a willingness to admit mistakes or weakness and solicit peer feedback.

How to Acquire New Skills

Now that you have a huge list of things you could know, how should you develop these skills and demonstrate them to your supervisor? The first question you may ask is "How do I learn all the things I need to know?" Today we have access to a virtual buffet of knowledge. Formal training opportunities are available as either live or online courses. In addition, vendors offer training in their own latest product or technology. Some schools offer classes for employees at a discount or even for free. Combining coursework with hands-on experience is the best way to acquire any skill, and many companies specialize in this type of education. A few training options are listed in the sidebar on this page. Your institution's HR or employee training department may have additional suggestions.

There are also many informal ways to get needed knowledge and training. Make use of your personal and professional network. Team up with someone who is knowledgeable in the area you want to learn more about; there is probably something you could teach in return. Form small study groups that meet to delve into a specific topic. Ask someone to come in during lunch hour to make a presentation to your department or group. That person can be from another institution, a member of the faculty, or even a member of someone's network. Take advantage of...
webinars offered by professional groups and associations such as ACUTA.

Do not forget to look at free classes on the Internet. One such place is http://www.gcflearnfree.org. An offshoot of Goodwill Industries of Eastern NC, Inc., GCFLearnFree.org developed 750 different lessons, including courses on social media and Google Docs, focused on technology, literacy, and math skills. Another is http://www.intelligentedu.com. This site run by Scott Turton offers courses in program design, C++, Java, and Python.

Preparing for the Jobs Most in Demand
You have many opportunities to gain hands-on experience in the new technologies. Talk to your supervisor about working in a different area for a short time. Gaining insight and new skills will make you a better team member and build up your own portfolio. Every community has not-for-profit organizations or new start-up companies that need technology services but cannot afford them. Volunteering at one or more of these is a good way to practice new skills, help someone else, and expand your resume at the same time. If the manager or owner writes a letter when these tasks are completed, you can claim the experience and have a document to back up your claim.

Conclusion
Today's volatile work scene makes it imperative to stay up-to-date with emerging technologies. The industry is constantly changing: Old technologies fade and new ones take their place. It is important to be adaptable and learn new skills. While it is probably impossible to be fluent in every new technology or application that arrives on the scene, we must all be aware of the newer, more promising directions. Subscribe to trade magazines and online groups, attend conferences, and talk to people in other industries. Constantly ask yourself how you can apply a new technology to something in your organization. Above all, never stop learning!

Dave Wirth is an experienced telecom/IT professional and a longtime ACUTA member who is currently looking for new opportunities. Reach Dave at wirth_dave@hotmail.com.

Back to the Future
Mark Reynolds
University of New Mexico

At the University of New Mexico in 2007 we were just moving to the "hybrid buzzword" status. This included digital, analog, and the new IP-based voice solution. The network was also changing to faster speeds—100 Mbps to the desktop, 1 gig backbones—and we still had to learn about DSCP values, quality of service, and DHCP scopes for voice as well as VLAN trunking, but we were determined that VoIP was going to be the "fix-all" scenario.

The challenge was on. We met with the university architect, building designers, infrastructure groups, management, data group, and finance and presented our VoIP fix-all scenario; but since we had yet to see the true value, because the costs were a lot higher than traditional telephony, and we relied on more experts, we had to take a step back. We decided it would be best to do a proof of concept, ROI, and put this "hybrid solution" to the test.

Fast forward now to 2011. We now deploy VoIP as the standard, with digital and analog as a one-off or secondary. Our infrastructure to the buildings has flipped from little copper to larger bundles of fiber. The network is 20 gig on the backbone with 1 gig to the desktop. QoS, DSCP values, DHCP scopes, and VLAN trunking are standards that "just" work. We now are tweaking our installations to enable the customer to pick up her phone, configure it, and install it. This has already saved us on the overhead labor costs. What has changed is the customer service aspect, which becomes more important as our tier 1 support. The challenge now is to transfer the years of knowledge to this frontline support and continue to find ways to automate our processes and troubleshooting techniques.

With soft clients (soft PBXs) becoming more commonplace, even our standard PBX look and feel is going to change. The onset of this technology will embrace the social media we see already in many other forms, as in Skype, Facebook, and Twitter. We will continue to evolve to provide an economical solution for the university but allow a menu and options for staff, faculty, students, and healthcare to choose from.

If you fast forward another five years, what we deliver will be bundle-based with fewer widgets and more customer-facing applications.
Videoconferencing Goes Mobile
Confluence of Factors Drives Interest in Smaller Devices

For years, academic institutions have relied on videoconferencing systems to enhance the classroom experience, conduct distance-learning classes, and exchange information among employees. “Our videoconferencing systems have been in place for more than a decade,” noted Doyle Friskney, chief technology officer at the University of Kentucky (UK), which has about 27,000 students and 13,000 faculty and staff on its campus, which is spread out in the Lexington, Kentucky, area.

Sold by vendors such as Cisco Systems, FuzeBox, LifeSize, Polycom, Radvision, Skype, and Vidyo (see sidebar on page 36), video conferencing systems traditionally have been expensive and required specialized, turnkey hardware and software. Recently, they have become less expensive and more modular, running on commodity hardware, laptops, and PCs. But the future of these systems revolves around them moving to smaller form factors. “Virtually all videoconferencing vendors have been pushing to add support for handheld devices to their product lines,” noted Andrew W. Davis, an analyst at Wainhouse Research.

That’s because increasingly, smartphones and tablets are replacing laptops and PCs as the users’ device of choice. This transformation presents both opportunities and challenges to academic institutions. The new features will enable them to communicate with staff, faculty, and students more efficiently.

However, “organizations need to be aware of the potential negative impact that handheld videoconferencing may have on their network infrastructure,” noted Pamm Jain, a principal analyst with market research firm Frost & Sullivan. Network managers need to make sure that this push does not overwhelm their networks and that they have the tools in place so they can manage such connections effectively.

Theater of the Absurd

Until recently, the idea of holding videoconferences on mobile devices seemed absurd. The devices’ small screen size and low resolution made it difficult for users to see information clearly. Also, entering data was often a befuddling experience.

That viewpoint began to change with the announcement of the Apple iPhone 4 in June 2010. “Apple did a very good job developing a functional handheld videoconferencing system,” noted Peter Brockmann, president of market research firm Brockmann & Company. The device’s resolution was top notch (HD video quality), and the design enabled users to enter information via simple touches rather than complex data entry. Also, Apple’s FaceTime videoconferencing software was intuitive and easy to operate.

The move to mobile videoconferencing is also riding the growing wave of popularity with tablets, which was sparked by the introduction of Apple’s iPad in April 2010. “About 15 percent of our users work with tablets; they have been quite popular among faculty members,” said UK’s Friskney. Such numbers are expected to grow exponentially in the near term. Frost & Sullivan estimates that shipments of business tablets reached 600,000 units in 2010 and predicts that the number will grow to 49.1 million in 2015.
These devices mesh well with video conferencing because they have a larger screen size than cell phones—typically seven inches compared to four inches found with smartphones.

**Bandwidth Constraints Limit Adoption**

Traditionally, a lack of available bandwidth discouraged interest in mobile videoconferencing. Video communications are bandwidth intensive, a challenge that has grown more significant with the recent movement to HD transmissions. A few years ago, a 720pixel HD video connection required as much as 5 Mbps of bandwidth, so having a number of videoconferencing users online could create network bottlenecks.

A number of recent improvements have eased that burden. Vendors have enhanced the algorithms (basically software that condenses the video before it moves from place to place), so video transmissions require less bandwidth, typically about 1 Mbps to 2 Mbps. Also broadband penetration continues to rise, so increasingly, users work with connections that offer at least 1 Mbps of bandwidth.

Also, handheld devices have become more network ready. For instance, the iPhone features integrated Wi-Fi networking functions, so any two iPhone users can hold a virtual face-to-face discussion. The phone also includes a forward-facing camera. Holding videoconferences over Wi-Fi links has some advantages compared to cellular connections. The Wi-Fi option offers hundreds of Mbps compared to the single-digit Mbps available with cellular links. Also with Wi-Fi, users do not eat into an academic institution's cellular monthly minutes. The end result is that videoconferencing transmissions no longer wreak havoc on academic networks.

“I feel confident that our network will be able to support high growth in videoconferencing,” noted Friskney.

**Enhance the Classroom Experience**

The influx of these handheld devices opens up new opportunities to academic institutions. As schools adopt more online courses, they can enrich the courseware with videoconferencing, file sharing, whiteboards, and chat functions. In addition, distance-learning instructors can alternate between fixed lecture-style presentations where they are the only presence on the screen to sessions linking multiple remote sites. For instance, experts can collaborate with cohorts: A marine biologist in London could be present to illuminate videoconferencing with a colleague at the University of Hawaii and outline the impact of shark attacks on submarine cables.

In addition, students, who typically are quite tech savvy, can hold virtual teacher conferences rather than rely on e-mail exchanges. “Videoconferencing has become a desirable communication medium because seeing participants ‘face-to-face’ reduces miscommunication,” noted Frost & Sullivan’s Jain.

While gaining interest, the emerging mobile solutions still have some blemishes. Tablets and cell phones are not ideal form factors for complex interactions. While they are suited for a one-on-one or a one-to-many communication, they can run out of real estate when a number of individuals take part in a conference. The same limitation holds true when add-on items, such as PowerPoint slides, are part of an exchange. Also during a videoconferencing session, attendees will have to man the device’s camera while watching the conference, a feat that may test their manual dexterity.

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**Back to the Future**

Jana McDonald  
Texas A&M University

When I started at Texas A&M University in the Fall of ’07, VoIP was just a word that was beginning to be uttered. We were a campus that was almost completely Centrex, with an Option 61 that served three off-campus buildings. Fast forward a year, we had put out an RFP for VoIP and began our first installation in March ’09, with a focus on all new buildings and major remodels being VoIP.

Today we have well over 2,000 users on VoIP and are speeding ahead faster than we can keep up with. It is no longer just new buildings—departments are coming to us daily wanting to convert over, and we can hardly keep up.

WiMax, P25 Radios, and IPTV were words that we had heard of, and now we either have full implementations or are in the process of going live with these services. Pagers and regular cellphones are on the way out; it is now all PDAs and iPads. We have also seen a large decline in the amount of 800# audio conferences that we set up.

We seem to be moving toward a converged voice and data network with our networking counterparts, instead of the completely separate networks that we operate today. With the advance of technology, I see us becoming more converged every day, especially with future VoIP implementations.
Videoconferencing Options

The need is clear: Users want videoconferencing functions on their mobile devices. In response, vendors have been adding various products to their lines, so academic institutions have more choices.

- Cisco has focused on its Cius, an Android tablet designed for business users. Weighing slightly more than 1 pound, it features a front-mounted 720p camera and a 5-megapixel rear-mounted camera, dual noise-cancelling microphones, and a 7-inch super VGA display.
- Google has been promoting Hangouts, a live video chat service. Users broadcast their Hangouts and turn their chat sessions into a live stream that can be watched by participants. Hangouts require a minimum of about 900 kbps of bandwidth on the upload side and twice that amount on the download side. As a result, 3G users may be out in the cold if they try to initiate a session on their mobile phones, but 4G and Wi-Fi users should have sufficient bandwidth.
- FuzeBox’s Fuze Meeting is a multiparty HD videoconferencing service that works with Apple’s iPad and Android Honeycomb tablets (https://fuzebox.com/fuzemeeting/). The system supports up to 10 participants and pictures with 720p resolution.
- LifeSize, a division of Logitech, offers the ClearSea line of enterprise mobile videoconferencing systems (www.lifesize.com/Products/Infrastructure/ClearSea.aspx). It supports Apple’s iPhone and Android-based mobile devices from Dell, Google, HTC, Motorola, and Samsung Electronics. The product stemmed from Logitech’s acquisition of Mirial.
- Polycom’s RealPresence Mobile runs on the iPad 2 and Android tablets (www.polycom.com/products/hd_telepres-ence_video/realpresence_mobile/index.html). The app connects up to 16 calls simultaneously and allows users to view documents, such as PowerPoint presentations and PDFs.
- Radvision enables companies to tie Apple iPads and Android tablets into their videoconferencing solutions. (http://blog.radvision.com/videooverenterprise/2011/10/03/scopia-mobile-v3-mobile-videoconferencing-at-its-best/). The SCOPIA Mobile V3’s click-to-participate capabilities allow users to join videoconferences supporting two-way video and exchange information with up to 28 participants simultaneously. The video application supports data collaboration with review capabilities, conference call control, and user administration. Radvision’s data/collaboration slider feature allows users to review previously shared materials without interrupting the presenter.
- Skype for the iPhone supports a variety of communications functions. Users can make video calls to people on their computers as well as other iPhones, place free audio calls to anyone else on Skype, and connect to other landlines and mobile systems.
- Vidyo’s VidyoMobile works on iPads and iPhones as well as Android systems (www.vidyo.com/products/vidyomobile/). The mobile application allows Vidyo’s enterprise customers to connect mobile workers to company videoconferences. The product is designed to interoperability with H.323 and SIP end points.

Mobile videoconferencing solutions have been packaged in a variety of ways, from simple, consumer-oriented solutions to enterprise-class systems. Consequently, academic institutions should be able to find one that meets their requirements.

Network Complications

The handheld devices also create novel networking challenges. Unlike LAN-based enterprise videoconferencing services, mobile connectivity adds several degrees of complexity. Users tap into the service from a variety of locations, and unlike static video end points, the handheld device is constantly moving. Dual-mode devices, like the iPad, automatically switch between a Wi-Fi and a cellular network, so bandwidth and signal strength can vary dramatically from second to second. If it drops or there is a blip (which is quite possible), transmissions become garbled. Consequently, it takes sophisticated management software to account for all of those scenarios in real time, and the evolution of such features is now in an early stage and, therefore, imperfect at times.

Interoperability has been an ongoing issue in the videoconferencing arena. Unlike other market sectors, this area has lacked comprehensive standards. Theoretically, customers should be able to mix and match their videoconferencing end points, but often the level of interoperability varies greatly. Consequently, academic institutions may find it difficult to bring the mobile systems into their existing videoconferencing solutions. In most cases, the systems work best when one vendor supplies all of the equipment, avoiding compatibility problems.

For academic institutions, security is an omnipresent concern. Security functions available with handhelds are not as well developed and comprehensive as those found with other computer systems. In fact, the first security hole was discovered in summer 2006 when hackers developed a trojan horse for Research in Motion BlackBerry handsets. “With mobile devices becoming more popular, hackers have identified them
as potential targets,” explained Wainhouse Research’s Davis.

Oops, Google’s Big Mistake

There have been several high-profile security breaches. In spring 2011, Google announced that it had removed about 50 malware-infected applications from its Android Market and activated an Android application kill switch that would remove the malicious apps remotely from user devices if they had already been downloaded. The episode highlighted the potential downsides evident with Google’s open approach to publishing third-party applications. The company allows anyone to put an application on the market and only takes one down after a third-party documents a problem.

In April 2011, Skype, one of the most popular mobile videoconferencing applications, fell victim to hackers. A coding vulnerability in its Google Android application let intruders steal key information, such as users’ e-mail addresses, contact lists, and chat logs, from their smartphones. Skype left personal contact files with improper permissions, allowing anyone or any app to read them; a later release of its software fixed the problem.

Mobility also raises new concerns. “Employees may hold their videoconferencing sessions in public spaces and possibly breach confidential information,” noted Davis. Facing FERPA statutes, faculty and staff need to be careful about what personal information they transmit about students during their video conferences.

Recently, mobile videoconferencing has moved closer to mainstream adoption. This technology still faces some hurdles but the challenges (better management functions, development of robust security functions) often are associated with emerging technologies and expected to be addressed.

Videoconferencing has always been a challenge to do well. Current systems and technologies are expensive, they’re bandwidth hogs, they’re fixed in place, and they entail good management and training in their use (including how the participants must behave and act) to get maximum benefit from the experience. Newer and future technologies solve many of these problems, but introduce new issues. Videoconferencing is still a kind of borderline application on campus; it can be great and very useful but when not planned and carried out properly, it can be an expensive waste of time and generator of confusion.

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Back to the Future

Jeanne Jansenius
Sewanee, The University of the South

As I think back to what I was doing five years ago I must chuckle at a statement I made as a presenter at an ACUTA conference: “Thanks to the poor coverage that everyone accepts from the cellular world, I will no longer have to worry about quality of service.” Little did I know those words would come back to haunt me a few years later when we took on the wireless network (Wi-Fi) for our university...we are currently looking at interfacing the Wi-Fi network and the cellular network linking back to our IP/PBX.

One of my favorite programs was the Jetsons and all the “out of this world” devices that were normal in their everyday lives. I remember George Jetson getting fired by his boss, Mr. Spacely, who was using a video phone. Technology always changes the way we provide services. Less than 10 years ago, cell phones were for the rich or pretentious and were carried in bags with a battery the size of a brick.

If you look at technology as a process, this has led the way we all are doing business. Mobile devices are now capable of more applications than a PC was capable of ten years ago. Students are coming to campus with iPods, iPads, tablets, Wiis, and network gaming devices. ITS staff scrambles to support the technology that shows up on campus after the Christmas holiday. The university network is expected to support all media.

Social media such as Twitter, Facebook, Skype, Flicker, and YouTube are changing the way we handle communications. The big issue becomes bandwidth and 24/7 help-desk support. “If you build it, they will come.” Mobility will be leading the way as application devices such as PDAs become common on our campuses.
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ACUTA: Aside from funding, what issue are you, as the CIO, currently spending most of your time addressing?

Lang: I spend a lot of my time addressing the needs of the various colleges and administrative offices within the university. I want to ensure that we are not missing anything major and that we’re keeping up with our current projects as we seem to be running more projects simultaneously all the time.

Another area I spend a lot of time on is staff resource planning. It’s hard to get additional staff, so we adjust responsibilities and eliminate or automate whatever and wherever we can. Keeping current staff trained on new technologies and moving people around to cover growth is critical to our ability to provide great service to the campus users.

ACUTA: What is the impact of this issue for your campus? What is your strategy for addressing this issue?

Lang: We often do pilot projects before implementing a major new technology. For instance, we were looking at desktop virtualization but now are focusing on developing a virtual lab where students can use any device they want to access our services, rather than replacing lab PCs with a virtual machine and/or thin client. We’re starting with virtualizing software for one lab first and will build from there. I try to ask, “What problem are we trying to solve?” so that we implement technology that solves problems and/or meets needs. One strategy is to leverage as much of our existing technology while still addressing the future needs of the campus.

ACUTA: Given that a key function of the CIO’s responsibility is preparing the campus to support future technologies, what technology changes do you see for your campus as you look forward five to seven years?

Lang: As I look forward five or seven years, I think we will see a lot of changes to the way we manage our infrastructure. More and more services and technology (including data center operations, storage, DR, and more) will be placed in a cloud-type infrastructure, public or private. The cloud is going to offer the ability to expand and contract our services to meet peak demands.

One of the other changes I see is the whole device debate going away. We will have a variety of devices, probably many more than we have today, and it won’t matter what device we have, we’ll be able to access the data and services we need. We have so many more options today than we did just five years ago; think what the next five years may bring.

ACUTA: How are you readying the campus for these changes?

Lang: As IT departments continue to implement new technology and provide enhancements to current applications and services, we need to continue to focus on change management. Change is hard for many people—students, faculty, and IT staff. I often tell people that if we are not changing, we are stagnating, and if we are stagnating, we are dying; therefore, we must continue to change because the alternative is not good. I often refer to the hype cycle graph and talk about the “trough of disillusionment” as a reminder that change can be tough but we can push through it.

And, probably, the most important element of readying the campus for change is not technology but rather communication. We always develop a communication plan as part of any major project, such as an update to our ERP system. Since we are not communication experts, we involve our office of marketing and communication to provide expertise in the development and execution of the technology plan. The more effectively we communicate, the better we can lead the campus through future technology transformations.

Thanks to Kathy Lang for taking time to share her insights and experiences with us. Reach her at kathy.lang@marquette.edu.
Q & A with the CIO

ACUTA: Much of the technology we now support in higher education is driven by consumer electronics. What decisions about your technology infrastructure have been affected by this and how?

Lang: Consumer technology plays a critical factor when making decisions regarding our technology infrastructure. On average students bring four wireless-type devices, such as laptops, smartphones, iPads and gaming devices, to campus. We need to ensure that our infrastructure can support the demand these devices place on it, making the increasing density a critical part of the decision-making process. We can’t just replace network equipment; we also have to enhance the environment.

ACUTA: Freshmen at most institutions today are far more extensive users of technology than those of even five years ago. What is the most challenging technical aspect this presents for your campus?

Lang: There are a number of challenges with regard to the pervasive use of technology. The most critical is whether or not our infrastructure has the capacity for the increased usage. Most students come from homes with wireless access and limited users sharing that access. They do not understand the density issues that accommodate the sheer volume of wireless users on the campus today. The demand for more access is going to be a continuing concern for some time, especially with the volume of traffic consisting of video transmission.

3. In what ways has this affected how you deliver support services?

We’ve always tried to support students with the technology they bring to campus. Specifically, support services have changed in two ways: first, increased assistance required by the growing number of devices; and, second, in our delivery systems. Many students want to be able to text and use online chats — not the traditional email, phone or walk-up requests that we as a support organization are used to providing. Fortunately, we hire a number of student employees who often use these consumer devices themselves. It’s important for us to mine information from them to ensure we can meet the needs of our students.

We also try to use as many channels as possible to get information out to the students — including social media like Twitter.

4. Since higher education seems to be perpetually in challenging budget times, what is your most important financial issue? How are you addressing it on your campus?

Our most important financial issue is the cost of keeping up with demand. First, there is often a capital expense followed by maintenance and then replacement and/or upgrades and then further enhancements, etc. The cycle continues. Technology provides the means to improve processes and quality of the university as a whole; that costs money and we need to plan for it. One of the ways we are addressing the issue is by planning when we’ll need upgrades, what we can do to automate to reduce staff time, what can we eliminate or what we can push to the cloud, etc. Internally we also implement process improvements and

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AN OPEN LETTER TO APOGEE
RE: MOVE-IN

We are nearing the end of move-in week for our freshmen class and it couldn't have gone smoother.

Typically at this time of year, our network and help desk teams are scurrying in and out of dorms troubleshooting network connectivity for our students. With Apogee now in place, those calls for help have simply stopped, allowing HSU personnel to focus on the multitude of other tasks necessary to begin the academic year. Even better than that, our students absolutely love the new wireless connectivity and the ability to choose the service plan that best meets their needs.

While Apogee's customer support has been outstanding, I think it is important to note that move-in week has been so successful in large part because of the meticulous project organization that we have experienced from the very start. Throughout the entire process, Apogee made us feel comfortable because it was clear they had walked this road before and were on point. From the initial discovery, to the network engineering, to the installation, this project has run beautifully. Each Apogee representative that has been on our campus was respectful, competent, and efficient. Move-in week has been wonderful, but the foundation that was laid throughout the preceding five month should not be ignored.

From top to bottom, you have an organization of which you can be proud. We look forward to many years of successful partnership with Apogee.

- TRAVIS P. SEEKINS
ASSOCIATE VICE PRESIDENT FOR TECHNOLOGY SERVICES
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