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Winter 2010

# ACUTA Journal of Telecommunications in Higher Education

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Winter, 2010  
Vol.14, No.4

**acuta**

# *Journal*

of Information Communications Technology in Higher Education

Published by The Association for Information Communications Technology Professionals in Higher Education



This Issue: Great Expectations—The Technology Behind the Applications



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# Events Calendar

Event	Date	Location
Winter Seminar	January 9–12, 2011	Pointe Hilton at Tapatio Cliffs Phoenix, Arizona
Annual Conference	April 3–6, 2011	Hilton Bonnet Creek Orlando, Florida
Summer Seminar	July 17–20, 2011	Hyatt Regency Baltimore, Maryland
Fall Seminar	October 9–12, 2011	Boston Park Plaza Hotel Boston, Massachusetts

ACUTA's Core Purpose is to support higher education information communications technology professionals in contributing to the achievement of the strategic mission of their institutions.

#### 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

The logo for ACUTA, featuring the word "acuta" in a bold, lowercase, sans-serif font. The letter 'u' is stylized with a small square cutout in its center.



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Photo credit: Media Technology Services, Boston College

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Thanks to the companies that support ACUTA by advertising in our Journal.

We invited our Corporate Affiliates to share with us how they are preparing to meet campus technology needs of the future. Look for these shaded boxes throughout this issue for their replies.



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From high-end telepresence to group conferencing rooms, from desktop video to soft clients, planners need to prepare for a massive increase in bandwidth consumption and a radical change in traffic patterns.

*David Willis, Gartner  
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## The ACUTA Journal of Information Communications Technology in Higher Education

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## PRESIDENT'S MESSAGE



**MATTHEW K. ARTHUR**  
WASHINGTON UNIVERSITY IN ST. LOUIS  
ACUTA PRESIDENT  
2010-2011

## Widen the Net

I was privileged to have a rewarding encounter at the end of the Fall Seminar in Vienna, Virginia, in October. A "First Timer" approached me in front of the registration desk after the last presentation and introduced himself. He thanked me for the outstanding experience he had attending the seminar. He said the things he had learned and the people he had met went beyond his highest expectations. He was eager to follow up with those he had met from other campuses as well as many of our corporate partners he had met in the vendor hall.

One of the great "perks" of being president of this organization is the chance to represent ACUTA as the host of the First Time Attendees' Orientation before each onsite meeting where I welcome them and encourage them to maximize their investment and take home as much as possible from their time at the seminar or conference. (Think new ideas, knowledge nuggets, new products, and names to add to your professional network.)

At any ACUTA event, as many as 20 percent of the attendees may be there for the first time. If they are like the fellow I met in Virginia, they may take that next step and become an active part of ACUTA.

Why is this a good thing? Why do we need to widen the net and draw more people to ACUTA from member campuses as well as nonmember campuses? Because it benefits not only them, but you and me as well. Growth has two huge benefits:

**1. A larger knowledge base.** As the great expectations of the latest applications and technologies rise ever higher and higher, the need to manage the infrastructure supporting those technologies is exceeded only by the need to manage the expectations themselves. Pooling our experience and knowledge as Information Communications Technology Professionals in Higher Education exponentially expands our base of information beyond our office or our department or our university.

It has been said that many university presidents and chancellors wish to be on the "leading edge" of technology (as opposed to the "bleeding edge"), but how do we get to the "leading" without getting cut up because we have taken our office/department/university over the "bleeding" edge? A wise mentor of mine once told me that belonging to higher education technology associations allows us to see where we are compared to other colleges and universities. ACUTA is the premier association in higher education that helps each and every one of us find the path to those answers.

**2. A wealth of experience.** ACUTA will be celebrating our 40th birthday this April at our Annual Conference, the theme of which is "Succeeding in the New Reality." What kind of unique insight into the technology that serves your school could someone give you who had been in your department for the last forty years? How much would that person have had to learn and grow over that time just to stay current?

ACUTA—always made up of highly skilled professionals—has learned and grown over those 40 years. From its original narrow and deep focus on telephony and telecommunications, ACUTA has broadened its view to include networking, customer technology support, financial/billing/budgeting, student technology support, system engineers/architects/programmers, IT security, emergency communications, CATV, data center, and the list goes on... We need to reach out to others on our campuses whose responsibilities are listed above but who are not yet a part of ACUTA. We need to *widen the net* to keep growing!

I was recently asked to do a presentation for our central IT department about the benefits of our ACUTA membership. The first thing I did was show them the brand new ACUTA video available on the "About Us" page on our ACUTA website. Take a look! Better yet, get others in your department and school to take a look! The video does such a great job that I probably could have stopped right there, but I didn't. After reviewing the stated membership benefits



on our website, I talked about the variety of seminar topics from the last year and widely varying program titles from the last annual conference. Practically everyone in the room found more than one golden nugget that would have helped them in their duties and responsibilities. I left them with a slide of "Matt's Membership Benefits" which included the positive benefits I have realized over my decade-plus long association with ACUTA. Widen the net, indeed.

Are you taking advantage of all of the benefits of membership in ACUTA? Is there someone else on your campus who would benefit from participating? Here are some of the resources available to members:

- Subscription to quarterly *ACUTA Journal*, and monthly *eNews* and Legislative/Regulatory updates

- Access to Membership Directory and the Guide to Products and Services

- Access to online ACUTA Community and listserv

- Access to active RFIs and RFPs online

ACUTA covers topics of importance to all of us, such as these from recent events:

- Unified Communications
- Wireless—The New Paradigm
- Managing Change in an IT World
- Green IT
- Managing and Financing the Converged Environment

Looking closely on a personal level, here are Matt's Membership Benefits:

- ACUTA helps you to see where your institution stands relative to others and learn why.

- ACUTA helps you become better at your job by offering leadership, management, and technical professional development in one convenient package.

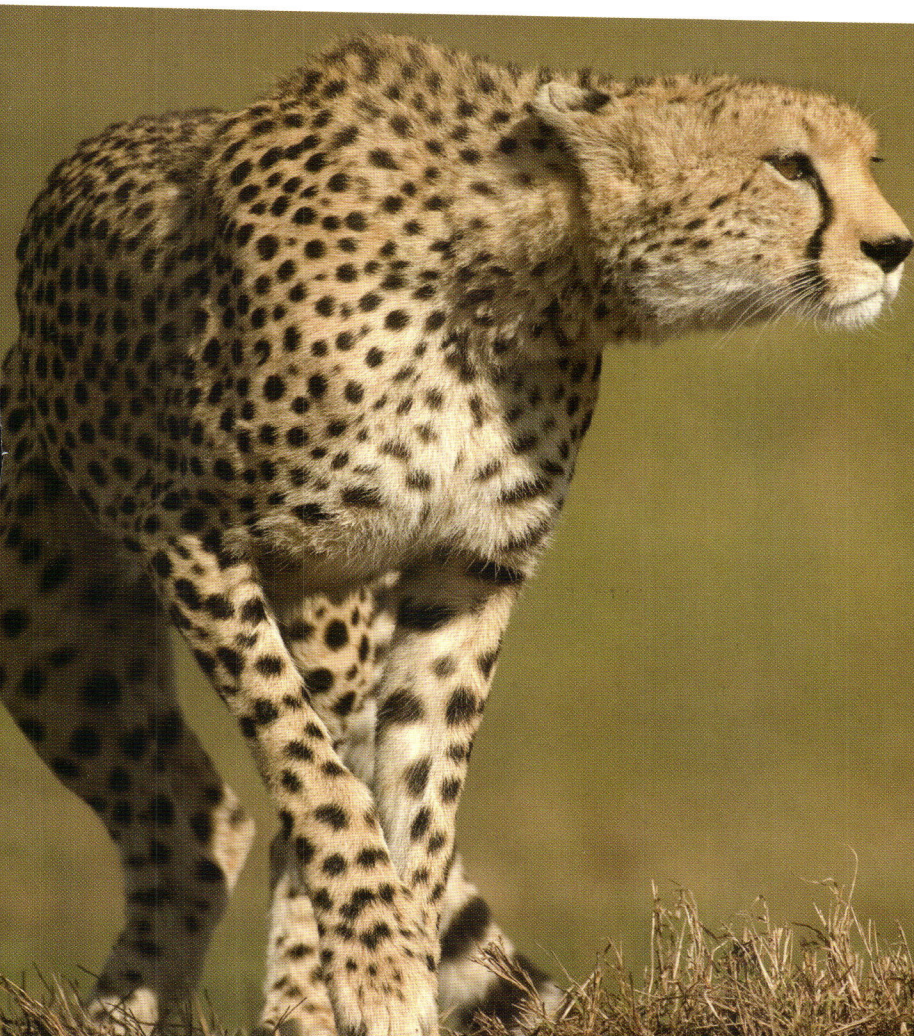
- ACUTA provides opportunities to learn, network, serve, and make an impact at a national level.

- Your ACUTA experience makes you more valuable to your department.

- Your department becomes more valuable in support of the college/university's strategic mission.

I have had the pleasure of meeting many of you and hope to meet even more. Hopefully the First Timer mentioned above will take that excitement back to his campus and widen the net!

Hope to see you in Phoenix in January—and in Orlando next April!



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FROM THE EXECUTIVE DIRECTOR



JERI A. SEMER, CAE  
ACUTA EXECUTIVE DIRECTOR

## From the Capitol to the Campus: Impact of the 2010 Elections on ICT Policy

The results of the November 2, 2010, United States elections have brought the largest shift of seats in a midterm election to the minority party since 1938. As of the date this is being written (November 16), Republicans are expected to gain a 240–190 majority in the House of Representatives (with five races currently undecided), and in the Senate the Democrats are projected to maintain a majority of 51 Democrats, 46 Republicans, and 2 independents (with one race currently undecided).

The full political and policy implications of this sweeping change will become clearer over the coming months as key House and Senate leadership roles are finalized and the Administration and Congress establish a new and very different working relationship. However, this clear statement by the electorate signals a shift to a more conservative approach to legislation in many areas, including ICT policy. At the same time, the FCC retains a Democratic majority of 3–2 among the commissioners—which could create some interesting dynamics in communications regulation over the next two years.

Admittedly, communications legislation is not on the list of highest profile issues likely to be addressed in the lame duck session of the 111th Congress or early in the 112th Congress. Extension of the 2003 tax cuts and funding bills for the federal government will be the focus of the lame ducks. There are a few other bills said to

be open for consideration during the short lame duck session, some of which deal with unresolved ICT issues (including net neutrality, cybersecurity, spectrum allocation, and privacy), but they face high hurdles due to their controversial nature. By the time you receive this *Journal*, the lame ducks should have gone home for the holiday break and the results of any ICT issues dealt with during their session will be clear.

Focusing on the 2011–2012 legislative session entails more speculation. It is clear that repealing health care reform is a priority of the new Republican majority in the House, but they will face significant opposition in the Senate and the Administration. Resolution of the tax cut extensions may also extend into the next session, if a compromise cannot be reached in the few remaining days of 2010. Some pundits are predicting that it will be difficult for either party to pass their legislative priorities during the next two years.

Focusing on ICT legislation that is likely to affect your campus, there are several issues that bear close watching as the Congress enters this new, more conservative era. ACUTA's

advisors have offered the following thoughts and predictions about these issues:

- **Universal Service Reform:** Congress has been struggling with comprehensive reform of the Universal Service Fund (USF) for years—almost since the Telecom Act of 1996 was signed into law! This program, which funds the e-rate for schools and libraries, rural health care, rural high-cost areas, and lifeline and linkup programs, is suffering from a shrinking contribution base and pressure to expand subsidies to deploy broadband services. Comprehensive reform legislation was introduced in summer 2010, but it faced opposition, and one of its key co-authors (Rep. Rick Boucher) was defeated in his House re-election race. This makes it less likely that we will see comprehensive USF reform pass during this Congress. (However, the FCC may still attempt to exert its regulatory authority to adopt reforms under current legislation, and in fact does have several current rulemaking proceedings underway.) ACUTA is actively commenting to the FCC on this matter, and two representatives of the Legislative/Regulatory Affairs Committee met with key FCC staff last month to discuss our views.

- **Network Neutrality:** Several bills were introduced on this subject during the current Congress, but none passed, and none are likely to pass during the lame duck session. Considering the wide range of views on this controversial subject, some are predicting a similar fate for bills introduced next session. However, this continues to be a high priority for FCC Chairman Genachowski, and the FCC with its Democratic majority may well vote to assert its jurisdiction to reclassify the transmission component of broadband service as a “telecommunications service” that is subject to many of the common carrier rules. In this way, the FCC Chair believes that the Commission would have the authority to impose net neutrality regulations. Complicating this issue is the possibility that the new Republican majority in the House may seek legislation to prevent the FCC from enacting this reclassification—and it is unknown whether such an attempt would be successful.

- **Privacy:** Many pundits believe that online privacy is one of the few communications issues on which legislation is likely to be passed in the near term. Such issues as collection of consumer information, giving consumers the right to “opt-in” and “opt-out” of having their



information collected or shared, behavioral advertising based on the consumer's online activities, sharing of information among websites, disclosing information to third parties, and related issues are all on the table.

• **Cybersecurity:** This is another ICT issue that may gain bipartisan support in the next Congress, focusing on legislation to protect key computer and telecommunications infrastructure and systems. Legislation could expand the government's authority to deal with cyber attacks and could impose security standards on the private sector, including colleges and universities. A very controversial proposal would give the president the right to shut down all or portions of the Internet if a catastrophic attack should occur. It remains to be seen whether concerns about privacy and extension of the government's regulatory authority will prevent the success of such legislation.

• **Communications and Video Accessibility:** If your campus develops and/or deploys "apps" for mobile devices, you need to be aware of the recently passed Twenty-First Century Communications and Video Accessibility Act of 2010, which addresses "access to emerging Internet Protocol-based com-

munication and video programming technologies" for individuals with disabilities. Although this legislation was signed into law by the 111th Congress, the FCC is just now in the process of developing rules to implement the new law. These rules will cover the types of mobile devices and applications that must be accessible, acceptable accommodations, and the impact on network features, functions, and capabilities. It will also specifically address accessibility of mobile browsers for the blind. ACUTA has a team examining the new law to decide if we should submit comments to the FCC—stay tuned for more specifics as the rulemaking proceeds.

Progress on these and other ICT issues, as well as whether hearings will take place on broad telecom reform legislation that would incorporate spectrum policy and FCC authority over the Internet (including network neutrality), will depend on who is selected to chair key committees in both the House and Senate. This direction should be clarified early in 2011.

Much of the information in this column is drawn from the November 3, 2010, memo from Dow Lohnes Government

Strategies on the impact of the 2010 mid-term elections on ICT policy. If you are interested in more details, I invite you to read the full memo at <http://www.acuta.org/wcm/acuta/legreg/111610a.pdf>, and also the November ACUTA Legislative/Regulatory Update at [http://www.acuta.org/wcm/acuta/pdf/leg\\_1110d.pdf](http://www.acuta.org/wcm/acuta/pdf/leg_1110d.pdf).

These are interesting and volatile times for ICT policy in Washington, D.C. At ACUTA's Fall Seminar, an FCC commissioner and the senior counsel to the House Energy and Commerce Committee shared their insights on future legislative and regulatory developments. Feedback from the seminar participants was very positive, and we were encouraged to invite these types of presenters again in the future. Clearly, ACUTA members recognize the importance of keeping current on ICT policy issues that are likely to affect their institutions.

As always, the ACUTA Legislative/Regulatory Affairs Committee continues to monitor and comment on policy issues that are relevant to our members.

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# IT Market Clock for Enterprise Networking Infrastructure, 2010

David A. Willis  
Gartner

Future enterprise communications systems will be highly virtualized, intelligent, and application-aware—and the network infrastructure underneath must adapt. The impact of new infrastructure and application strategies on the network cannot be overstated: To prepare for these changes, the enterprise network must be modernized, and legacy technologies have to be aggressively retired. The IT Market Clock (Figure 1) helps planners evaluate and prioritize their investments in network infrastructure technologies by mapping each class of technology asset in terms of two parameters: commoditization and progress through its own market life cycle. Planners must

understand both parameters when setting strategies for deploying, sourcing, and retiring key assets in their portfolio of network infrastructure assets.

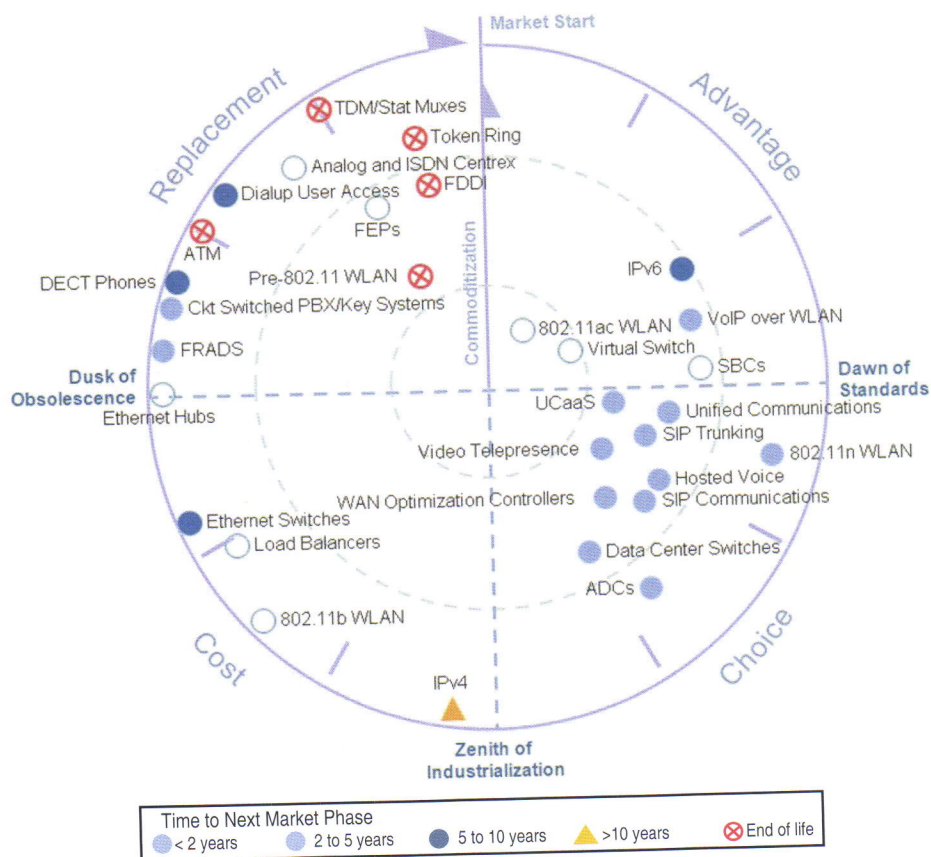
## Key Findings

Bandwidth demand continues to rise. Virtualization of the desktop will increase average WAN consumption by over 100 percent compared with traditional data-center-hosted applications. Mobile application usage is increasing tenfold, but video stands to be the biggest driver of network bandwidth consumption by far.

Many assets must be decommissioned, as support costs rise and the inherent limitations of those assets become a barrier to growth. These assets span all major domains: voice network, data center, WAN, campus LAN, branch office, legacy host access systems, and user remote access.

Voice systems are rapidly moving toward software, becoming just another data type—even as unified communications (UC) stays loosely defined and standards are relatively weak. Some legacy systems must be retired within the next five years. Wireless infrastructure will be built out as mobile demand

Figure 1. IT Market Clock for Enterprise Networking Infrastructure, 2010





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Table 1. Recommendation Summary, Part 1

Item	Focus Now	Next Change	Recommendations
802.11ac WLAN	Advantage	Choice in 0 to 2 years	No action now—review in 12 months
Virtual Switch	Advantage	Choice in 0 to 2 years	Deploy when needed, invendor-specific solutions. Look for broader standardization during the next two years.
IPv6	Advantage	Choice in 5 to 10 years	Take limited action, e.g., externally facing services in Asia and sensor networks. Conduct basic training for staff. Review in 2012.
VoIP over WLAN	Advantage	Choice in 2 to 5 years	Time VoWLAN trials with larger WLAN rollouts, increasing in-building voice coverage and use of dual-mode handsets. Look for UC clients that support enterprise features.
SBCs	Advantage	Choice in 0 to 2 years	Deploy tactically for security and interoperability.
UCaaS	Choice	Cost in 2 to 5 years	Look for opportunities to standardize.
802.11n WLAN	Choice	Cost in 2 to 5 years	Build out broad coverage across the enterprise, at 2.4 GHz for legacy and migration and at 5 GHz for higher throughput needs.
Unified Communications	Choice	Cost in 2 to 5 years	Plan to integrate multiple UC technologies and vendors to meet full requirements.
Hosted Voice	Choice	Cost in 2 to 5 years	Deploy for voice services, especially when capital costs must be optimized and future UC applications are not the driving factor.
Video Telepresence	Choice	Cost in 2 to 5 years	Choose a cornerstone vendor, considering future standards & integration into UC platforms
SIP Trunking	Choice	Cost in 2 to 5 years	Review carrier options. Look for opportunities to standardize.
SIP Communications	Choice	Cost in 2 to 5 years	Emphasize interoperability. Examine licensing fees.
WAN Optimization Controllers	Choice	Cost in 2 to 5 years	Standardize on vendor solutions based on most critical application needs and vendor's strategic road map.
ADCs	Choice	Cost in 2 to 5 years	Make ADCs a key part of data center upgrade planning. Look beyond basic load balancing to advanced application capabilities. Deploy for both externally & internally facing application infrastructure.
Data Center Switches	Choice	Cost in 2 to 5 years	Choose a cornerstone vendor for the data center as a separate consideration from the campus switch you choose.

ADC - application delivery controller  
 IP - Internet protocol  
 SBC - session border controllers  
 SIP - session initiation protocol  
 UC - unified communications  
 UCaaS - unified communications as a service

VoIP - voice over Internet protocol  
 VoWLAN - voice over Internet protocol  
 over wireless local area network  
 WAN - wide area network  
 WLAN - wireless local area network

surges, and voice over Internet protocol (VoIP) will continue to mature in both wired and wireless networks.

Video in myriad forms is on the rise, and it will hit the infrastructure hard. From high-end telepresence to group conferencing rooms, from desktop video to soft clients, planners need to prepare for a massive increase in bandwidth consumption and a radical change in traffic patterns.

Ethernet infrastructure is commoditized. Customers should emphasize price for most uses, especially in the campus access and core networks (Ethernet switches). The only area where

switching vendor choice truly matters is the data center, where customers must carefully select a cornerstone vendor.

Intelligence in the data center revolves around the application delivery controller (ADC), obviating the need for traditional load balancers. For ADCs, vendor choice matters—it won't be about price until 2012 to 2015.

The all-wireless office is becoming a reality, matching the user's desire to connect transparently from any location. Wireless bandwidth is now sufficient to handle all foreseen loads, including video, for most users. Planners must emphasize WiFi as the common connection model, focusing on broader coverage, higher capacity, and resilience to meet this need.

IPv4 will remain in the network for the foreseeable future. Although IPv6 is needed by some, most IPv4 users need not change. Customers with unique reasons to move toward IPv6 will support dual-protocol capabilities through 2020.

#### What You Need to Know

The "IT Market Clock for Enterprise Networking Infrastructure, 2010" (Figure 1) analyzes product categories in a number of key networking technology segments. It maps each segment in terms of two key parameters: commoditization and progress through its own individual life cycle. Organizations must understand both parameters to review their current and future sourcing, deployment, and retirement strategies, taking account of current generations of networking technology and new technologies that are coming to market. The goal is to:

- Drive efficiency and effectiveness through informed sourcing decisions.
- Proactively manage current portfolios of networking assets.
- Align resources to manage new services and infrastructure successfully.

This research should be used to evaluate and prioritize investments in communications infrastructure and technologies. It is a companion to "Hype Cycle for Networking and Communications, 2010" and other IT Market Clocks, such as "IT Market Clock for Enterprise Mobility, 2010" and "IT Market Clock for Communications Services, 2010."

#### The IT Market Clock

Gartner's IT Market Clocks analyze the relative market maturity and commoditization levels of major classes of technology asset.

During the early stages of a specific networking technology, it will likely be used primarily by early adopters looking to gain first-mover advantage. This may be the case for such customers as military field operations, emergency response, machine-to-



machine communications, and sensor networks. Technologies can remain in these stages for long periods.

If demand and supply continue to grow, a networking technology may reach an inflection point, during which mass customization begins to occur. There is often a higher degree of vendor differentiation at this stage. The technology establishes a compelling value proposition and can sustain growth.

As the market segment matures, the number of vendors, stronger channel and service support, broad technologist training, and maturing standards lower the cost of adopting the technologies and make it easier to switch suppliers. Here, the market segment is at its most commoditized and price competition at its most vigorous. In this commoditized phase, switching costs, prices, and margins for suppliers reach their minimum levels in the market segment's life cycle. Vendors that have not differentiated themselves through lower operational costs, especially in relation to ease of management and easy access to quality support, are increasingly exposed to attrition as customers evaluate alternatives largely on price. Ethernet switching in the campus and remote office is a good example; unless operational management is defensibly less expensive with one vendor than another, the most important criterion is pricing.

Higher levels of commoditization typically lead to market consolidation, as scale becomes important to deliver solutions profitably while pricing pressure continues. The result is the final phase of market development, during which the level of commoditization for the market segment decreases, leading to gradually rising prices because of reduced supplier choice. This is the depreciation phase, creating opportunities for new solutions that deliver similar capabilities with an improved value proposition. Examples are legacy LAN technologies (token ring, Fiber Distributed Data Interface [FDDI], asynchronous transfer mode [ATM], and prestandard wireless LANs); access systems for users, such as frame relay access devices, front-end, and dialup systems; and non-IP voice systems, such as analog Centrex and circuit-switched PBXs.

The "IT Market Clock for Enterprise Networking Infrastructure, 2010" is shown in Figure 1 (page 10). It positions 31 technology asset classes according to where they stand within their market life cycles and their relative levels of commoditization.

#### IT Market Clock Recommendation Summary

The Recommendation Summary (see Tables 1 and 2) provides brief recommendations. Each technology asset is color-coded by the priority of the required actions:

- Red denotes a recommendation that should be acted upon within the next 12 months.

Table 2. Recommendation Summary, Part 2

Item	Focus Now	Next Change	Recommendations
IPv4	Cost	Replacement in 10+ years	No action. Maintain IPv4 for the foreseeable future.
802.11b WLAN	Cost	Replacement in 0 to 2 years	Migrate to 802.11n systems during the next 2 years.
Load Balancers	Cost	Replacement in 0 to 2 years	Refresh load balancers in the data centers with advanced ADCs.
Ethernet Switches	Cost	Replacement in 5 to 10 years	Limit deployments of Gigabit Ethernet access, especially when there is a price premium over 100 Mbps. Emphasize cost, service & support, management capabilities & simplicity.
Ethernet Hubs	Replacement	End of life in 0 to 2 years	Retire shared hubs in favor of manageable switches.
FRADs	Replacement	End of life in 2 to 5 years	Move services to MPLS and IP-VPN
Ckt Switched PBX/Key Systems	Replacement	End of life in 2 to 5 years	Migrate to IP-based systems during the next 3 years.
DECT Phones	Replacement	End of life in 5 to 10 years	Use tactically, and gradually replace with VoWLAN & cellular systems.
ATM	Replacement	End of life	Retire.
Dialup user Access	Replacement	End of life in 5 to 10 years	Decommission for user access whenever possible; recognize that many machine-to-machine & point-of-sale systems will continue to need analog dialup.
Analog and ISDN Centrex	Replacement	End of life in 0 to 2 years	Migrate to IP-based systems during the next 3 years.
FEPs	Replacement	End of life in 0 to 2 years	Retire when possible.
Pre-802.11 WLAN	Replacement	End of life	Retire; migrate to 802.11-based systems
TDM/Stat Muxes	Replacement	End of life	Retire whenever possible.
FDDI	Replacement	End of life	Retire.
Token Ring	Replacement	End of life	Retire.

ADC - application delivery controller

ATM - asynchronous transfer mode

ckt - circuit

DECT - digital enhanced cordless telecommunications

FDDI - Fiber Distributed Data Interface

FEP - front-end processor

FRAD - frame relay assembler/disassembler

IP - Internet protocol

ISDN - Integrated Services Digital Network

MPLS - Multiprotocol label switching

stat mux - statistical multiplexer

VoWLAN - voice over WLAN

VPN - virtual private network

WLAN - wireless local area network

- Orange denotes a recommendation that should be acted upon within 24 months.
- Green denotes a recommendation that is less urgent.

Networking infrastructure matures over long periods, yet the pace of innovation isn't slowing. Planners need to understand when to seek strategic advantage from new technology options, when to focus on price, and when to retire technologies.

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# Emerging Technology Trends— Finding the Next Big Thing

Michael Bowman, PhD  
Murray State University

Organizations and individuals around the world spend billions of dollars each year providing and using information technology. New capabilities, standards, and products appear every day. Many involve incompatible or even competing specifications and interfaces. Remember VHS versus Betamax? How about Blu-ray versus HD DVD? Which technology is the right choice for you or your organization? Working with ACUTA, researchers at Murray State University (MSU) collected and analyzed scientific, academic, industry, and popular data in order to predict technology trends. The target timeframe for the predictions was two to five years.

If this were an easy task, readily approachable with a standard scientific method, making IT investments would be much simpler. There have been many famous technology forecast blunders, such as Tom Watson, chairman of IBM, stating in 1943, “I think there is a market for maybe five computers,” and Bill Gates, Microsoft, in 1981 saying, “640K ought to be enough for everyone.” The predictions that follow are personal opinion about the most important technology trends for the next two to five years (your results may vary).

## Methodology

Before describing what was done, it is important to stress what the methodology was not. This project was not a formal, highly funded modeling or simulation-based effort such as would typically be done by government, military, or investment/market researchers. In this case, a variety of relatively informal approaches was used to collect and assess information to forecast the most important emerging technology trends based on a fairly rigorous review of available information, including forecasts made by industry sources, such as Gartner Inc.<sup>1</sup>

A basic but essential analytical assumption was that the more often a technology term appeared in literature, on the Web, or in a conversation, the more likely it was to be a viable and important technology trend. As an example, the concept of cloud computing appeared in one or two articles in technology publications more than five years ago. One or two years later, it might have been in 10 articles per year. Currently, the phrase *cloud computing* probably appears in 100 articles per week. This kind of progression is a clear indicator of emerging importance. The trick is to identify the emerging trends early and know which are important.

The three student research assistants—Josh Stump, Stefan Bischoff, and Jeffrey Kaleta—were challenged with proposing and developing their own innovative approaches to supporting, improving, or refuting the author’s predictions. Each student designed and implemented an approach that took the lead researcher’s input and generated some level of confirmation or rejection of the predictions.

In addition to my own literature review, about 75 students in MSU computer science and networking classes were asked to nominate and vote on proposals for “the next big thing” in IT. Their opinions are factored into the predictions that follow.

## Technology Trend Predictions

The fifteen items listed are the top new technologies, approaches, standards, or issues identified by the project. They are listed in their relative order of importance based on either their expected impact or how quickly they will become a current hot topic.

**1. Cloud computing and its variations.** Cloud computing is the concept of computing and IT resources being positioned in the Internet or an intranet “cloud,” rather than owned and oper-



ated locally. This topic cannot be discussed without an introduction of the many variations, such as private clouds, public clouds, hybrid clouds, open cloud, cloud storage, agile infrastructure, and real-time infrastructure.

**2. Virtualization.** Running multiple iterations of one or more operating systems on or from a single powerful computing platform is the modern, popular definition of virtualization. Multiple virtualization systems, software, and approaches exist, and many organizations are moving quickly to virtualize their computing environments.

**3. Mobile computing.** Mobile computing is the use of mobile and handheld devices as the primary computing platform of choice. Mobile devices combine communications and computing power in a single device, and whether we use a cellular network, WiFi, or Bluetooth, many more of us are staying connected to the world through mobile computing. Mobile computing is also how advertisers and cyber criminals want to connect with us!

**4. Social networks and their application.** Social networking, and all the related interaction, advertisement, gaming, and cybercrime, appears to be the killer app of the Internet age. Everyone, from preteens to 80-year-old seniors, is staying involved with friends, family, and communities through social networks.

**5. Wireless networks.** End users expect wireless access to the Internet from everywhere, and IT providers are working hard to deliver it. This includes the family of IEEE 802.11 WiFi standards, 802.16 WiMAX, and the emerging Long Term Evolution (LTE) standard.

**6. Collaborative computing and collaboration tools.** Like a trip down memory lane back to the days of Lotus Notes,<sup>2</sup> many product developers, service providers, and endusers are again talking about the importance of collaborative effort now supported by mobile computing and communications platforms.

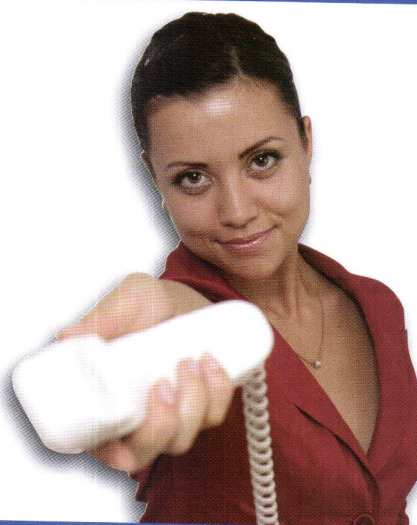
**7. Green IT.** Green IT is providing and using computing and communications with a focus on being environmentally friendly. With rising energy and environmental costs, Green IT is (and always has been) a smart business move.

**8. Computer games and online gaming.** Game play on computers, game consoles, and the Internet now rivals industry profits from movies/motion pictures.<sup>3</sup> Even the simplest, single-player games on the market today usually require Internet connectivity for license verification and sale of extra content before a game can be played. This is an important topic for both the time and network bandwidth consumed. It is also an emerging venue for cybercrime.

**9. Context-aware computing.** Context-aware computing is a concept that combines many of our top 15 topics. The primary idea is that our mobile computing devices will know our location, our interests, our typical activities, and the current time and will automatically prompt us about opportunities or issues in a timely and context-aware manner. Imagine walking down the street and having your cell phone remind you it is lunch time, offering directions to a local restaurant, and offering a discount coupon for your favorite meal at the restaurant.

**10. E-health records.** Mandated by a variety of national and local laws and regulations, our medical records are being digitized and made available for collaborative medical efforts via networks. Along with the opportunity for portability and collaboration come requirements to ensure security, accuracy, and privacy.

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**11. eDiscovery.** The more that official documentation and records go digital, the more likely it is that these e-records will be required by courts. eDiscovery is the formal retrieval and presentation of electronic records, such as text messages and e-mail, for use by the legal system.

**12. Cybercrime.** All of our computing and communications topics include an increased exposure to cybercrime. Crooks go where the money is, and today money and opportunity are online and mobile.

**13. Mobile ad hoc networks (MANETs).** A topic long researched by the military, MANET is coming to commercial products. Rather than rely on dedicated wireless access points and other dedicated networking devices, end-user mobile devices will interact and cooperate to extend communications services out to remote users.

**14. Software-defined radios (SDRs).** Another topic long researched by the military, SDR could revolutionize communications interfaces and interoperability. Rather than a communica-

tions device having a limited, hardwired capability to communicate on certain frequencies with certain protocols, SDR would permit a single device to communicate in a much broader range of formats and protocols by switching between software components.

**15. Solid-state memory and storage.** The era of rotating-disc-based mass storage is rapidly coming to a close. The solid-state technology that makes USB thumb drives possible and affordable is becoming less expensive and denser and will soon replace the much less reliable disc-based storage that we have used for six decades.

#### Summary of Recommendations

Each of these topics is likely to have some importance for every ACUTA member. While all the data collection, analysis, and reporting done within this project has been done with ACUTA members in mind, the following paragraphs summarize advice and forecasts specifically for the ACUTA membership.

Wireless access everywhere, with full Internet access to and from handheld and larger devices, will be expected as the mini-

## Students and Supporting Projects

This ACUTA project served as a wonderful opportunity to spawn and motivate student-designed and -executed research. While their projects warrant publication of academic papers on their efforts, it is also appropriate to mention them here.

Josh Stump is an MSU undergraduate computer science major. To support this project, he created a series of automated online search programs that, with a single mouse click, would execute multiple complex searches of the Internet for the technology terms that this research produced. Josh's program used advanced features of Google's search engine to indicate how popular a particular term was with regard to how many "hits" it produced. Since the Google search engine does not encourage automated searches, development of these programs required coordination with Google and some complex programming approaches.

Stefan Bischoff and Jeffrey Kaleta were MSU graduate information system students who both recently completed their degrees. Stefan took the initial technology terms the research produced and created a database that stored the terms and their synonyms, as well as the relationships between terms that were identified over time. Stefan also produced the

complex multiline search terms that were used in our automated Google searches.

A search for *cloud computing* provides a powerful example of the importance of doing a proper search of the Internet. Searching for *cloud computing* (without quote marks) results in over 20 million hits—most of which are not useful items. Simply adding quote marks and searching for "*cloud computing*" still produces over 10 million hits. A properly formatted search string that includes synonyms and excludes certain unrelated words reduces the results to 950 hits, which are almost all useful information.

Jeff Kaleta created a relational database of the technology terms and sources that were produced by the project and then developed data-mining routines that examined the information to extract relationships between the terms. An example of a relationship between technology terms that his data mining produced is the link between context-aware applications and mobile computing. A publication that had an article on context-aware computing on a particular date was very likely to have an article on mobile computing in the same edition, and both terms were likely to appear in both articles. Jeff's research also included the development of relationship models that allow forecasting on the rise or decline in popularity of the terms.



mum standard by users. If your campus and service providers do not offer this, you will be at a competitive disadvantage. WiFi variants will continue to get better and cheaper but probably will still not provide the long-range coverage you would like in the next five years. WiMAX (IEEE 802.16) has finally become a viable longer-range wireless option in terms of product availability; but if you go this route now, you may be buying into as dead a standard as Betamax tapes. The emerging LTE wireless standard may kill WiMAX before it is widely adopted.

Your wireless coverage will soon need to support more complex and bandwidth-intensive applications. Wireless access to social networking, context-aware applications, mobile gaming, and electronic wallet capabilities will be expected on every campus within five years.

While expanding your wireless networks, also expect to adopt IPv6 to some extent during the next five years. Most of the IT equipment you buy today is IPv6 ready, and some of your campus IT systems may already be using it, whether or not you are aware of it. You will not be able to acquire significant blocks of IPv4 addresses after 2010.

It won't be common soon, but perhaps by the end of the next five years, your users' mobile devices may be able to help you with your wireless coverage problems. Mobile ad hoc networking (MANET) has been researched and tested for many years, but device manufacturers may soon routinely include this capability in their mobile devices. If you allow it, users' devices that are out of direct range of your wireless access points could be assisted by other users who are within range, facilitating the relay of the distant users' data to and from your wireless access points.

Enhanced computing and network environments will be expected from your users, while your budgets will remain flat—or even go down. Some of the latest technology trends can support doing more with less. Cloud computing, virtualization, green IT, and solid-state memory and storage are all technology trends that have the potential to save you money while enhancing capabilities.

Cybercrime may be one of the most important issues of the 21st century. Although users will demand unlimited wireless access and complex mobile computing and communications capabilities, they will also expect safety, security, and privacy. The criminals of the world know that there is money to be made on the Internet and through your wireless networks.

If you fail to provide safety, security, and privacy in your IT environment, your networks and computers can become crime scenes subject to eDiscovery that can cost you millions of dollars and damage your reputation. Your IT environment and security/privacy requirements will become more complex because of steady progress on e-health records. The government is requiring, and

users are beginning to expect, their medical records to be digital, mobile, and available everywhere, while never having their security and privacy violated.

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## Where's Your Focus for the Future, Apogee?

We've seen many technologies rise and fall on campus over the past decade. Traditional phones, for example, are now dead, and nonmobile VoIP is simply a non-starter for college students today. Over the long run, we also see traditional cable TV going the way of the landlines. From our perspective, the future of residential technology will be centered around bandwidth and mobility.

Considering the rising call for pervasive wireless coverage and increasing bandwidth consumption, all of our partners are now being transitioned to the most robust 802.11n wireless standard to meet the scale of present and future student demand. One of the unique things we are doing in this area is enabling multicast video to run over the wireless network. We are also working on bridging student cellular use with the campus network. We've experimented with everything from small femtocells to full-scale carrier towers. Our primary focus is on innovation that will tie student use of mobile and cellular technology to the campus network in ways that are both meaningful to the university from a cost-value perspective and attractive to students who want to take advantage of the latest technology without sacrificing mobility.



# Money and Mobile Access Challenge Community Colleges

Curt Harler  
Contributing Editor

ACUTA members lead the communications revolutions on their campuses. However, sometimes the job simply calls for providing more of the same thing and doing a better job of it. Perhaps nowhere in higher education is the challenge more acute than at community colleges. Resources are limited. The IT departments are small. Yet the teachers and students have the same expectations for connectivity, communications, and applications as clients have on every other campus.

In keeping with the theme "Great Expectations: Applications in Demand on Tomorrow's Campus," the *Journal* asked several campus leaders at Tier I colleges (2,500 students and fewer) what they are doing now and what their crystal balls show as the applications and technology that students, faculty, and staff will want in the coming years.

"The interesting question that rolls around in my mind is, How do I meet the needs of the population I support with the staff I currently employ?" says Stephen A. Vieira, chief information officer and executive director of information technology at the Community College of Rhode Island in Warwick. "The people in my department are great, but IT is a lifelong learning experience of immense proportions, and the new demands are growing faster than perhaps we can all learn.

"I hear more concerns about IT folks learning one step before students and of faculty being challenged to keep up with the technology. There is no end in sight, and if you stop learning, you become fossilized and unable to support the new kids on the block," Vieira says.

No doubt, there is a pile of new technology building blocks rumbling across campuses. Among the biggest is the rush of mobile devices.

## The Mobile Flood

"It's almost impossible to keep up with the flood of mobile devices people carry these days and want to attach to the network," says Gary Sigmen, director of information systems for Tacoma Community College (TCC), Tacoma, Washington. He notes the growth of smartphones, iPads, and similar devices. "There are so many different types, and they change so frequently," he points out. Faculty and students want to be able to connect with the "flavor of the month" device, and keeping connectivity and security at acceptable levels presents another challenge.

TCC runs a Microsoft network with PCs on campus. All users have to authenticate to get into the trusted part of the network. "As far as what they use to access the network, that's up to them," Sigmen says.

TCC has a diverse student population with a sizable population of students from Asian countries on campus. So their website offers students a range of languages from Spanish and German versions to Chinese, Arabic, Vietnamese, and Bahasa Indonesian. New technology is nearly universal—so what an American student wants to use, a Japanese student will also want to use to access the network.

One of Sigmen's biggest fears is that the mobile technology will become a new vector for viruses or malicious attacks on the network. "We've seen few attacks so far, but it is likely the threats will grow," he says.



One of the goals for Thomas Lovince, assistant vice chancellor and CIO at Delgado Community College, New Orleans, Louisiana, is to incorporate that cellular and wireless technology into the campus network. "We work closely with the student government association," Lovince says. "The students want technology to share content and project things from the Internet into the classroom setting," he says.

The school is in the middle of a major retention program, and part of that is giving the student body the access they need to information—when and where they want it.

"We want to do data mining and analytics to determine call flow," Lovince says. They are upgrading their Avaya switch to handle call-center functions. "We now will be provided with information on who the students are calling, when they call, and how they are provided with information," he continues. This harkens back to the access issue—directing students to information as quickly as possible, no matter what portal they use.

For those involved with technology in the classroom, the applications Vieira expects to be in highest demand are streaming video, lecture capture, and mobile use of the learning management systems. For those not involved in the classroom, he sees a booming demand for anything that makes scheduling and communications more effective and possibly involved with mobility. For staff will be any processes (imaging, voice driven, automated reporting) that would alleviate anything manual. He also sees demand for digital transfer of information from integration of existing applications and anything involving single sign-on capabilities and more one-stop shopping.

"Faculty also would be looking for ways to streamline grading, grade changes, attendance recording, wait listing, student progress tracking, and overload permission," Vieira says.

All of that means demand for bandwidth. "Demand to access data on and off campus is a big driver," Lovince says.

Delgado is growing at a 10 percent annual clip. "Couple that with us trying to be efficient with classroom space and the growth for distance learning, and we need more bandwidth," he says. The school has three campuses and another 20 learning centers that range from simple access points to the fire school and nursing school.

Their ERP (enterprise resource planning) application also is coming under pressure and will be upgraded. They use it for everything from human resources to payroll to student registration.

"We want richer reporting capability, access to data mining, and more analytics," Lovince says.

#### Add Social Networking

Students—and staff—love anything that allows them to communicate in the social network and provides greater feedback on how they are doing in comparison to others.

"The expectation is that students will use mobile technology for just about anything they use a laptop or computing lab to acquire today," Vieira says. He expects them to want immediate and "always on" capabilities to get the tools and information they need to be successful.

"Their expectations continue to grow based upon their experiences with so many online vendors with whom they come in contact," Vieira says. "The growing question will be, If I can get this service outside of campus, why can't I get it on campus? Naturally the challenge then becomes how to best

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utilize the dwindling human and capital resources while maintaining the campus identity."

The flexibility of the social network and the growing body of mobile applications that can be easily dropped onto myriad handheld devices clearly delineate the direction that IT in higher education must follow, Vieira says. "Supporting these tools—and as in any primordial heap, bolstering the select group of survivors while searching out the pool of incoming new candidates of favorites—will keep IT busy in servicing the student population," he predicts.

"Students don't want to be tethered to the delivery of technology. They are 'on the go,'" Vieira says. With so many activities and events in their lives, and so little free time with which to engage, immediate and reliable feedback and constant states of being online force this new stream. As a parent of two 20-somethings, Vieira knows that

mobile devices and the state of being constantly connected are absolutely vital.

"The virtual environment in which they are always on and always in contact makes their lives viable for them. They simply could not contemplate not being part of everything that is happening exactly when it is happening," Vieira says. So students are going to demand to know everything about their surroundings and anything offered through the college as quickly as it occurs and to have the information delivered to them wherever they are.

#### Mountains to Climb

Providing anytime/anywhere access is a huge challenge for any college. "I read all the journals, and I don't see where anyone has a solution," Sigmen says. "Even the big, well-funded, four-year colleges don't seem to have a solution."

Funding at community colleges is tighter than a marching band drumhead. "We have no money," Sigmen says. Tacoma Community College's budget was cut by \$2 million from \$33 million two years ago. In the latest round of budgets, the state took \$1.2 million back and announced a further cut of \$800,000 for the next fiscal year. In fact, the management at TCC is fiscally conservative, which has allowed budget cuts by attrition rather than firings. But when a college sees 86 percent of its budget go to salaries, there is no way to make up the difference in technology.

Vieira says he thinks finding money comes down to looking at everything IT does—legacy or new technology, student service or instruction, ERP or LMS—and evaluating whether someone else could provide the service both cheaper and more efficiently through the cloud. ▶

## \$30 Million Project at Kirkwood Community College

Mark Zuber, telecommunications specialist at Kirkwood Community College in Cedar Rapids, Iowa, found himself in the middle of a \$30 million project this past year. As part of its teaching mission, and to attract corporate and academic meetings, KCC planned a four-star hotel for the campus. The 71-room Hotel at Kirkwood Center was a "pretty aggressive" project, Zuber says. But they pulled it off.

Zuber broke down the project into three parts, which basically included providing telephony to the hotel, the requisite in-house systems, and a premium experience to those at the hotel.

"Everyone's handhelds have to connect or else the guests will not have a good experience," Zuber says. "Providing in-building connectivity is part of the service." Five major cellular providers—AT&T, Sprint, T-Mobile, US Cellular, and Verizon—have antennas on the roof of the hotel.

"When you have a couple of hundred people roll out of a conference on break,

they'll all flip open their phones. That has to be a positive experience," Zuber states.

KCC's solution is the in-building Inter-Reach Fusion wireless system from ADC. The firm designed a distributed antenna system (DAS) consisting of one mini hub, three expansion hubs, and 13 remote antenna units (RAUs). The system is fed by donor antennas placed on the roof of the hotel. Deployed as part of a major technology program that KCC calls the Kirkwood Features Initiative (KFI), this is a big-college solution. Schools like Duke, Michigan State, and Stanford have deployed similar systems.

The hotel is served by an Avaya switch that sits in the same room as the legacy Fujitsu 9600XL. "The hotel sits on campus but is insulated from the main servers," Zuber explains.

Even the trunking is independent, coming in from the south side of campus rather than the north end. Service is provided by a separate vendor.

"The students on campus are covered with a redundant database," Zuber says.

While the hotel is definitely guest-focused, it sits on campus and is intended as a learning experience. Features offered to hotel guests can be expanded to the rest of the campus through its fiber network.

"The tough part—negotiations with the carriers—is done," Zuber says. "Now we can expand the network."

With the increase in nonstudent guests expected on campus, the security system has been beefed up, too. "We've added blue light phones around campus," Zuber says. Down the road they may go to digital signage to provide all manner of information to both guests and the student population.

KCC is fortunate to have the \$30 million budget for its hotel project. While it is expected to self-amortize over several years, funding remains the overriding concern at community colleges.



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"In those areas where it is evident that it can be done better than we are doing it, alternatives must be analyzed and followed," Vieira says.

"New funding and new human capital is not suddenly going to be available," Vieira states. "The new reality says that large development shops will be difficult to sustain. Buying what you can build will be the only viable option for those where higher-education funding continues to take hits."

Vieira recommends researching what others in higher education are doing and coming to conclusions about what is best for their particular institution. "Look for high-impact practices that will truly deliver better service while saving dwindling funds," he advises.

They say it is an ill wind that blows no good. In New Orleans, Delgado was slammed five years ago by the illest of winds, Hurricane Katrina. But now, the FEMA Recovery Fund is helping the school make the leap to a modern network.

"We've started to repurpose a lot of the classroom space," Lovince says. "Classes have to be smart, have to have access (to the Internet)."

To that end, Delgado is reengineering many rooms to provide what the student association has requested. Especially aggressive are the students from the Nursing School. "They want content, lectures, and even their tests online," Lovince says.

Delgado is starting to roll out its first virtual desktop environment, based on a Citrix server. "It will serve 80 students on the main campus," Lovince says. "It will have thin clients for accessing applications on the server."

He notes this was pushed by faculty who did not want to continue to have to load solutions onto desktops. "We're finding the right fit," Lovince says.

However, the Washington IT consortium does find ways to leverage resources. For one thing, Sigmen says, they share apps.

"We write a lot of our own SQL and Dot Net apps here," he says. "We have a movement in state to share apps among the 34 member colleges," Sigmen adds. This allows everyone to benefit from the small programs that make life easier and handier.

#### More Technology Needs

"Business intelligence reporting for all would be vital to provide in immedi-

ate mode without request. On-demand reporting of dynamic data would also be required," Vieira says.

Vieira expects support for e-books to grow as expenses for texts rise. "Better means of organizing instructional materials through content management systems and repositories for sharing and collaboration would also be desirable features," he says.

Collaborative work spaces for sharing information of all media types with students and other faculty will continue to grow in demand. "Virtual contact applications that allow outside-of-classroom interaction with faculty and students has highest impact potential in higher education. A convergence of voice, data, and video networks will need to be provided for those who will exercise the multitude of mobile and personal devices available and pervasive on campus on a 24/7 uninterrupted basis," Vieira says.

"One area where we struggle is the whole idea of evaluating whether it is better to build an infrastructure of high availability, redundancy, and immediate fail-over versus shifting this responsibility to a host of vendors out in the cloud who might be able to better handle the expense and maintenance of such a requirement," Vieira says.

Another broader, but nagging, question is whether IT has the capability of being all things to all constituents and how this model becomes sustainable in the future.

"Those organizations that become most inflexible will be those who are hard-pressed to respond to future challenges," Vieira says.

"The best get-started strategy is to get started now self-evaluating the services and support delivered to the campus," Viere says. "Review existing service level agreements and establish delivery goals with constituents to set an objective playing field. When those levels get too high or when resources become unavailable, the strategy should be in place for how best to transform the IT department to continue its effectiveness," he concludes.

Curt Harler is a contributing editor to the *Journal*. Reach him at [curt@curtharler.com](mailto:curt@curtharler.com).

## Where's Your Focus for the Future, 911 ETC?

Fully managed E911 service for school campuses has always been important to have in place; legislation is now putting some teeth into the urgency of it by placing responsibility and liability directly upon schools and businesses. In September 2010, the FCC adopted a Further Notice of Proposed Rulemaking and Notice of Inquiry to investigate ways to improve the 911 location information capabilities for both existing and new communication technologies. Sixteen states have E911 legislation in place, and five more have it pending. At the same time that responsibility is being placed on colleges and universities, emerging technologies are making it more difficult to navigate E911. Consider hybrid scenarios of multiline telephone systems and VoIP, on-site notification capabilities, soft-phone provisioning, or even multisite universities that have adopted IP telephony across a robust WAN. 911 ETC's founding mission in 1997 was to assist organizations in ensuring the E911 safety of their campuses, and that goal continues to drive the company today. Addressing the list of emerging technologies above, we have recently introduced products that manage VoIP and softphone provisioning. For information about what could be next, visit us at [www.911etc.com](http://www.911etc.com).





## Bobby Fong, PhD President, Butler University

**ACUTA:** The college experience of the 21st century increasingly revolves around technology, not just socially, but academically and administratively as well. How does Butler make decisions about which technologies or devices to support? How does Butler balance the need to support new technologies or devices with the demands placed on the infrastructure?

**Dr. Fong:** Butler has several committees that help guide the decisions on technologies in which it invests and for which it provides support.

Three of these committees have responsibility, respectively, for governing administrative computing, for governing academic computing and infrastructure, and for guiding the adoption of new technologies and emerging trends by providing input on the needs of students and the effectiveness of our technology in their lives. A fourth group of technology-support people found in departments across campus have responsibility for daily technical issues. Finally, the vice presidents and I determine strategic directions.

We are always evaluating existing technologies for effectiveness. If a technology is effective, we continue to invest in it. That which has marginal value or is just serving the few is removed from the portfolio, freeing up people and money for other activities.

We invest in new technologies that offer the greatest promise of benefiting the teaching/learning mission or that facilitate communication and collaboration. Obviously, we cannot pursue all new technologies, so we must be selective.

For example, we recently invested in a video-capture solution that allows faculty to record their classroom activities so that students can better review material after class, prepare for exams and review previous content areas. This system is also supporting small-group discussion in various

disciplines and is being used to create stand-alone learning opportunities for faculty, staff, and students.

New technology requests are considered within the need to balance the budget. We balance competing needs to stay near the leading edge—not the bleeding edge—of technology.

**ACUTA:** How do the devices that many students bring to campus, such as iPads and Smart Phones, enhance the educational experience—or do they?

**Dr. Fong:** They do. It's a matter of figuring out how to leverage their use in the classroom. For example, faculty are using a virtual clicker system to gather feedback during class.

Six faculty members are participating in an innovative teaching project involving iPads in the classroom. Through the lenses of their particular disciplines, they are investigating how access to information via mobile devices can shape the students' understanding of the subject. [Find details at [www.butler.edu/information-technology/training-workshops/faculty-development](http://www.butler.edu/information-technology/training-workshops/faculty-development).] They enhance the educational experience by making the classroom more personal, allowing them to take the classroom wherever they go.

**ACUTA:** What role does the Information Communications Technology department play in the strategic planning process at Butler? Although the Emerging Technologies Committee was only recently developed, could you share any lessons learned or success stories?

**Dr. Fong:** Our current strategic plan addresses nine priorities and 38 recommendations. Information Technology staff have been working with each of the nine implementation groups. The IT department was asked to develop a technology master strategic plan as part of our campus stra-

Dr. Bobby Fong became the 20th president of Butler University in 2001. At the time he assumed the presidency, he was one of only 20 Asian-American college presidents in the country.

Fong grew up in Chinatown in Oakland, Calif. He attended Harvard University, where he graduated magna cum laude in 1973 with a bachelor's degree in English. Following graduation, Fong returned to California to earn a doctorate in English Literature from UCLA in 1978.

Fong began his academic career at Berea College in Kentucky, where he taught from 1978-1989. For his first sabbatical in 1986, he was accepted as a Fulbright lecturer in China. Before he was able to go to China, however, the Chinese government canceled its participation in the Fulbright program. What initially appeared as a setback turned out to be a career crossroads when Fong became a National Fellow and assistant program director for the Association of American Colleges in Washington, D.C.

Fong then returned to Berea, but left two years later to become professor of English and dean of arts and humanities at Hope College in Holland, Michigan. In 1995, Fong accepted a position as dean of the faculty and professor of English at Hamilton College in Clinton, New York, which he held until 2001.

During his tenure at Butler, Fong has led the university to unprecedented heights, including record-breaking fundraising in the ButlerRising Human Capital Campaign, which ended in May 2009 with nearly \$154 million in gifts and pledges.

Throughout Fong's administration, the university has had numerous achievements, including consecutive balanced budgets, a doubling of endowment, successful completion of one five-year strategic plan and beginning implementation of another, as well as the construction of needed campus infrastructure.

In 2008, Fong received the "Man of the Year" Award from the Center for Leadership Development's Minority Business and Professional Achievers of Indianapolis.



tegic planning. They have completed this task with the help of a campuswide team consisting of faculty, students, and staff from a wide cross-section of campus. Daily, IT is working with all departments across campus to help them achieve their goals, both strategic and local.

The Emerging Technology Group, which is in its second year, funded the teaching innovation project that supplies 20 iPads to faculty for exploration. [See details on the Emerging Technology Group at [www.butler.edu/center-academic-technology/center-for-academic-technology/emerging-technology/](http://www.butler.edu/center-academic-technology/center-for-academic-technology/emerging-technology/)] The following three projects were piloted during the 2010 fall semester:

- Andrea Gullickson, Music: Ear training and sight singing assists students to develop skills that integrate knowledge of music theory with the art of making music. Incorporation of certain applications (Karajan Pro, Do Re Mi, Virtuoso) provides a multi-sensory and small-group approach to class exercises. Rather than solely aural identification of an interval, use of the iPad allows students to identify the interval and also see the piano keys associated with the interval—both enhancing the experience of visual learners and adding a useful tactile component. The iPad promotes collaboration outside of class and allows students to experience coursework on a multi-sensory level with instant feedback, which reduces anxiety of those with no previous experience with theory and/or aural training.
- Marjorie Hennessy, Center for Urban Ecology (CUE): The iPads are incorporated into the Environmental Practicum course where students work with community partners, stakeholders, and experts. This project is specifically slated to work with “Lights out Indy,” a nonprofit that collaborates with building managers in downtown Indy to resolve an urban ecological issue—window strikes and mortality of migratory birds in downtown areas due to night lighting. The

iPad technology promotes “network” material sharing and mobility while collecting data, interviews, surveys, and other information needed to fulfill assignments.

The CUE is also working to develop a series of smartphone apps, called “Indian Apps” through its Rain Barrel project. At the heart of Indian Apps is a computer platform that links smart phones and handheld devices to citywide databases that can then be openly accessed and updated by the public for data compilation. Use of iPads by course participants may allow for a beta testing launch of this app.

- Larry Lad, College of Business: Two assignments were proposed for two sections of MG 490, one with iPad and one without: a two-week “state-of-the-world” analysis and presentation, and a one-week kick off to the culminating analysis and presentation project. The course will function as a case study between a control and a test group to explore the depth of inquiry beyond using PCs and library resources. Initial questions to address include the following: What will the iPad do to encourage more in-depth analysis and exploration? Will the use of a control group create competition between sections? Beyond the novelty of this tool, what new types of inquiry does it encourage? Students will likely discover some unexpected or unplanned learning with the technology. Faculty will acquire new ideas for teaching from observing the students as they utilize the technology.

As part of the master plan, IT looks for ways it can contribute to professional development of faculty using technology. Developing human capital is as important as investing in capital.

**ACUTA: During the difficult months we’ve endured recently, how has Butler handled the impact of the economy on the need to upgrade and expand technology on your campus? Have you had to make major changes to the infrastructure, or do**

**you anticipate such an investment in the near future?**

**Dr. Fong:** We have been looking for ways to deal with the financial impacts that have befallen all of us over the past few years.

One thing we have done is reduce technologies that are not valued or being used significantly, such as dorm room phones. Most students have cell phones today, so we now offer landlines as an option.

The savings from this initiative allowed us to make moderate investments in areas that the campus values—such things as wireless in the residence halls and classroom mediation.

We also looked for ways to get the same or better service at a better price point. For example, we joined a state higher ed network to get Internet services at a significantly faster speed, but at the same price. We also look for “free” services where appropriate, such as Skype and Google docs.

In addition, we have postponed 75 percent of faculty and staff desktop refreshment for one year rather than cut other services that the students rely upon.

**ACUTA: What is the place of collaborative learning in the future of higher education? How can technology facilitate the increasingly collaborative learning style of today’s students?**

**Dr. Fong:** We know that students value shared learning and want to co-create content with other students and faculty. Technology facilitates access to resources and information, creating an integrated learning environment. Students can work virtually anywhere on campus, gather in social spaces, or work together in residence halls and do so “just in time” or when they want to do so.

Some faculty have been experimenting with videoconferencing tools allowing them to bring people from around the world into their classrooms or group dis-



cussions. We have also used Skype to interview potential faculty and saved money and time on travel expenses. We are looking at ways to use teleconferencing for students who may want to contact employers who are far away.

**ACUTA: How does technology support effective governance at Butler? What technology applications do you find most useful in carrying out your leadership and governance responsibilities?**

**Dr. Fong:** Blackboard enables us to provide access to Faculty Senate agendas and minutes. The Board also has an intranet website for trustees. For Board meetings, we distribute flash drives instead of hard-copy documents as much as possible, although many trustees are still more comfortable with paper. That seems to be a generational thing, and obviously we are in a period of transition.

The Internet has been very important in our communications with alumni and friends of the university. For years we have printed a quarterly alum magazine. Now, I can do a monthly president's perspective online, which gives me instant response and has changed the perception of how accessible I am.

**ACUTA: How significant an issue is security on Butler's campus? In light of various security breaches on other campuses in recent years, has Butler overhauled your emergency notification system? What has been the most effective way to communicate with large numbers of your students?**

**Dr. Fong:** We have not experienced a major security event, but we are always evaluating and investing in technology, policies, and procedures to ensure the security of our people and their data.

The relationship between the Butler University Police Department and IT is very strong. We have invested in video monitoring where appropriate; card access to buildings; and a multiple notification

system for emergencies that reaches desk phones, cell phones, and home phones via e-mail, paging, and testing. Notifications go right to phones of those students who have integrated voicemail and e-mail.

We perform regular security audits, and IT recently launched an awareness campaign to help educate people on important issues. We caution them about such things as posting their social security number and other privacy issues. We regularly invest in technologies to protect, audit, and alert the campus to potentially harmful practices.

**ACUTA: What exciting technological innovations are on the horizon for Butler? Is there any special technology-related project underway that you could describe for us?**

**Dr. Fong:** Most important is the technology master plan. It outlines a shared vision of technology at Butler and an investment in tools and training to enhance the teaching/learning experience. We have discovered that faculty and staff have a greater need

for training than today's students who have been technologically literate since about the 4th grade. We are badly behind where the students are.

Our master plan expands our mobile computing investment to help faculty and students learn anywhere on campus. It includes investments in collaborative technologies to help bring people together where time or geography otherwise get in the way.

We have developed a virtual information commons, a student-led training and professional development program that supports academic achievement by providing information and technology literacy training through the use of technology.

Butler has many innovative programs in place, and technology is enabling us to do exciting things in terms of teaching and learning.

Many thanks to Dr. Fong for sharing his insights and experiences with us in this interview. Visit Butler's campus at [www.butler.edu](http://www.butler.edu).

## Where's Your Focus for the Future, Nebula Manufacturing?

Nebula Manufacturing has observed that most educational institutions have limited access to fiber strands in parts or all of their networks but have rapidly expanding data transport needs. Nebula continues to expand its range of passive wavelength division multiplexing (WDM) equipment and active components in order to carry yet more bandwidth over low-count fiber networks.

The roadmap we are pursuing is focused on scalability and assumes incremental installations that fit the lumpy nature of an educational institution's capital budget. We are adding to our higher capacity dense WDM line in order to provide a clear path from 1 gigabit to 10 gigabit services between campuses and within the campus. We have recently added some unique multiplexers that help new systems share the fiber with legacy SONET systems. The move to 10 gigabit links requires dispersion compensation and amplification in many cases, and our product line is expanding in these areas as well. To assist IT and telecom departments with the design of their fiber systems, we have added to our application support and are evolving our network design tools to aid our customers in their network design decisions as they mix 1 Gig, 10 Gig, CWDM, and DWDM technologies.



# A Business Perspective on Hosted Communications

Gary Audin  
Delphi, Inc.

Moving to a hosted solution for communications is the next big thing for CIOs to consider. The hosted solution, usually a cloud-based offering, offers rapid expansion capability, flexibility, cost control, and expense reduction.

There are cloud-based IP telephony (IP PBX), unified messaging (UM), call centers, and unified communications (UC) services. The hosted service can also support backup and recovery for remote offices and deliver business continuity at a lower cost. Acquisition and support costs can be significantly reduced. Service levels may even be improved.

Think of a hosted solution as communications as a service (CaaS), or communications in the cloud. How do you define what CaaS does for communications? SaaS (software as a service) is the umbrella term; CaaS is a subset. Both can be called cloud or hosted offerings. There are about two dozen competing definitions for SaaS, and there will be multiple definitions for CaaS as well.

The value of CaaS, or hosted communications, is that the enterprise accesses the services through the Internet to gain use of managed technology services. The enterprise does not buy hardware (in reality, the enterprise needs end points and some internal network to access the services) or software. The use of a

pool of servers, either dedicated or shared, is a form of virtualization.<sup>1</sup>

Communications services are delivered as a common set of features and functions. The enterprise subscribes to the features and functions desired. The financial arrangements for access can be by the seat, the feature, usage or unlimited usage, and flat fee. At this time there is no standard agreement on the service pricing model, as pricing models are still evolving. This makes it somewhat difficult to compare hosted provider's charges. The possibility of lower cost to the enterprise is the big attraction when considering hosted communications services.

## Why Look at the Hosted Solution?

The first benefit is a controlled and predictable cost. Reducing costs is almost always the primary driver for considering a hosted solution. Because the hosted site is shared with many other subscribers, the overall hardware, software, and operations costs can be prorated over the subscribing organizations. The hosted site's costs benefit from the economy of scale.

However, there are other advantages that can accrue to subscribers to hosted communications services, including the following:

- **Flexible sizing.** The hosted solution can expand or reduce the number of seats very quickly. This is especially useful when the number of active seats varies by season or for special events or situations.
- **Business continuity/reliability.** The cost of high availability may be beyond most budgets. The continued operation when a disaster occurs, and the rapid recovery of communications services, is often financially more affordable with a hosted solution than if the enterprise tried to produce the same level of business continuity.

<sup>1</sup> What is virtualization? "Virtualization refers to technologies designed to provide a layer of abstraction between computer hardware systems and the software running on them. By providing a logical view of computing resources, rather than a physical view, virtualization solutions make it possible to do a couple of very useful things: They can allow you, essentially, to trick your operating systems into thinking that a group of servers is a single pool of computing resources. And they can allow you to run multiple operating systems simultaneously on a single machine." [www.cio.com/article/40701/Virtualization\\_Definition\\_and\\_Solutions](http://www.cio.com/article/40701/Virtualization_Definition_and_Solutions).



- **Staffing.** The enterprise information communications technology (ICT) staff responsibilities are significantly less with a hosted solution. The ICT staff can be smaller and will not require expensive certification training. The ICT function is mostly administration.
- **Software.** The enterprise does not have to deal with software subscription fees and licensing costs.
- **Management.** The enterprise should not have to allocate significant time to managing a hosted solution. Management will deal primarily with a contract that has very specific deliverables and service level agreements (SLAs).
- **Features and functions.** In many cases, the enterprise can gain access to features and functions that are not available on their existing system/service or that are too expensive to implement.

#### Implementation Models

There are several possible business models for the hosted communications providers. Here are the business models now in place:

- In a total cloud service, the provider owns the hardware, software, and network and has the staff that implements and maintains the service.
- The cloud service can be a collection of dedicated or shared servers that run customer-owned software. Amazon's Elastic Compute Cloud (EC2) platform is a cloud-based business service that provides resizable computer capacity in the cloud. Here, the SLA covers the platforms and network but not the features and functions offered.
- Another model is a communications software vendor operating on another provider's hardware and network. The Amazon EC2 service is a candidate to support this model as well.

Table 1. Comparing the Hosted and Internal System Solutions

Issues	Hosted	Internal system
Cost	Expense dollars	Capital & expense dollars
Provider financial strength	An issue for startups	Probably not an issue
Contract issues	Evolving and can be complex	Dealing with standard VAR & vendor contracts
Legal implications	What liabilities are accepted by the provider?	Standard enterprise issues
Business continuity	Network connection is biggest concern	This is the enterprise's problem
IT staffing	Mostly a provider responsibility	enterprise responsibility
Certifications	All provider responsibility	All enterprise responsibility
Security/Privacy	All provider responsibility	Mostly enterprise responsibility
Compliance & regulations	All provider responsibility	Mostly enterprise responsibility

- The provider locates the system/solution on the enterprise premises, charges by the seat, but manages the system remotely. The enterprise becomes responsible for some of the business continuity capabilities, as well as power and cooling costs.
- A reseller owns nothing but sells cloud services for one or more providers.

The business model will have a great influence on the SLAs and acceptable use policies (AUPs) that an enterprise will encounter. The stability of the service may be in jeopardy if the service provider's business model is not successful. What if the hosted provider goes out of business? What if the provider decides to terminate some functions and features? The enterprise should have a backup plan in place in case any of these situations occur.

#### Hosted Provider vs. Internal Solution

It is quite common that enterprises look at the features and functions offered by a purchased/leased system versus what is offered by a hosted solution. The technical re-

quirements are usually the initial concern. This concern is important, but the business issues will have longer-lasting impact on the solutions acceptability. Table 1 summarizes the business concerns that must be considered when comparing the hosted and internal system solutions.

#### Service Descriptions

There are a number of hosting services available, with more than 50 providers. Each has its own definition of hosted communications. Almost all of the services are accessed via the Internet. Here are the types of hosted services available today:

- **IP telephony (IP PBX).** The common features and functions found on a legacy PBX and newer IP PBXs are offered.
- **Unified messaging.** This messaging service includes a single store for voice, e-mail, and fax messages.
- **Presence.** This system collects and manages an individual's status, ability to



communicate, and preferences for mode of communication.

- **Call center support.** This includes individual or combined functions such as automatic call distribution, interactive voice response, and auto/predictive dialing.
- **Unified communications.** This communications service includes two or more of the following elements: voice, unified messaging, video, mobility, Web/data collaboration, and presence.

The more unique functions and features that an enterprise needs, the more likely those items will not be found on a hosted service unless that service targets the enterprise's vertical market. There will always be functions that are common to most enterprises, and these will be the candidates for hosted services.

Some providers sell flexibility as part of their service, but contract language hinders and may eliminate the achievable flexibility. Enterprises want flexibility in their traffic volumes. Many providers support the traffic changes well. Flexibility also includes changing the balance of cloud versus enterprise operations, hardware, and software usage.

#### Security, Privacy, and Compliance

Regulatory, security, and compliance issues can hinder the hosted solution implementation. How much responsibility will the provider accept? What happens when the requirements are not met? Is the enterprise left holding the bag? Contracts for these issues of hosted services can become very complex, with the provider trying to absolve itself of any liabilities. This may make the enterprise reluctant to move functions onto the hosted solution.

The security issue is being pursued by the Cloud Security Alliance (CSA). The mission statement for the CSA is "to promote the use of best practices for providing security assurance within cloud computing, and provide education on the uses of cloud

computing to help secure all other forms of computing."

The CSA objectives and recommendations are the same for hosted services. The CSA website, [www.cloudsecurityalliance.org/About.html](http://www.cloudsecurityalliance.org/About.html), states, "The issues and opportunities of cloud computing gained considerable notice in 2008 within the information security community. It was at a security practitioners' conference, the ISSA CISO Forum in Las Vegas, November 20, 2008, where the concept of the Cloud Security Alliance was born. Following a presentation of emerging trends by Jim Reavis that included a call for action for securing cloud computing, Reavis and Nils Puhlmann outlined the initial mission and strategy of the Cloud Security Alliance. A series of organizational meetings [was held] in early December 2008."

The primary decision is to determine the risk associated with moving functions to a hosted service, with security being a major consideration. For anyone considering moving functions to a hosted solution, the security issue will probably be the hardest to resolve.

The CSA published "Security Guidance for Cloud Areas of Focus in Cloud Computing V2.1" in December 2009, ([www.cloudsecurityalliance.org/csaguide.pdf](http://www.cloudsecurityalliance.org/csaguide.pdf)). For those new to the hosted services, the 76-page CSA guidance document has an excellent introduction (section I, "Cloud Architecture"). The 17 pages of introduction cover the entire set of cloud/hosting considerations and how they operate. Mapping the cloud/hosting model for compliance is a subset of the security control model which in turn is part of the cloud/hosting model. What applies to cloud security applies to hosting security.

#### Legal Considerations

Because hosted services have legal implications as well, planning should include the legal department. Should all users have access to all features and functions? I have

one client who decided to limit UC availability to deal with compliance regulations. My opinion is that if it is communications in any electronic form, eDiscovery<sup>2</sup> as well as other requirements will be applied to the hosted service. Plan for them and avoid the legal surprises.

When you contract for a hosted service that needs to be secure and meet compliance or regulatory requirements, read the fine print. Ask your lawyers to be both critical and precise in their review of the provider's responsibilities and liabilities as well as the liabilities not accepted by the provider.

Another issue is ownership of the information residing at the hosting site. Most enterprises would expect that the information passing through the site is theirs and not owned by the provider. But what about information about the individual users? How about the traffic information that is sent and received? If presence is involved, can that presence information be sold to others? Will the provider use access to the enterprise's users to send out information created by third parties for the sale of products or services? Would the provider be able to sell profile information of the enterprise's users? Privacy issues are an important consideration.

The provider will set the acceptable use policies, which will favor the provider's business model and revenue. Read your AUP for your present ISP service to get an idea of the unbalanced arrangement that favors the providers.

#### Performance Considerations

The SLA will be measured over a long period of time, possibly weeks. Of course the SLA will be met when no one is using the service. The SLA is most important when the busy hour occurs. Experience with the SLAs of MPLS services is an example of

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<sup>2</sup> eDiscovery refers to the legal right of the court to electronic information that may be relevant in litigation.



the biased arrangements that clearly need to be renegotiated to satisfy the busy hour performance.

The demarc (where the SLAs start and end) for accessing the service may be much farther away than the enterprise expects. The distant demarc means that the provider is not responsible for meeting the SLA at or near the customer premises or desktop.

Analyze the reports produced by the provider. Do they offer real insight into the usage? Are they demonstrating how to tailor the offering to meet the enterprise's needs after the service is turned on? As more features and functions are introduced, the enterprise should be able to evaluate who uses what and how well, so that only the features and functions of value continue.

#### Provider Considerations

Independent of the technology concerns, a number of questions need to be answered when considering a particular hosted service provider.

- Is this provider venture-capital backed or profit making? Is the provider going through any financial difficulties?
- Can delivery be made anywhere in the United States and Canada?
- Is the solution a combination of vendors and providers? Is the final solution made up of more than one vendor's products and services? If so, who is the prime solution provider, and how do the other partners integrate their products and services?
- Where does hosted service fit in the overall vendor product and service strategies? Is the primary product/service an addition to an IP telephony solution or a small part of the vendor/provider's portfolio?
- Is the provider reorganizing its structure? Reorganization can mean some discontinuity in service deployment and support, as well as delays in service enhancements.
- Is the solution really a partnership? Is the service offered a collection of separate

products and services combined under an umbrella service?

- Is the solution a set of recent acquisitions? Recently acquired components (software and hardware) may not inter-operate well. The solution support may be fragmented.
- Is the product delivery direct or indirect? Subscribing to a solution from a third party means that the third party's capabilities may be just as important as the primary provider's.
- Is the provider's focus on all elements? The focus may be more on IT or telecom, not the full range of communications capabilities.
- Does the provider have an established record in your vertical market? Experience counts for a lot of confidence in the provider. New services will almost always have some initial deployment problems.
- Does the provider have IT as well as telecom and call center experience? The

broader the experience, the more likely that the provider will be able to deliver the range of communication features and functions successfully.

- Is the service a recent announcement? The newer the service, the less stability that service can deliver. You do not want to be the provider's test lab.
- What happens when the provider goes out of business?

Hosted or cloud-based services have prompted much discussion and press coverage. The enterprise cannot ignore the hosted service alternative. Look at the values and challenges and make an informed decision. Hosted services are not for everyone.

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## Where's Your Focus for the Future, ADC?

Delivering strong and consistent mobile coverage on campus will be a major challenge for universities and colleges in 2011 and 2012. Students and faculty rely on mobile phones for voice and data services, and many universities are adjusting to this reality and even planning to discontinue wired telephones in dormitories.

Mobile phones allow universities to implement emergency text-messaging systems and to provide always-on connectivity for students and staff. The challenge is that mobile signals from macro base stations don't reach many areas of campus (inside buildings, underground garages, etc.).

ADC is addressing this challenge by providing distributed antenna systems (DAS) that bring coverage and capacity to every area on campus, whether outdoors or indoors. The best DAS solutions support multiple carriers (eliminating the need to deploy separate systems for each carrier) and are proven to deliver consistently high signal strength across the campus. In addition, cost-effective in-building solutions use thin coaxial cabling, making it easy to retrofit existing structures, from dorms and classrooms to stadiums and arenas.



## FMC: Ready to Fly or Flop?

Paul Korzeniowski

Wireless communications have become common in academic institutions. Cell phones are used by students, faculty, and staff to converse as well as to surf the Internet. Laptops with WiFi connections are found in almost every nook and cranny on campus. Rather than continue to operate two separate wireless networks, some academic institutions are looking for ways to combine the two.

Fixed mobile convergence (FMC) is a set of new network devices and cell phones that support both cellular access and institutional VoIP services. "FMC has a great deal of potential to help institutions manage their networks and their costs," says Craig Mathias, a principal with Farpoint Group, a wireless communications consulting firm.

FMC's potential benefits have been touted for the past few years. First, universities could reduce their inventory by outfitting users with one phone, rather than a couple of phones. That change would also simplify inventory and network management. In addition, the switch can lower an institution's telecommunications charges by offloading calls from their cellular networks (where they are charged for connections) onto their enterprise networks (where calls are essentially free).

While the services have potential, they carry with them some possible downsides. First, their deployment requires purchasing additional network equipment, which may erase some of the potential savings. Managing connections between the two networks can be difficult because the tools are still in the early stage of development. Also, some cellular carriers have not been set up to service these networks. So to date, although the technology has not been widely deployed, some observers think that will change dramatically in the next few years.

### Variety Is the Spice of FMC

FMC networks can be deployed in various ways and require a few different elements. One of those elements is the phone. A typical dual-mode phone contains a cellular radio (GSM, CDMA, or W-CDMA) and an IEEE 802.11 WiFi radio, which enables users to work with either a cellular connection or a WiFi router that is usually connected to a broadband link and an enterprise network. These phones are designed to automatically recognize dorm, office, or commercial hotspots, so that whenever the phone is in range of a WiFi network, it seamlessly routes cellular calls through the WiFi network and onto the Internet. Ideally, the caller will not notice any difference during the switch.

Various network devices are needed to support this process. Data connections via WiFi are very mature, and many campuses have deployed wireless LANs that provide students, faculty, and staff with access to information. Switches that run voice over WiFi are needed for FMC to become viable. "WiFi voice is becoming more common on campuses," said Dan Shey, practice director enterprise at the market research firm ABI Research.

In addition, a university needs equipment capable of working with both cellular and WiFi data links. A femtocell allows cell service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable. These devices have been making their way onto campuses recently. Other devices translate WiFi transmissions so they can run over cellular networks. Companies such as Agito, Aruba Networks, Cisco Systems, NEC, Motorola, Netgear, and Siemens Enterprise Communications have developed such products.



### Cell Service Provider Reluctance

The last element is support from cellular carriers. A few years ago, carriers seemed concerned about losing revenue as institutions moved their voice traffic off of cellular networks and onto WiFi links. They thought the option would reduce the amount of traffic flowing over their cellular networks. Gradually, they softened their stance.

"The cellular carriers realize that FMC services have the potential to help customers connect to their networks more often, and that capability increases, rather than decreases, cellular traffic," noted Farpoint Group's Mathias. In addition, the change helps them offload traffic from their licensed spectrum, which can become crowded at certain times or in certain cities if users transmit a lot of data.

T-Mobile was one of the first carriers to promote dual-mode phone services. Worldwide, the carrier operates 45,000 hotspots, with 10,000 in the United States. The company started off supporting Nokia and Samsung dual-mode phones and eventually added Research in Motion's Blackberry Storm and Bold, as well as Google Android devices, such as HTC's HD2 and Motorola's CLIQ.

In November 2008, AT&T paid \$285 million for Wayport and its 20,000 WiFi hotspots, with the goal of intermingling its cellular and WiFi infrastructures. The service provider now offers WiFi connectivity in 20,000 U.S. locations, and individuals with Apple, HTC, LG, and Samsung phones can access the service.

The main benefit from FMC services is reduced costs. With staff, faculty, and students increasingly relying on mobile connections to exchange information, routing cellular calls through a university's internal network can reduce local, long distance, and international calling charges. In addition, cellular carriers often have various usage models. For instance, they may charge institutions extra after a certain number of cellular minutes have accumulated. Placing voice calls over an existing WiFi network can reduce that possibility. By adding FMC features to a network, an

academic institution can reduce its cellular call charges by 10 to 40 percent with the higher end coming from those paying cellular roaming rates.

### How to Improve Productivity

The switch also promises to make employees more productive. In cases where cellular connections are unavailable for one reason or another (bad connections, lack of coverage), employees can toggle over to a WiFi network. Since individuals are able to access needed information, they will be able to solve problems more quickly. In addition, collaboration should improve because individuals are able to contact one another more regularly.

Because of the benefits, certain academic institutions have forged ahead with deployments. Hertford Regional College, which operates two sites in Broxbourne and Ware (just north of London), began searching for an FMC solution in June 2008. "We made a mistake when selecting the construction materials for a new building on campus," admitted Dr. Daniel Hidlebaugh, network services manager at the college, which has 900 staff and more than 12,000 full-time and part-time students. As a result, the users would have had no cellular coverage in the building.

### A Quick Payback

To provide access, the colleges examined Agito's RoamAnywhere wireless router versus having a cellular carrier place another antenna on campus. The latter process would have taken two years to deploy and would have cost more than £300,000. The Agito solution could be installed in a few months, would cost about £14,000, and could be integrated with the academic institution's Cisco wireless network and Cisco call manager. So the Agito system was installed in the fall of 2008. "We have cut our cell phone minutes by half, so our ROI was about five months," stated Hidlebaugh.

At the moment, Hertford's tale is an aberration. Even though there is a lot of interest, few academic institutions have moved ahead with FMC deployments for a variety of reasons. The status quo works well at Montclair State University in New

Jersey, which has 18,000 students and offers more than 300 degree programs, with an emphasis in education and the theater. The university began aggressively moving to wireless communications in 2003.

"We saw that students were trading in their phone connections for cell phones, so we started getting rid of the landlines in our dorms," said Ed Chapel, vice president and CIO. They are now using the cell phones in many of the classrooms to enhance the experience.

However, the university does not see much use for FMC at the moment. "Few of our users have dual-mode cell phones," Chapel explained. In fact, ABI Research found that only 6.3 million FMC handsets shipped in 2009. The market research firm anticipates that the number will increase to more than 27 million (more than 90 percent of all smartphones) by 2014. Another challenge is that the dual-mode cell phones that are available cost quite a bit. This feature is found mainly on high-end smartphones, which fall in the \$400 to \$600 price range in a market sector where prices start at about \$100 (although they have been dropping recently) and quickly rise.

### Only One Type of User

Another wireless advocate is the University of Kentucky, which has about 27,000 students and 13,000 faculty and staff on its campus, which is spread out in the Lexington area. The university has outfitted staff with mobile phones, and students regularly use cell phones to find needed information. However, the university does not see a need to move to FMC.

"Our users tend to work with either a cell phone on the road or a WiFi phone on campus," explained Doyle Friskney, chief technology officer at the university. "Few of them bounce between the two, so FMC does not offer us many potential benefits."

Cost has been a factor at the University of Washington, which has 65,000 students, faculty, and staff members working on three campuses. The academic institution has moved aggressively to take advantage of mobile communications. WiFi connec-



tions are available virtually across the entire campus. In addition, 2,500 employees work with university-supplied cell phones, 20,000 individuals take advantage of special university discount programs, and just about all students use cell phones as their primary means of communications. So it is not a surprise that the university has been eyeing FMC developments.

"FMC has the potential to make communications between our network and WiFi hotspots seamless," noted David Morton, director of mobile communication strategies at the University of Washington. However, the university has not moved to this area because it has not been able to build a sound business case.

A number of factors are at play in the university's cost-benefit analysis. The cellular carriers have been aggressively cutting service pricing. In some cases, users can make an unlimited number of calls for about \$50 per month.

"Without the add-on charges, the price differential between using cellular or WiFi connections is not as great as the vendors have portrayed," said Morton. In addition, the new system can create unforeseen costs. Because traffic constantly increases on academic WiFi networks, upgrades may be needed. To accommodate more traffic, institutions may have to increase their number of WiFi access points by as much as 25 percent.

### Creating New Management Challenges

Management can also present new challenges. Users now move between two different networks, and network technicians may not be able to troubleshoot problems down to the phone.

Security has been an ongoing concern with WiFi connections, which offer various techniques to ensure that only authorized

individuals gain network access. However, many smartphones were not designed to support security check, such as IPsec. Consequently, individuals' personal identifiers (password, user ID) can be transmitted in the open air. Recently, phones, such as Apple's iPhone, have been outfitted with IPSec. However, even that feature may not be enough, since cellular-to-WiFi hand-offs open up new security holes. Vendors have been tweaking their products so security functions pass from the cellular to the WiFi network, but their approaches may not be 100 percent effective.

Lost functionality is another deterrent. Customers may not have as much functionality with FMC applications as they would with a PBX. The telecommunications industry has spent decades developing the features found with their systems, while VoIP systems are still in a relatively nascent stage of development. For instance, FMC systems often do not allow five-digit dialing.

Voice over WiFi (VoWiFi) networks introduce another level of complexity. (Note: VoWiFi is actually VoIP over a switched Ethernet WLAN.) Quality of service (QoS) is very important to voice calls, and packet networks just aren't engineered with the right stuff...at least not right out of the box. Sufficient bandwidth has to be reserved for the anticipated level of voice traffic and committed to each call for the entire duration (off-hook to on-hook) in order to ensure that latency, jitter, and loss are within limits. Supporting stationary users is relatively straightforward, but that's not the real world. Mobile users walking around a building or campus present a considerable challenge, as the network has to deal with call hand-off issues between WiFi access points (APs), just as a cellular network has to deal with hand-offs between base stations. That translates to additional investment in infrastructure in the form of

either VoWiFi-capable fat APs or centralized VoWiFi switches and controllers. Once designed and configured properly, the network also must be monitored and managed properly to ensure QoS levels over time. That means investment in management tools, including probes and network management and optimization software, and the skill sets necessary to make proper use of them.

### Closing Up Their Systems

Functionality can also vary by device. In order for FMC equipment vendors to enable phones to toggle between networks, they must map functions to a device's application program interfaces (APIs). In some cases, the handset suppliers have been reluctant to expose their APIs for fear of losing their competitive advantage. Standards would help address such limitations, but to date, cell phone vendors have been trying to differentiate their product designs rather than coalesce around different feature sets.

In sum, FMC has the potential to ease wireless communications management functions at academic institutions, but the underlying infrastructure is immature. Consequently, colleges are taking a look at the technology, but few are implementing it. Some of the shortcomings—such as product pricing and security features—should be addressed as the market matures. Such changes may pique universities' interest. "FMC should help academic institutions simplify their networks, so it just makes sense that sooner or later they will move to it," concluded Farpoint Group's Mathias.

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## Solar Chargers: A Bright (Green) Idea

For students or faculty on-the-go, keeping electronic devices like cell phones, PDAs, iPods, and even laptops charged can be a challenge. "There are many budget-friendly portable charging devices on the market that harness the power of the sun—a free

and totally clean energy source," notes Paul Holstein of CableOrganizer.com.

One example is the JuiceBar Solar Charger. It's equipped with solar cells that begin to charge immediately upon contact with light. It includes 12 of the most com-

monly used adapters for cell phones, iPods, MP3 players, portable gaming systems, and more, and it sells for less than \$50.

More info: <http://cableorganizer.com/pocket-solar-charger>. Solar power is a hot idea!



# Challenges Facing Broadband Wireless Providers

Ron Walczak  
Walczak Technology Consultants

The past 10 years have provided IT professionals the opportunity to watch and participate in the birth, growing pains, and mainstreaming of the wireless local area network. Not that long ago, we referred to wireless as an “overlay” or “convenience” when compared to the wired network. Access points were expensive and provided little throughput (5.5 Mbps shared), and deciding where to place them for maximum coverage was a perplexing challenge. For these reasons and more, the installation of hotspots (islands of wireless coverage) was the entry strategy for many institutions that wanted to provide wireless LANs to students and faculty but that also had a significant investment in a wired infrastructure.

What a difference a few years makes! The combination of faster and more pervasive wireless network access with the rapid proliferation of client devices with broadband wireless capabilities has unleashed the promise of mobility for everyone, and there is no going back. Projections are that 1.3 billion new mobile devices will be sold in the next three

years. If your network isn’t ready to provide pervasive broadband speeds to a large number of handheld devices, you had better get moving.

End users don’t just look to your network for laptop/e-mail capabilities anymore. They now have high-performance, media-rich applications running on multiple (I’ve read projections of up to five) devices per person! Remember the bad old days when students first discovered Napster?

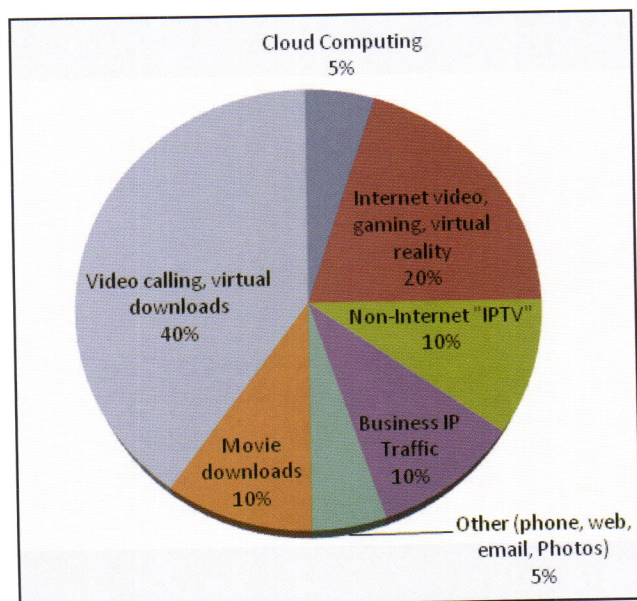
Networks ground to a halt because of the “massive” file transfer traffic being presented to the 10 megabit Ethernet connections. Institutions scrambled to install packet shapers and larger Internet pipes to protect “business IP” traffic from the music downloads. Edge switches were upgraded to 100 Mbps per port with 1Gig or 10Gig wired connectivity back to the core. The demand just kept growing, and now it is transferring from the wired to the wireless network.

Media-rich applications on cell phones (iPhones and Droids) are the driving force behind new model sales. (Does anyone still talk on a cell phone?) As of September 2010, the Android operating system had more than 10,000 applications, and the iPhone/iPad had more than 200,000! Many of these applications stream video across the enterprise network, and your end users are playing with all of them. The ONN (Onion News Network—my source for all the news) application on my Droid2 warns me that if I am not connected to a WiFi network, my video performance will suffer. YouTube, IPTV, hi-definition images and video, 3D games, and virtual worlds are going to make Napster look like a minor inconvenience.

And then there is the impact of IPv6. The new numbering scheme ( $3.4 \times 10^{38}$ , or 340 billion billion billion billion addresses) will make it possible for everything to have a unique IP address. This does not bode well for the U.S. Postal Service or your network capacity.

A study by Swanson and Gilder estimates Internet traffic exploding by a factor of 50 times 2006 levels and provides the projections of network traffic by 2015, shown in Figure 1.

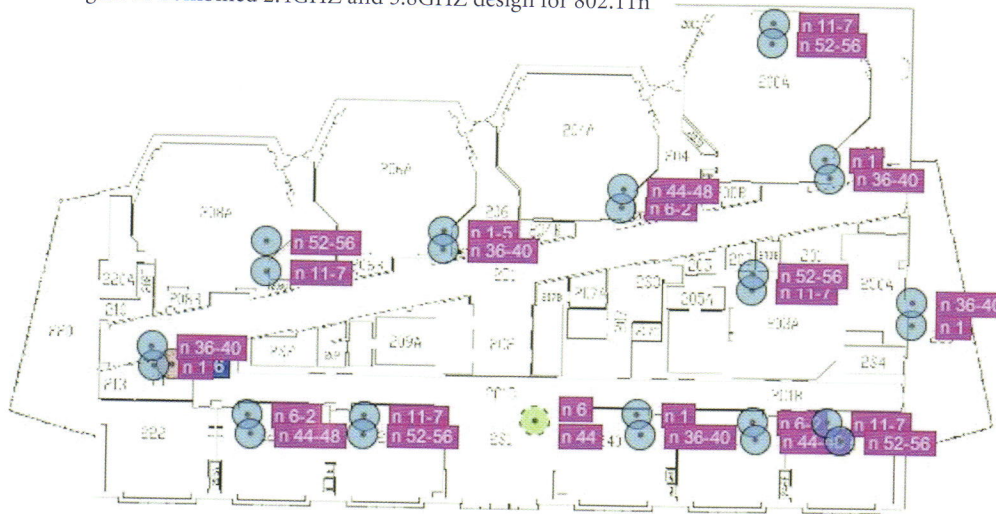
Figure 1. Projected Network Traffic 2015



Source: Swanson, Bret and Gilder, George. 2008. Estimating the exaflood. Discovery Institute. Seattle.



Figure 2. Combined 2.4GHZ and 5.8GHZ design for 802.11n



Did you catch that business traffic will represent only 10 percent of total traffic? It makes me wonder if we are building a digital version of the Roman Colosseum! The remaining categories are relevant to the campus network and will probably be skewed even more toward high-bandwidth entertainment and peer-to-peer applications.

## How Much Is Enough?

The question that network engineers (and chief financial officers) struggle with is, How big and fast do we have to build the network? The reality is that the bigger and better you build it, the more usage will increase. Andrew Odlyzko of the University of Minnesota has pointed out that South Korea, with one-sixth our population, matches our Internet traffic due to the extensive penetration of broadband. Hong Kong generates six times the traffic generated in the United States! The reason? The robust networks available to everyone on the island. Apparently, if you build it, they *will* come!

## Wireless LAN Technology—There Is Only One Real Choice

The enterprise wireless LAN space will continue to use 802.11n as the core wireless network platform for some time. The

standard's ability to accommodate multiple data streams and uplinks should carry the load for the foreseeable future. However, I believe we will see the installation of more access points using the 5.8 GHz band and 40 MHz channels being deployed in smaller (lower power) coverage zones to provide more aggregate throughput to any one area. With 11 non-overlapping 40 MHz channels, it is conceivable that you will be able to provide 1.6 Gbps to 3.3 Gbps of aggregate wireless throughput (11 channels with real throughput of 150–300 Mbps each) in any one zone of coverage. I think it is safe to say that numbers like that will take a while to saturate at the edge, but the core will need attention. The challenge of RF engineering the zones will keep consultants busy.

There is a catch introduced by the backward compatibility of 802.11n. Old (slow) devices still connect to fast access points. And we have all learned that slow devices on a half-duplex, collision-domain network slow everyone down. The iPhone 3G only connects to WiFi at 802.11 b/g rates (and often you have to scale it back to “b” for a good connection), and the iPhone 4 only does 802.11n in the 2.4 GHz band. Many of you have already had to deal with the

older WiFi devices (especially Apple) not roaming because the client is satisfied with a 1 Mbps association, even though it could switch to a closer access point providing better rates. This will continue to be the case with any “b” client. The Motorola Droid only does 802.11 b/g.

So your blazing 802.11n network is going to be slowed by the handheld phones and other client devices in the 2.4 GHz band. What's the solution? Leave the 2.4 GHz band for the laggards. Keep utilizing the three-channel spread available with 20 MHz channels and let the handhelds have it. Steer the laptops to the 5.8 GHz band where they can access the faster 40 MHz channels (and more of them) without the slowpokes clogging the channel. For those of you who haven't upgraded to "n," try changing the minimum association speeds on your "g" access points to 5 Mbps. Serving the low-speed handhelds is also a good way to keep older 802.11g access points in service while upgrading to "n" for the laptops. Just watch your channel spac-

Figure 2 details a layout that still respects the three-channel 2.4 GHz limitations (providing 2 AP coverage of any space for an aggregate of 300 Mbps data rate). Even respecting three-channel limitation of the 2.4 GHz band, the 5.8 GHz data rates provide an aggregate of 600 Mbps in every space. Remember that throughput is roughly half of the data rate—so we are looking at 150/300 Mbps everywhere. If clients need more throughput, they can add 5.8 GHz radios using the remaining channels available in the spectrum with no worries about interference.

## Planning for the Coming Surge of Data over Your Enterprise Wireless Network

The addition of 802.11n access points at full capacity is going to require yet another look at your data closets and edge switches. In addition to PoE gig ports, it is important to remember the edge switch backplane



capacities and the uplink speed to the core! It only takes four access points at full capacity to overwhelm a 1 gig uplink. So in the example with 11 APs, it is conceivable that the customer will deploy edge switches with 10 gig uplinks or two or three PoE edge switches with 1 gig uplinks for the initial design. As capacity needs increase, they may have to add more. There will be a lot of empty ports in those switches.

Additional switches translate to additional rack space, additional power, additional heat, and of course additional capital and maintenance expenses. So once again, the telecom closets must be evaluated for capacity.

#### Your Wireless Network Will Eventually Become Mission Critical

It is inevitable that the wireless network will become mission critical to your institution. You need to start planning and budgeting for the infrastructure components to maintain reliable, secure, and robust connectivity via wireless.

#### The Wide Area Network Will Affect Your LAN

The WAN is a different story. Competing 4G technologies continue to battle for the heart of the consumer. 802.16e (WiMAX) was the early choice of Clearwire/Sprint. They have been rolling out WiMAX since 2008 in large metropolitan areas with a service area that targets 120 million users by the end of 2010. Verizon and AT&T have gone with LTE (Long Term Evolution). At this time, both technologies are falling short of the hype due to lack of general availability.

Verizon will launch LTE this year in a total of 38 cities and more than 60 airports, covering 110 million POPs. They project 200 million POPs by 2012 and more than 285 million by 2013. AT&T is just beginning their rollouts.

Verizon and AT&T have targeted LTE as the better upgrade for their GSM/UMTS/HSPA/CDMA-based networks and sub-

scribers. Now that Cisco has scaled back plans to support WiMAX (Navini) in favor of LTE (Starmax Networks), it seems the writing is on the wall.

Both LTE and WiMAX are providing download speeds of 5–12 Mbps, with upload speeds of 2–5 Mbps. LTE is providing peak downloads of 40–50 Mbps. These speeds will require carriers to get Internet access of 100 Mbps or better to the cell towers.

Handheld devices with LTE and WiMAX are still scarce at this point, although Verizon promises a half-dozen models by the middle of 2011.

Your end users will be selecting carriers based upon the perceived value, just as they do now. You will have to be prepared

to accommodate the new client devices and the anomalies that come with each. There are already many discussions on various wireless listservs about handling the specific handsets that are on the market. These new devices just don't plug and play as well as laptops. You may want to be proactive and test various handsets before the help desk gets inundated.

Just another day in the life of the IT department. Best of luck!

Ron Walczak is the principal consultant at Walczak Technology Consultants, Inc. He is a frequent contributor to the *ACUTA Journal* and has made many presentations at ACUTA events. Reach Ron at [ron@walczakconsultants.com](mailto:ron@walczakconsultants.com).



## Where's Your Focus for the Future, Carousel?

Carousel has identified some key areas of opportunity within the campus environment that we feel address specific challenges faced by today's administrator. As an example, the overall lack of communications between the institution and the student body leads to a disconnected alumni. Leveraging integration between the recruiting department or admissions (or other campus-based contact centers) and networks like Facebook allows the institution to deliver a wide array of informational and subscription-based services to network subscribers, increase the sense of community, and keep alumni involved long after they graduate from the school. This integration also allows the contact center to cull information from an incoming contact from a social network to better handle the caller.

In addition, we see the challenge of managing student demands for voice over WiFi becoming increasingly apparent. Carousel has done a significant amount of work in this space, partnering with Aruba to deliver high-quality voice over WiFi to campuses nationwide and ensuring we are well educated in the requirements for campus wireless delivery. Overall, we'd say the management of the wireless spectrum within campuses is becoming something that needs close attention, between covering the campus with RF, 802.11a/b/g/n, and the right cellular carriers in the right places.



# Deploying IEEE 802.11n Data and Security Networks Campuswide While Optimizing Energy Efficiency

Daniel Feldman  
Microsemi Corporation

Most modern educational institutions, either at the K–12 or university level, are using technology to entice new students, improve campus learning and productivity, and drive critical safety initiatives. Three technologies that are especially useful include voice over IP (VoIP) telephony, wireless LANs, and surveillance systems using networked IP cameras. These technologies can be deployed more efficiently, while minimizing energy consumption, by using power over Ethernet (PoE) technology.

PoE technology has made it significantly easier to deploy VoIP phones, WiFi access points, IP cameras, and other powered devices (PDs), by enabling them to be powered over the same cabling that delivers data. The industry has steadily increased the amount of power that PoE can deliver over Ethernet cabling so that a broader range of devices can be supported, from 802.11n access points and thin clients to pan tilt zoom (PTZ) cameras and even full outdoor cameras that include a heater.

## Benefits of a Midspan

Midspans offer the easiest approach for quickly deploying high-power PoE, as they can simply be inserted between an existing switch and PD. This also enables PoE's power-management capabilities, which allow campus administrators to monitor, manage, and reset PDs remotely to improve network operation while optimizing energy efficiency.

Midspans are also a more cost-effective and scalable solution than PoE-enabled switches. It is difficult to justify the expense of upgrading to a new PoE-enabled switch when the existing switch is just a few years old and when only a few ports with PoE capability are required. And midspans offer a green alternative to PoE-capable switches, because they deliver only the necessary power for a given application.

In general, midspans deliver higher port granularity than PoE switches, which means campuses can add PoE ports incrementally rather than all at once during initial installation.

Midspans also typically improve mean time between failure (MTBF) rates. The MTBF of PoE switches is considerably lower than that of non-PoE switches. This "TV with built-in VCR" effect is due to the concentration of high-power dissipation from the PoE section and the highly sensitive data section into a single box. For example, Cisco's 2960S-48TS-L (non-PoE) has 328,058 hours of MTBF, while the 2960S-48FPS-L (its PoE counterpart) has an MTBF of only 189,242 hours—a 42 percent reduction. And once there is an issue and a new switch is required, one pays for both data and power again, instead of dealing only with the section where the issue exists.

## Moving to High Power

With the ratification of the IEEE 802.3at standard in September 2009, PoE delivers 30 W over two pairs of Ethernet cable, which guarantees delivery of 25.5 W across distances up to 100 meters. Additionally, it is now possible to deploy fully compliant, industry-standard PoE functionality over all four pairs of Ethernet cable. This option opens the door for safely delivering 60 W of DC power over a single Ethernet cable, using current levels of 600 mA rather than the 1.2 A level of two-pair 60 W midspans. Today's 802.3at-compliant midspans also incorporate all necessary PD PoE compliance detection features for safe powering, as well as safe PD disconnection in overload, short circuit, or underload conditions.

To enable 60 W powering levels over all four pairs, the IEEE specifications changed the definition of a PD so that it considers the



PD the power interface, as opposed to the whole device being powered. This means that there can now be two power interfaces, each taking 25.5 W inside the same box. Nothing precludes these to be connected—one over the two pairs using lines 1, 2, 3, and 6, and the other over the two pairs that use lines 4, 5, 7, and 8. This is what makes it possible to double the standard 802.3at 2009 maximum of 25 W and go up to 51 W while fully complying with the standard.

Powering over all four pairs of Ethernet CAT5 cable not only boosts power delivery to PDs, but also improves efficiency when compared to two-pair solutions. Rather than delivering 51 W over CAT5 cable via a four-pair solution, this same four-pair configuration can be used to power two-pair devices with 30 W of power. The reduced power dissipation and energy translates into savings of approximately \$25 per year per powered device, assuming energy costs of \$0.10 per kilowatt hour.

#### PoE Deployment Considerations

There are many key issues that campus administrators must consider when deploying PoE-based networks. First, VoIP deployments require E911 capabilities, which are especially important in situations such as earthquakes, fires, and other emergencies. Many of these emergencies include an electrical power failure. This makes PoE with UPS backup essential for deployment, but also brings to mind serious questions, such as:

- In case of a power failure, are all PDs created equal, or should some be disconnected based on the remaining UPS power?
- In the unlikely case of a midspan power supply failure, should a redundant power supply be available?
- Is there a way to have redundancy without paying for an additional power supply?

Similar decisions must be made in deploying network cameras that are essential for maintaining the physical security of educational institutions and for preventing theft and vandalism. PoE technology offers many benefits for these applications, including enabling cameras to be deployed

anywhere without having to install costly AC outlets, or sending electricians to pull cables, modify building plans, or get safety approvals.

As mentioned earlier, PoE's comprehensive power-management capabilities enable administrators to optimize system availability by remotely monitoring and managing cameras and other PDs, including resetting malfunctioning units in a secure way. Administrators have direct online network power supervision capabilities for complete midspan configuration, monitoring, and diagnostics. This enables campus administrators to significantly reduce the overall number of IT department trouble tickets as users experience faster, more reliable service. In addition, administrators can use PoE to remotely turn access points on or off at predetermined times to reduce power consumption during periods of low traffic.

While PoE's power-management capabilities make networks more efficient and available to students, teachers, and staff, they also must ensure that the network is

not vulnerable to breaches. Power management must be executed in a secure fashion, so that malicious agents don't interfere with network operations. To eliminate this threat, Microsemi midspans feature an exclusive PowerView Pro™ management option that supports both IPv4 and IPv6 addressing and that is delivered as a secure SNMPv3 application to allow simple and efficient monitoring and control of network devices, including power-off/power-on, unit scheduling, UPS, and Web-based monitoring. IPv6 is critical for creating a PoE infrastructure built to last for decades and is a must-have feature for several governments worldwide.

Backup power is also important. Interconnected midspans can be used to back each other up in case of a power-supply failure. There are a variety of flexible powering options from AC, DC, or another midspan. DC inputs can be used with external power supplies to increase midspan power capacity or provide redundancy.

## Where's Your Focus for the Future, PAETEC?

PAETEC offers information technologies to higher education institutions that maintain a university's functionality and data integrity by storing and protecting vital information for students, faculty, and staff.

Our data center colocation service allows important data to be stored offsite, ensuring that it will still be accessible in the event of a disaster such as a power outage, natural disaster, or hacking attempt.

All of our geographically diverse data centers are SAS 70 Type-II certified and provide data encryption and transmission on a highly secure network. Additionally, our data backup and recovery product allows for a simplified data retrieval and restoration process through an easy-to-use, point-and-click interface.

Along with using our data center services, universities can use an additional security solution that is built upon the network firewall already installed on campuses. Our security solution, IDPS (Intrusion Detection and Prevention System), is able to proactively stop and eliminate threats in real-time before they gain access to a network. By living in our MPLS cloud network, the IDPS's zero-hour protection is able to keep malicious threats away from campuses while guaranteeing 99.9999 percent protection against false positives.

This ease of use, along with our customer service support, is able to help IT professionals with their data management, as well as alleviate common worries about network protection.



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Another key consideration for campus administrators is whether their powering solution can support the environmental requirements of PDs, such as IP cameras, that must be installed outdoors. Until recently, PoE could only be deployed safely with a costly surge-protection unit installed alongside it, to prevent direct or nearby lightning strikes from damaging or destroying both the PDs and their network switch. Surge and lightning protection units can cost from \$250 to \$400.

Because of this expense, a high percentage of outdoor PoE installations, especially in the enterprise, do not implement surge protection. Unfortunately, nearby lightning strikes are much more common than most people think. Strikes as far as a mile away

can induce a voltage level that can damage outdoor devices. Without lightning protection, surges also can move quickly along the Ethernet cable to damage expensive indoor network switches.

By incorporating surge protection directly into the midspan unit, it is possible to reduce surge-protection costs by as much as 80 percent compared to using stand-alone surge-protection equipment. Midspans with lightning protection should be tested successfully to the GR-1089 lightning standard for surges up to 2,500 V/500 A.

### Conclusion

PoE midspans are the ideal solution to power VoIP phones, WLAN access points, network cameras, and many other appli-

cations that are an integral part of modern educational institutions. Campus network administrators can improve network availability and overall energy efficiency, while reducing capital and operating expenditures, by choosing the latest high-power PoE midspans that feature built-in power-management capabilities and four-pair powering. Every dollar that today's educational institutions save on network deployment and management can go toward improving the learning experience for their students.

Daniel Feldman is director of marketing, telecom, at Microsemi Corporation. Reach him at [dfeldman@microsemi.com](mailto:dfeldman@microsemi.com).





**ACUTA:** Aside from funding, what issue are you, as the CIO, currently spending most of your time addressing?

Fowlkes: For UVa-Wise, expansion planning is the first priority. Our college has seen, and is continuing to see, wonderful growth in our student body and facilities. We've recently moved into a new data center and staff offices. We have recently rolled out a new administrative system to the campus, and we are currently working to implement VoIP across our campus. These items, along with an expansion in our online learning program at the college, have been primary focuses, and we are seeing great success in moving our institution forward for the Commonwealth of Virginia.

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

Fowlkes: Infrastructure planning for our fast-growing campus is immensely important. What we do today has a direct relationship to recurring costs, support costs, performance, and reliability of our infrastructure over the long term for UVa-Wise. In these times of budget shortages, prioritization is crucial to success. UVa-Wise must prioritize projects based on available resources to meet strategic institutional goals. Our most important work is to make sure we are listening to and engaging with the campus community, hearing their needs and meeting institutional needs and goals.

We have been following this plan over the past three years in replacing our administrative system with a robust and scalable system with Web-enabled, self-service capabilities with a relatively low recurring cost. We are looking to do the same with the selection and implementation of a VoIP telephony system. We are using this same process to develop an expanded online learning program with growing summer programs and hybrid courses first; then moving to develop new online programs for off-campus, nontraditional students.

**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?

Fowlkes: It is difficult to plan technology needs five years into the future. If I were

asked to look five years down the road at what the future might look like, I would have to blend some of my hopes and speculation into my statement.

In five years, I hope that mobile devices and tablet-based computing will be prevalent. A nonproprietary format for electronic textbooks will be the standard, and students will be bringing tablet-based devices to their classes. With this, student textbook costs will be cut in half. Commodity Internet bandwidth needs for campuses will triple, with further developments in online video, audio, textbooks, gaming, conferencing, and cloud-based applications. With the widespread adoption of tablet-based computing, wireless access in every corner of our campuses will be necessary for coursework, research, and scholarship.

In five years, online learning will be much more prevalent for traditional students as well as non-traditional students. It is very common for our faculty to use online course management software resources to supplement their on-campus courses. We expect our use of instructional multimedia technology inside and outside of the classroom, as well as our instructional multimedia support needs for faculty, to grow dramatically in the coming five years.

I believe that the coming five to seven years will be an exciting time of change and innovation in computing and technology. For UVa-Wise, we are looking for new ways to not only evaluate and adopt new technologies but also demonstrate these new technologies to the businesses and people of our region.

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

Fowlkes: This year, UVa-Wise is developing the Center for Technology Application to showcase many of the new technologies being introduced today. The center has an internal function to prepare our campus for upcoming changes and developments in technology, while demonstrating new emerging technologies to businesses and people in our region for economic development reasons.

This new service, in addition to the training and workshops that we already conduct, will be a way for our UVa-Wise campus community to stay informed and to be ready for new technology developments in the coming years.

Thanks to Keith Fowlkes for taking the time to share his responses to these questions. You can reach Keith at [fowlkes@uvawise.edu](mailto:fowlkes@uvawise.edu).



## Where's Your Focus for the Future, Berry, Dunn, McNeil & Parker?

Given the challenges of operating in the "new normal," colleges and universities need to strategically plan for technology to keep pace with rapid demands for "better, faster, cheaper" IT services, systems, and support. An IT strategic plan is designed to serve as a roadmap to guide technology initiatives over a three- to five-year planning horizon. Practical considerations and guidelines for initiating the IT strategic planning process at your institution should include:

- Assess your current environment: Evaluate your organization's current IT operations, staffing, and systems. Seek input from both staff and a cross-section of academic and administrative personnel as well as students.
- Establish priorities: Upon completion of the assessment, you should have a clear sense of what's working well today and where there are opportunities for improvement. You should also consider benchmarking data from peer institutions. When establishing priorities, it's imperative that stakeholders be brought in to provide input.

The development of a comprehensive IT strategic plan enables higher education to manage technology systems, staffing, hardware, and software with a comprehensive framework that should be flexible and sustainable. By keeping the approach collaborative, the likelihood of stakeholder buy-in and plan implementation are that much greater.





**J. KEITH FOWLKES**  
THE UNIVERSITY OF VIRGINIA'S  
COLLEGE AT WISE  
VICE CHANCELLOR FOR IT & CIO

#### About UVa-Wise

A public, four-year residential college located in the lush mountains of southwestern Virginia, The University of Virginia's College at Wise is recognized as one of the top public liberal arts colleges in the nation. The only branch campus of the University of Virginia, UVa-Wise was founded in 1954 and currently enrolls 1,900 students.

UVa-Wise is home to Virginia's only undergraduate degree program in software engineering. UVa-Wise offers 29 majors, 29 minors, 7 preprofessional programs, and 23 teaching licensures.

For five consecutive years, students at UVa-Wise have graduated with the lowest debt load of any public liberal arts college in the nation, according to *U.S. News and World Report*.

UVa-Wise has been selected for inclusion in "Colleges of Distinction," which recognizes institutions for engaged students, great teaching, vibrant communities, and successful outcomes.

More information on UVa-Wise can be found at [www.uvawise.edu](http://www.uvawise.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?

**Fowlkes:** This is an urgent issue for higher education today, especially in light of the recent releases of tablet-based devices. UVa-Wise is currently assessing our bandwidth needs for students and faculty members downloading textbooks and other instructional resources to these new tablet devices. Expansion of wireless access to all corners of the campus will also be a major issue for many institutions. Once again, tablet devices will be pushing wireless access coverage on campus from a luxury to a requirement for colleges and universities in the coming few years.

This relatively new use of the Internet may also have ripple effects on the infrastructure of the Internet itself, especially at times of the year when students are preparing for starting a new academic semester or term. It may now be time for more higher-education institutions to get more involved in regional infrastructure planning with their service providers to ensure that capacity will be available when it is needed in the future.

**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?

**Fowlkes:** Meeting their expectations is a challenge. Many first-year (maybe all) students expect faster network access, widespread access to the fastest wireless services, Web-enabled service applications, more security and virus protection, and full access to gaming resources. Continuing to evolve our infrastructure gets more and more expensive every year, and most higher-education institutions are working with less and less money during the recession. This, along with the security aspects of students who are at a high level of proficiency with hacking tools, becomes

a daily challenge to keep institutional data and other network users safe from "curious minds."

**ACUTA:** In what ways has this affected how you deliver support services?

**Fowlkes:** In many ways, students are more ready and able to do much of their own support than in past years. Many students come from families where they were the "computer experts," and parents have to call them at college to get tech support back home. The most important aspect for support services is getting support resources to users, such as illustrated documentation, video tutorials, and new methods of communication like chat and video conference-based support. Helpdesk support services will probably always be needed, but getting accessible and easy-to-understand training resources out to our users is of the utmost importance.

I also believe that we underutilize our online video capabilities. In the coming years, we plan to do much more video production of quick Web-based tutorials on a variety of training topics, ranging from using our Web-based student portal to basic library bibliographic instruction. Students now are very accustomed to these types of resources and will use them if available.

**ACUTA:** 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?

**Fowlkes:** The single most important aspect for our campus is communicating short-range and long-range replacement schedules for equipment, software and training costs. Our Office of Information Technology is currently working on a rolling process for planning, documentation, and long/short-range budgeting and a brief explanation of priorities. This keeps the leadership team informed as to recurring infrastructure costs and what these needed expenditures bring to the institution.

*continued on page 39*



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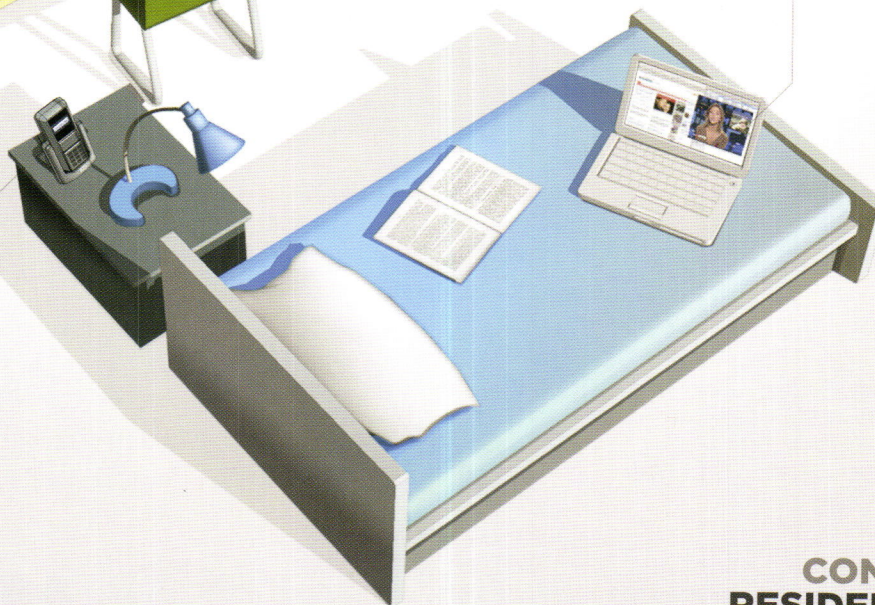


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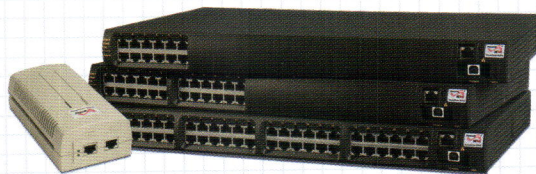
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