

Improving Institutional Collaboration through Unified Communications

A Study of Current Implementations

ECAR

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This paper is a publication of the ECAR Communications Infrastructure and Applications (ECAR-CIA) Working Group. ECAR working groups bring together higher education IT leaders to address core technology challenges. Individuals at EDUCAUSE member institutions are invited to collaborate on projects that advance emerging technologies important to colleges and universities. ECAR-CIA focuses on the challenges that higher education institutions face with respect to enterprise communication, collaboration, and mobility.

A desk phone rings, but no one is there to pick it up. A critical voicemail is left about a major funding opportunity, but the lit message-waiting indicator on the phone isn't seen until the following week, when the researcher gets back from travel. Because the institution doesn't have unified communications in place—allowing the voicemail to be delivered via e-mail—the funding opportunity is missed.

Unified communications creates tremendous opportunities for more effective and more timely communications and collaboration. Isn't that at the core of the higher education mission?

Introduction

Many higher education institutions are experiencing a fundamental shift in enterprise communication and collaboration, both within the institution and across institutions, with unified communications (UC) as the foundational service that helps enable institutional collaboration. Traditional telephone and e-mail systems provide reliable and highly available voice and text communication, but users of these technologies are beginning to see greater possibilities, such as multimodal communications, presence, mobility, document collaboration, and virtual meetings. Each of these new possibilities is often viewed as a disparate technology solution, but a better outcome can be achieved by integrating these technologies into UC. This document presents several approaches to this paradigm shift, along with the real-world challenges and benefits encountered.

UC Definition

Unified communications is the integration of real-time communication and collaboration applications/services, such as instant messaging (“chat”), telephony (usually IP telephony), videoconferencing (again, usually IP-based), e-mail, and data and application sharing (e.g., shared document editing and web-connected electronic whiteboards). UC typically leverages “presence,” which is essentially users’ availability as inferred from their calendars, current keyboard or phone activity, or location (based on GIS/GPS or RFID data). Presence also typically leverages mobility, thus not only providing an experience that unifies applications/services but also making that experience available at any time and from

anywhere (on almost any communication device). Call control—both outbound (initiating communication from a UC software client, even on a “hard phone”) and inbound (routing incoming calls/communication based on source, time of day, and/or existing presence information)—is often an element of UC. And unified messaging (UM), which provides integrated voicemail (often transcribed to text), e-mail, text messages, and fax, is also usually a part of the “unified” picture. UC is not necessarily a single product but is often a set of products that interoperate and provide a tightly integrated communication and collaboration user experience across multiple applications, devices, and media types. In essence, UC is typically the collection of communication and collaboration applications on the IP network that are often accessed and controlled via a single, integrating, *unifying* client experience across multiple platforms (from desktop to mobile devices). When UC is at the center of an enterprise’s communication and collaboration strategy, it provides a new paradigm for promoting more collaboration and for maximizing its efficiency and effectiveness.

Legacy vs. Unified Communications

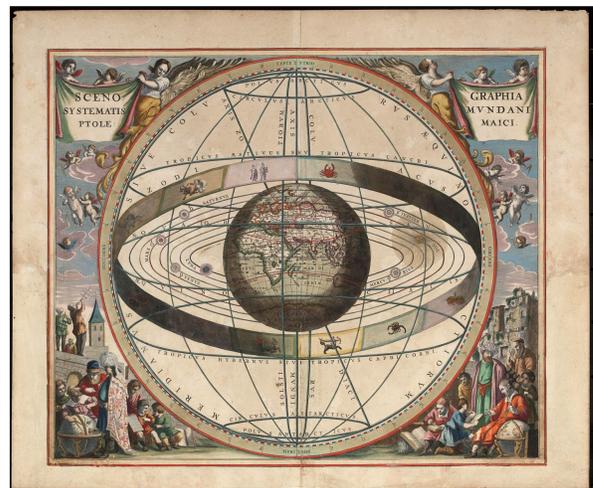
The primary distinction between “legacy” and “unified” communications is the role that voice plays. In legacy systems, voice (i.e., telephony) is positioned at the center of the communications universe—it is the primary approach, and any other forms of communications are simply peripheral additions. In UC, by contrast, we see voice no longer at the center, instead as simply one of many forms of communication that are available.

The term “legacy” is not meant to carry a negative connotation. That said, vendors are focusing their efforts on UC, and support for legacy approaches is diminishing. We can see the change in the reliability/functionality balance—for instance, where cell phones used to be the least reliable way of contacting someone by phone, we now often see them as the most reliable way.

Moreover, our descriptions of various approaches to UC do not privilege any approach over another; this is something that continues to evolve. For instance, if your current technology doesn’t work well for you today, you may want to look at outsourced solutions when making the move. Conversely, you may have a current on-premises approach that does work well, but you’d like to expand it to include more UC communications features.

Legacy Approaches (Voice as the Center of the Universe)

- **Legacy Telephone Service:** This approach positions telephone service as the center of the communications universe, rather than a unified communication approach (where telephone and data communications are intermingled and voice is no more important in the platform than anything else). Legacy telephone service, commonly known as the public switched telephone network (PSTN), is provided by a circuit-switched network (telephones are connected in real time by a



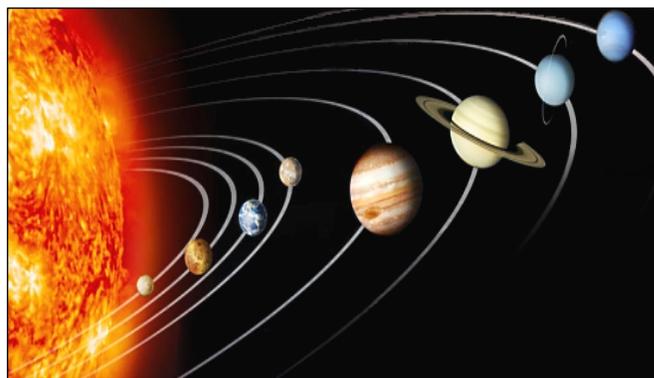
Source: http://commons.wikimedia.org/wiki/File:Cellarius_ptolemaic_system.jpg

physical facility; for example, ordinary business lines or trunks through a switching system or network), where the emphasis is on telephone calls and the network is optimized for voice communications.

- **Legacy PBX:** This approach is the most traditional *private* telephony solution. In this case, a large customer who elects to own and operate its own telephone system could purchase a private branch exchange (PBX), a telecommunications hardware system located on the customer's premises. It generally includes multiple inbound and outbound lines, voicemail, and many call routing and management features. A legacy PBX uses older technologies, like analog or digital phone lines. Moves, adds, and changes can be handled on-site but require professional staff to administer.
- **Legacy Centrex:** This approach is the most traditional *outsourced* telephony solution. Customers who did not wish to purchase, maintain, and administer their own communications solution could obtain service through their local telephone company's central office. Centrex (central office exchange) service provided advantages over a PBX, including cost savings on the initial investment and fewer full-time staff to administer the service, all while enjoying many of the same features available with a PBX.
- **Legacy VoIP:** These early IP-based systems are the first network-based, packet-switched telephone solutions. Legacy VoIP is IP-based telephony, in which a server replaces PBX but the traditional telephone characteristics (where all functionality—including voicemail, call forwarding, and other features—is handset based) are otherwise in place.

UC (Telephone Service on the Periphery)

- **Hardware-Focused UC:** This approach typically refers to a traditional, on-premises telephone system—such as a legacy PBX—that has been enhanced to include UC features, such as desktop and mobile smartphone applications with instant messaging, presence, and video. The scenario could occur in organizations with robust telecommunication centers and longstanding relationships with vendors allowing expansion of current systems.
- **Network-Centric UC (networking mind-set):** This version of UC builds on the IP networking system and support staff and usually occurs when the desire for a new UC system originates from the network design and support staff. Strengths include integration with IP network for resiliency, quality control, and security.



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- **Software-Focused UC:** This version of UC builds on on-premises server- and software-based systems and support staff and usually occurs when the desire for a new UC system originates from the server and application design and support staff. Strengths include integration with existing systems and applications such as identity management, e-mail, and productivity suites. This paradigm continues to evolve by broadening the set of collaboration modalities being enabled and integrated, from social to storage to project management.
- **UC as a Service (UCaaS):** This cloud-based approach offers UC with little or no on-premises equipment. It is often a nonmigration implementation that relies on an external entity to provide UC features over the Internet rather than hosting and configuring a solution locally. This approach is relatively new but growing and maturing quickly due to strong competition. Questions remain about the extent to which this solution can successfully integrate/interoperate with other collaboration platforms (learning management systems, emergency notification systems, videoconferencing infrastructure, networking infrastructure and architectures in general, and so on). And yet, the line between software-focused UC and UCaaS appears to be blurring, especially as more functionality is offered “in the cloud” (or “as a service”).
- **Open-Source UC:** This option focuses on open-source protocols and tools and allows for significant customizations. This approach is the least mature but may be a good option for groups with high development capabilities and low budgets. Ongoing staffing and support will be significant.

Case Studies

The following five use cases represent the varied approaches that can be taken to realize UC, including the different starting and ending points and some of the reasons each path was taken. Each case study shows a different approach toward the same goal of providing unified communications to its population.

Carnegie Mellon: Transitioning from Legacy Centrex to Network-Centric UC

Carnegie Mellon University (CMU) has been using a legacy Centrex service for voice communications for more than 20 years. Institutional dissatisfaction with the capabilities of and support for its current service, along with information gathered in a commissioned, in-depth Gartner report on user requirements and deployment strategies, led CMU to embark on a project in late 2012 to replace the Centrex service with a modern, in-house VoIP system fully supported within the institution. The platform CMU selected is an all-encompassing UC system with modular applications included, such as e-mail integration, presence capabilities, and robust collaboration and messaging tools. Today, CMU is in the early stages of the UC deployment, having moved approximately 500 users to the new platform. The early-adopter UC deployments were made opportunistically (one new building, one remote site’s failing legacy PBX). CMU also ported its IT department for proper “eat your own dog food” analysis. The next phase of the project will be to port the remaining 8,000 lines in 1,000+ line “zones” (large departments and/or geographical groupings). This will continue on a rolling basis over the next several semesters. Challenges so far

include cost modeling (trying to balance a higher-cost, new service against department needs in a flat budget environment), sequencing (which departments to do next), technology overlap with other projects (e.g., video collaboration and learning technologies), and training the telecom staff to support the new UC system while supporting the legacy Centrex service during the transition to UC.

Penn State: Transitioning from Legacy VoIP to Software-Focused or Network-Centric UC

The Pennsylvania State University was an early leader in VoIP deployment, having moved to an enterprise VoIP system as its primary voice communications system in the early 2000s. Today, the largest Penn State Campus (University Park) uses the Cisco Call Manager VoIP system as its primary voice engine and has nearly 17,000 VoIP lines installed. However, in spite of its being VoIP based, the actual architecture in place is very much within a legacy paradigm. The LAN infrastructure supporting VoIP is physically separate. Telephone moves are still largely processed through the service provider (versus end-user self-moves). In addition, voice remains isolated, with hard telephones being the only supported endpoints and UC unimplemented at this time. Finally, the other 23 Penn State campuses still leverage legacy PBXs, which not only are mostly obsolete but also require relatively expensive maintenance agreements. Penn State's voice/UC roadmap consists of two parts:

- Extend the existing VoIP system to the rest of the campuses to meet the immediate need of cost savings and supportability (and to create a consistent end-user experience).
- Pilot two UC platforms—the first being the enterprise UC solution suite by Cisco, the university's existing VoIP vendor, and the second being Microsoft Lync, as a more directly integrated tie-in to the current institutional move to Microsoft Active Directory and Exchange, as well as to existing Microsoft solutions already in place (Office 365, SharePoint, Skype, Yammer, and so on)—to assess and compare everything from ease of use to functionality to interoperability to reliability.

Penn State's goal is to expose people to the powerful paradigm of UC and, ultimately, to improve communication and collaboration and increase overall efficiency for the institution in terms of both cost and time, all of which aligns with its strategic planning. Penn State is presently embarking on the first part of its roadmap (formally called the "Telephony Expansion Project") and is actively pursuing the foundational pieces of the second part (installing middleware and application infrastructure that will best support the trials). The biggest pitfalls seen thus far are primarily misperceptions around risk and the lack of appreciation of the power of UC—something that is difficult to appreciate without actually "living it."

Virginia Tech: Transitioning from a Legacy PBX to Hardware-Focused UC

Virginia Polytechnic Institute and State University (Virginia Tech) was operating with a 20-year-old ROLM Telephone CBX (Computer Branch eXchange)¹ and phone-mail system on its main campus in Blacksburg, in its Graduate Center in Northern Virginia, and in other satellite offices, with feature sets that were not relevant to some and not convenient for most. It was also becoming increasingly difficult to ensure the integrity of the operation with aging electronic components and replacement parts that were in limited

supply, combined with the decline in the number of available experts who were familiar with the legacy system. The move to a UC approach was to position Virginia Tech to be more productive and more efficient in the way that it supports efforts to enhance learning, discovery, and collaboration. An overarching goal was to ensure that the IT department continued to be a strategic asset to the university through integration with the research and education agenda, while improving and enriching scholarly collaboration and making the use of the technology as transparent as possible. The process of migrating 10,500 telephone subscribers to the new Avaya telephony system is approximately 90% complete. Virginia Tech has also successfully implemented approximately 15 contact centers, SIP (session initiation protocol) trunking, voicemail, and UC services in satellite offices.

University of Iowa: Transitioning from a Legacy PBX to Software-Focused UC

Moving from NEC SV8500 hosting 19,395 endpoints to Microsoft Lync unified communications is the current strategy for telephone service at The University of Iowa. A locally hosted PBX has served the campus well for many years. However, industry technology is shifting from dedicated analog connections to Internet traffic, and users now expect work-from-anywhere communication tools. Microsoft Lync has emerged as an attractive platform due to the current set of Microsoft infrastructure and support services already built on Active Directory, Exchange, Office, and SharePoint. The current hardware will need costly upgrades within the next two years and will not meet the mobility needs of users. Microsoft Lync provides these mobility features, integrates well with other Microsoft technologies that already have a strong presence on campus, and lowers licensing expenses for the existing enterprise agreement with Microsoft. Several Lync features have been offered to users at Iowa for years, but as part of this project a new Lync 2013 system has been installed on-premises and is now providing instant messaging, presence, online meetings, and Lync-to-Lync voice/video communication. Next steps will involve working with telecom vendors to move campus network connections from analog PRI (primary rate interface) to SIP trunks, as well as installing a session border controller (SBC) at the edge of the network to provide added security and a user-friendly migration of telephone numbers from NEC to Lync.

Iowa State University: Transitioning from Legacy Centrex to UCaaS

Since 1985, Iowa State University (ISU) has been running its own large PBX (between 12,000 and 16,000 stations). That system had been upgraded over the years and even supported about 500 VoIP phones. In 2010, as the system arrived at the end of its useful life (requiring a major forklift upgrade), and with landline use on the decline, ISU embarked on an on-premises UC pilot, which was marginally successful, with both product maturity and user expectations creating challenges. Following this pilot, a broad UC project was undertaken, and the emphasis soon centered on mobility as a primary requirement of a new solution. The foundational pieces of a central enterprise directory and e-mail system were completed, and ultimately an RFP award was made to Internet2's NET+ SIP service for cloud-based UC. The PBX replacement was fully completed on July 31, 2013, with all users having been migrated to either the on-premises or the cloud-based UC solution, depending on whether individual need focused more on mobility or on other collaboration platform integration. Among the important lessons learned was the need for many different customer engagement and outreach strategies. Additionally, there were many analog

services (such as fax machines, elevator phones, alarm circuits, etc.) that needed to be assessed and handled separately. Multimodal collaboration client complexity and support, as well as interoperability between different collaboration platforms, remain as challenges.

Themes

The following themes emerged from the use cases and from subsequent conversations with the contributors from each institution. With UC, we are seeing the emergence of the suite of communication options being equal in a software-centric solution (not just voice as the center of the universe). Not only are new products following that approach, but services that already exist are starting to move in that direction. In the new communications paradigm that is UC, voice isn't going to be the go-to mode. Many knowledge workers will, indeed, opt for communications mechanisms other than voice, and voice will be just one tool in the toolbox.

Why Now?

Why do more enterprises seem to be making the move toward UC now? Some observations about timing for UC adoption include current technology at end of life, support contracts ending, internal support staff changes (retention, skills, retirement), user desire for new features such as mobility, cost reduction, and changes in vendor offerings.

Funding and Staffing

As communication and collaboration modalities converge, it becomes clear that the UC *function* overall is a common good, needed by practically every member of the campus community. Additionally, this convergence of modalities makes the idea of cost recovery for any individual modality not only difficult but inappropriate in that collaborators should choose the modality for a specific purpose based on applicability/effectiveness, not cost. Current funding models may not apply in this new world, and other models—such as funding this collaboration centrally and/or as part of an overall “per head” IT fee—are likely more viable approaches.

Staffing and role changes are common in the step to UC. As mentioned, voice communication is a key part of UC but not the sole, driving factor. In the past, voice communication was a backbone service and platform. In the new model, UC is the backbone and platform, with voice layered on as a mode of communication. Some individuals will be willing to make that shift, but others may not. Technology changes also lead to completely new support responsibilities. Again, some support staff may be able to adapt, but it may be necessary to hire new skills into the organization. Underlying all of these staffing requirements is funding. In the end, several options exist, including modifying roles for existing staff, hiring new staff, purchasing outside consulting, and outsourcing support and maintenance. All of these options come with funding choices.

Stepping-Stone Approach

Because UC alters paradigms, it must be deployed with a sensitivity to change overload. A stepping-stone approach (e.g., moving from TDM [time-division multiplexing] PBX to IP PBX to softphones [a software representation of a traditional phone] to UC clients to full communication integration and interoperability) appears to foster the greatest user appreciation, acceptance, and success.

Tiered Offerings

Tiered offerings—low functionality with high availability (LFHA) and high functionality with lower availability (HFLA)—are becoming the norm. LFHA offerings include endpoints like emergency phones (for life safety) and guest phones. HFLA offerings include endpoints such as soft phones and UC clients in general.

Technology to Solve Problems

UC implementations are being used to give researchers and faculty a platform to help them solve problems, as opposed to simply implementing technology for the sake of technology. It is also anticipatory—although users might not take advantage of all the available features of UC today, these features might be needed tomorrow as a solution. To use another technology shift as a comparison, most written communication was previously done on paper with either internal memos or outside mailings. When e-mail was introduced, some people immediately made the change and scrapped much of their use of paper communications. Many people made slight changes to use e-mail for specific situations, and others ignored e-mail completely. The point of this comparison is that, although e-mail wasn't universally adopted and implemented, it was worthy of organizational effort to make the platform available to the institution. This can be seen today by the nearly universal adoption of e-mail and a steep decline in paper mailings. UC is at the early stage but provides the opportunity to create reliable, multimodal communication paths both inside and outside our current organizations. If UC is done well, adoption will occur over time, and both individuals and the organizations will benefit.

Contact Centers, Fax, and Other Specialized Voice Functions

In the old telephony-centric paradigm, all voice functions were typically provided by a single, vended system—phones, auto attendant, voicemail, unified messaging, and contact-center solutions such as ACD (automatic call distributor) and IVR (interactive voice response) existed on the same base platform (and/or platform-specific adjuncts). In the new UC paradigm, where voice is but one of many communication modalities, some of the more specialized functions of voice are more appropriately provided separately. In essence, basic voice and contact-center solutions have been decoupled. Additionally, because of the challenges of transmitting fax tones over IP and the relative obsolescence of the fax protocol in general, using a third-party fax service becomes an appealing and sensible option.

Centralized vs. Decentralized Management

Centralized client distribution and/or desktop management can substantially improve the supportability of UC. Additionally, simplified, tightly integrated UC solutions with robust help tools in place (e.g., a self-service knowledge management database) are likely more supportable than more complex, less integrated, and/or multiclient solutions. Even if you are centrally managing machines, supporting the desktop carries more challenges than supporting single-function devices, such as telephones. Of course, as both operating systems and users continue to evolve, this challenge should be less and less significant.

Common Pitfalls

Common pitfalls that higher education institutions are encountering in their move toward UC include everything from new funding models to client support, 911 routing and location identification,

infrastructure survivability, and interoperability with related platforms (from learning management systems to social platforms). It's important to decouple UC and life-safety (emergency phones). As mentioned previously, it's important to provide at least two primary tiers of service—LFHA and HFLA. However, the single greatest pitfall appears to be the challenge of helping users—and the enterprise at large—realize the tremendous efficiency gains that come with the UC paradigm. As mentioned, thorough customer engagement that includes the ability to experiment with and live in the new paradigm is key.

Conclusion

Demands for greater efficiency, new communication modalities and norms, an increased desire for richer collaboration experiences, and overall communications technology evolution have led to a seismic communications paradigm shift. In some cases, that shift has been ahead of users' tolerance for change, resulting in a "chicken and egg" situation. The efficiency gains and dramatically improved collaboration capabilities of the UC paradigm are difficult to appreciate until one has lived in it. At the same time, enterprise investments in this paradigm have been sluggish without the concrete evidence of, and confidence in, the aforementioned wins. UC continues to evolve, and many questions remain unanswered. Trends are changing, from newly realized student adoption to teaching and learning integration and contact center and customer relationship management interoperability. This is why the stepping-stone approach is likely best because it not only enables digestible, demonstrable trials with minimal investment but also ensures alignment with the curve of change tolerance. We should all recognize that communication and collaboration are at the core of what we do in higher education. This is as mission-aligned as technology gets.

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Note

1. CBX is a ROLM term for what is commonly known as PBX.