

EDUCAUSE Center for Applied Research

Research Bulletin

Volume 2006, Issue 23

November 7, 2006

E-Mail: Paradigms, Options, and Outsourcing

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Electronic mail (e-mail) is perhaps the most fundamental information technology (IT) tool in use today (Rainie & Shermak, 2005) and has been since it was the first “killer application” launched on the fledgling Internet some 16 years ago. Since that time, e-mail has become a part of our daily lives, and it is the relied-upon means of communication for people in an Internet-connected world. As the value of e-mail as a communication tool has grown, so have the demands placed on the infrastructure needed to support it. More users, increased daily message volume, larger messages (due to attachments), and dealing with spam—plus our increasing reliance on e-mail as the primary method of communication—have led higher education to make greater and greater investments in providing e-mail services. Today, though, the paradigm is shifting; new options include outsourcing the infrastructure as well as the entire service. With pressures increasing on higher education institutions to find ways to do more with less, e-mail provision is a challenge for which there are solutions that maintain or improve quality of service while significantly reducing costs.

Highlights of E-Mail Paradigms, Options, and Outsourcing

We in the ARPA community (and no doubt many others outside it) have come to realize that we have in our hands something very big, and possibly very important. It is now plain to all of us that message service over computer networks has enormous potential for changing the way communication is done in all sectors of our society.

These are the visionary words of Myer and Dodds in “Notes on the Development of Message Technology” from the Berkeley Workshop on Distributed Data Management and Computer Networks in 1976 as cited in Hardy (1996, endnote 52).

E-mail has indeed revolutionized the way we communicate. It has evolved from a very simple means of exchanging text messages and real-time chat with other users on the same computer to a suite of integrated services that foster electronic communication. It has become a primary means of communication both within and outside the academy.

E-mail dates back to the 1960s. It is with the introduction of networked e-mail on ARPANET (Hardy, 1996), and ultimately the Internet, that it truly began to realize its full potential. Throughout its history, e-mail has remained one of the top applications used on the Internet. In 1996, for the first time, the volume of e-mail sent in the United States exceeded the number of pieces of mail delivered by the U.S. Postal Service in one year (International Labour Organization, 1998). Today, the situation is even more dramatic. Some 60 billion e-mail messages are sent each day (Sarrel, 2006). Every four days, more e-mail is sent than the 212 billion pieces of mail processed by the U. S. Postal Service in 2005 (U. S. Postal Service, 2006).

In the academy, e-mail was initially viewed as a service that was tangential to the academic and administrative functions of the institution. As recently as the early 1990s, contributions to EDUCAUSE conferences and seminars promoted the use of e-mail for faculty and staff, offering tips to encourage widespread adoption and use (Updegrave, Muffo, & Dunn, 1990; Thomas, 1991; Jacobson, 1992). These contributions were followed by those that encouraged the adoption and use by students. By the mid-1990s, e-mail had become an accepted form of communication and was beginning to be used for official notifications (Ritland & Moore, 1999). Today, e-mail is ubiquitous.

Pressures on Central IT

As the suite of e-mail features and services has grown increasingly complex, responsibility for managing the environment has shifted from departments to central IT. Often over-burdened and understaffed, these IT organizations have struggled to keep pace with frequent system upgrades, virus infestations, spam filtering, backup/recovery options, quota allocations, and e-mail policy updates. Notwithstanding heroic efforts, the constant onslaught of market-driven pressures for bigger pipes and higher-capacity mailboxes to store larger messages and attachments ultimately means that continual investments in the e-mail infrastructure must be made—investments of time, personnel, and capital that institutions can often ill afford.

Market-Driven Demands

Few in the institution understand the total cost of maintaining an in-house e-mail solution (Osterman, 2006), including hardware and software costs, lost productivity when e-mail is not available, and missed opportunities when forced to direct scarce IT resources away from strategic, differentiating initiatives. The total cost is difficult to determine, yet it is clear that the cost is high and rising and that the funding challenge is immense.

Larger mailboxes to store multimedia and text messages and bigger network pipes to transport them are examples of market-driven pressures adding to the funding challenge. The volume of e-mail sent and stored per user grows by double-digit percentages each year. Mission-critical work is being conducted via e-mail at an increasing rate without consideration of the wisdom of that use and the corresponding demand to transmit larger files in multimedia formats. Is a 50-megabyte storage allocation enough? What about 250 megabytes, or perhaps 1 or even 2 gigabytes? Should the system allow for 25, 50, or 100 megabyte attachments?

Carrier-class providers like Google, Microsoft, and Yahoo that offer free Internet e-mail services rise to the demands for larger mailboxes and bigger pipes by increasing ad-driven revenue and by oversubscribing the physical storage deployed such that the actual storage allocated is much less than the number of users times the maximum allocation per user. Generally, institutions of higher education cannot, or will not, employ either approach. The academy shies away from the commercialization of e-mail, and academic users are much more likely to use the maximum allocation, driving the per-user storage requirements close to the listed maximum.

Universal Access

Users also demand anytime, anywhere access to e-mail, including from multiple platforms: computers, mobile devices, smartphones, and desktop e-mail clients and Web browsers. This demand for e-mail “when, where, and how I want it” is spurring innovations to e-mail access points and has IT organizations struggling to keep up with the heterogeneous environment. Web mail service providers are introducing Web clients such as Google’s Gmail that take advantage of Web 2.0 techniques to offer a feature-rich, Web-based mail experience that is beginning to rival that of the desktop, yet the demand for desktop clients is continuing to grow as users require access from mobile devices in addition to shared calendaring and delegated mail management. Some users are beginning to demand alternatives to traditional e-mail including private workplace wikis, blogs, instant messaging, RSS, and chat (Conlin, 2005).

Spam and Viruses

E-mail security continues to improve. Antispam and antivirus protections are now available and imperative at the institution at both server and client levels, yet attacks continue to challenge institutional resources as sophisticated spammers develop ever more evasive techniques. A single virus that gets through established defense layers can lead to widespread infection in a matter of minutes, slowing or rendering inoperable campus computers and, perhaps, even impacting the entire communications infrastructure. Recovery, replacement, and lost productivity costs can be staggering.

A further concern is compliance with state and federal legislation, such as the CAN-SPAM Act.¹ A momentary lapse of attention in this area and an institution can find itself cut off from the community.

Personnel

Much of the cost of maintaining an in-house e-mail system can be attributed to personnel (Srinivasan, 2006). Aside from the resources required to support e-mail users at the client level, the infrastructure—significant as it has become—requires a healthy number of systems programmers and operations staff to keep all that e-mail flowing and managed. Given the challenges cited here (antivirus, spam, and so forth), there is no reason to believe that this human resource requirement is going to diminish in the future, as it relates to in-house provided e-mail solutions. In fact, the opposite seems likely, and personnel costs will increase over time.

Outsourcing: A New Option

Traditionally, institutions of higher education have hosted their own e-mail services. This landscape is changing. Outsourcing some or all e-mail services may allow an institution to reduce the total cost of providing e-mail services and attain predictable price structures while improving quality of service and relieving the burden on central IT (MacKinnon, 2004). Importantly, outsourced e-mail may allow an institution to realize a scalable environment and to introduce new capabilities without upgrading software or hardware.

Getting Started: Defining Requirements

Over time, e-mail has evolved from a simple process that enables a send-and-receive exchange of messages to a suite of integrated services that fosters electronic communication. In addition to the basic messaging service, today's e-mail systems typically provide support for address books and calendaring. More sophisticated e-mail systems incorporate other collaborative services such as file sharing, Web hosting, and photo albums, and some allow for instant messaging, chat, or RSS feeds. The decision whether to outsource should be based on a thorough understanding of the requirements and expectations for the use of e-mail at the institution. Some aspects to consider include the user experience, group and enterprise solutions, and infrastructure, security, and reliability.

User Experience

The e-mail client is the primary vehicle by which users interact with the e-mail system to create messages and manage information. Given a robust and responsive infrastructure, the e-mail client will determine the quality of the user experience.

In many cases, e-mail client expectations have been set by the major service providers. Users expect to filter, sort, file, and forward e-mail. Multiple attachments and large e-mail quotas, once considered luxuries, are now becoming standard. A spell-check feature is not uncommon. It is important to track and to understand evolving e-mail features and corresponding expectations.

Institutional requirements regarding connectivity and branding also influence the selection of an e-mail client and, perhaps, the hosting decision. For example, one common mobile device requires a proprietary protocol that works with only a small subset of e-mail systems. Other devices require standard protocols such as IMAP or POP3 that may force the institution to look beyond "Web-only" solutions.

Group and Enterprise Solutions

The ability to have e-mail and calendars managed by a person other than the primary user, such as an administrative assistant who manages the calendar or e-mail for an executive, requires a suite of features not universally available. Likewise, group-based or enterprise calendars are features of only a subset of software solutions.

With respect to address books, most users want a user-friendly address book or contact list as part of their e-mail package. In many cases, this feature requires access to a centrally maintained directory, and these directories are not standard features for all e-mail solutions.

Infrastructure, Security, and Reliability

The integrity, reliability, and security of the infrastructure are critical. Institutions should demand redundancy in order to minimize points of failure and to optimize performance. Be sure that solutions considered are scalable and provide appropriate service, security,

backup, and recovery mechanisms. Consider the degree to which the e-mail solution should be integrated into campus portals and directories.

Individuals and Institutions: A New Paradigm

New alternatives for the delivery of e-mail services, as well as increased expectations regarding the quality of the service, demand a rethinking of the paradigm used to deploy these services. One view for segregating types of e-mail users relates to their role in the institution and results in a “student versus faculty/staff” distinction. A different model, based on the features that are important to a specific user, might be thought of as an “individual versus institutional” philosophy. The qualities of the latter model are outlined in Table 1.

Table 1. Characteristics of Individual Versus Institutional E-Mail Options

Features	Individual E-Mail	Institutional E-Mail
Architecture	Outsource-hosted, for student, faculty, and staff users	Institution-hosted, for faculty, staff, and selected student workers
Mobility enablement	General focus on market options	Institution-specific option support
Access	Portal and direct	Portal and direct
Interfaces	Support for many clients, including IMAP, POP, and Web	Support for maximum clients, including desktop application, IMAP, POP, and Web
Motivators	Individual E-Mail	Institutional E-Mail
Drivers	Cost and market	Reliability, integrity, and control
Influences	Reliability, integrity, and control	Cost and market

In this paradigm, the individual e-mail solution is designed for users with simple e-mail requirements who do not share calendars or mailboxes and do not have mobile devices with special interface requirements. Although reliability, integrity, and control are important, this solution is primarily driven by cost and by the market. Users who maintain their own private calendars and address books may be well served by individual mail.

Institutional e-mail is designed for users who share calendars or mailboxes or who use mobile messaging. For example, an executive assistant who manages the calendar of a dean would be best served by institutional e-mail. Additionally, if a user has been provided with a messaging device, such as a BlackBerry, this user should also be on institutional mail. Reliability, integrity, and control are paramount in the institutional option.

One of the advantages of this bifurcated paradigm is that individual e-mail services can be outsourced and institutional services provided locally. Many of the outsourced solutions already address some of the “beyond the Web” requirements. This bifurcated paradigm might bridge the gap between the services available today and those available in the future.

Case Study in Brief: E-Mail at LSU

The Louisiana State University (LSU) intranet portal, Personal Access Web Services (PAWS), supports the delivery of Web-based applications to more than 86,000 members of the LSU community. Approximately 77,000 times each day, students, faculty, and staff log in to PAWS to check e-mail, access class materials, view library materials, or execute any of a number of other transactions. PAWS has changed the way of life for the majority of LSU students, faculty, and staff by eliminating the need for calls and office visits that would have been necessary just a few years ago.

One of the first applications to be made available through PAWS was Web-based e-mail. In spring 2003, feedback from Student Government (SG) representatives and a subsequent requirements assessment made it clear that this service needed upgrades. The projected life-cycle infrastructure costs for this upgrade were in excess of \$300,000.

The central IT organization at LSU, Information Technology Services (ITS), in collaboration with student leaders, began to investigate alternatives for providing a centralized Web mail service that was feature-rich, reliable, secure, cost-effective, and easily integrated with the PAWS portal. The project evolved into a highly successful collaboration among student leaders, ITS, university administrators, and colleges. It can serve as a blueprint for other institutions faced with limited resources and a desire to expand services to their campus communities. The project demonstrated:

- The evolution, improvement, and outsourcing of a basic technology that has evolved into a core service with an expectation of high availability.
- The creation of a working partnership between administration and student leaders to implement a state-of-the-art Web mail solution that costs approximately \$6.00 per mailbox per year (or less!).
- Leveraging the intranet portal and strengthening the infrastructure in a manner that allows for further expansion over time.
- More efficient use of human resources to provide time for other technology projects (calendar improvements, identity management, and so forth).

Some factors that led to the successful implementation of the new Web mail solution include:

- *Early buy-in.* Student leaders participated in all aspects of the project including the initial request, initial research and pilot, bid specification, funding acquisition, marketing, and ongoing migration. The Student Technology Fee (STF) Committee provided the initial funding for setup fees and licenses and today underwrites more than 90 percent of the recurring costs of implementation.
- *Pilot.* ITS worked with SG to pilot software in June and July of 2003. Pilot participants established an e-mail account, tested the features offered, and completed an online survey regarding their experiences. The results of the survey indicated overwhelming support for the solution.

- *Phased-in implementation.* Beginning in June 2004, students were encouraged to voluntarily migrate from the existing service to the new service. Approximately 8,300 students migrated to the new solution in the first two months. One year later, more than 21,000 accounts had been created in the new system. LSU will require full participation by December 2006.
- *Scalability/flexibility.* The selected solution was scalable, meaning that LSU can add users and expand services without significant changes to the cost structure. Even better, economies of scale apply. For example, each additional 10 megabytes of storage drives the overall per-megabyte cost of storage down. In fall 2005, following the overwhelming success of the initial rollout and increasing demand for more e-mail storage, the STF Committee voted to take advantage of this decreasing cost per unit of storage to increase the storage allocation for each student from 50 megabytes to 1 gigabyte and to underwrite IMAP/POP3 connectivity. Later that fall, the STF Committee voted to expand services further by underwriting Web hosting services that were also available from the e-mail service provider.

LSU chose to outsource student e-mail in order to provide a higher-quality solution to students at lower operating costs, reallocate scarce IT staff to other strategic projects, and provide more flexibility to upgrade and enhance services. After careful consideration, LSU also made the decision not to completely outsource all e-mail services. This fall, LSU is moving to a paradigm that distinguishes between individual and institutional e-mail as described above.

The individual option will feature the PAWS Web mail service—straightforward Web-based messaging equipped with a standard 1-gigabyte mailbox and a variety of interface options including Web, IMAP (for specific clients you can choose), or POP. This system is very cost-effective and easy to use—a perfect solution for most e-mail users. LSU expects that this service will be used by students, faculty, and staff who do not share calendars or mailboxes and who do not have mobile devices with special interface requirements

The institutional option will feature a desktop-integrated messaging system. It, too, will come with a standard 1-gigabyte mailbox and also have Web and IMAP interfaces to go along with the advanced desktop client that many find valuable. This feature-rich system will supply an improved service for those comfortable using client-based e-mail services. It is not as cost-effective but delivers the extra value required by “power” users. LSU expects that this service will be used by faculty and staff who share calendars and mailboxes or who use university-issued BlackBerry devices.

What It Means to Higher Education

Emerging options for the provisioning of e-mail services to the institution offer significant opportunities to save time and money while improving the quality of service. These opportunities must be weighed against the risk of outsourcing a critical component of the IT infrastructure. Each institution is different: what works for one may not work for

another. As such, selecting the best option will require careful consideration by informed stakeholders. Some initial steps include:

- *Understanding the requirements of your campus.* One of the most important steps in successfully deploying new e-mail services is to clearly understand the requirements for those services on your campus. It is, in effect, the standard to which all considered options should be compared. A requirements definition is particularly important, given the large number of options and the dizzying array of bells and whistles now being offered by service providers. A good requirements definition will help keep the project on track and validate that a proposed solution will meet institutional needs.
- *Understanding the risks of outsourcing.* The risks associated with not providing an institutional e-mail option can be high. Outsourcing places the immediate responsibility of maintaining and managing the e-mail infrastructure in the hands of a hosting partner. The network becomes a critical factor in determining e-mail availability (Watkins, 2003). Further, it may be very difficult, if not impossible, to bring e-mail services back in-house if outsourcing doesn't deliver as promised. Those once responsible for the in-house solution will have been reassigned to other projects or will have left the institution. It is also likely that a formerly acceptable in-house solution will no longer meet the needs of the institution and will have to be upgraded to address demands for increased functionality. To mitigate these risks, consider a bifurcated paradigm. For example, use an outsourced model to provide services of an individual nature and retain in-house services for institutional users, or use some other combination of services that allows for a partially outsourced solution in order to get more information before considering a wholesale transfer to an outsourced e-mail service.
- *Carefully selecting a service provider.* The choice of a service provider is a critical and potentially costly decision that must be made in an evolving environment. Few institutions are positioned to change e-mail service providers often. Consider the provider's ability to deliver a robust e-mail infrastructure. For example, it may be important to the institution to select a service provider that has a proven track record and is capable of supporting hundreds of thousands of accounts. The service provider should meet and preferably exceed the level of reliability and service expected of an in-house solution. Also, consider how much influence the institution would like to have over the outsourced offering and what kind of relationship the institution would like with the service provider. Do you want to be a small fish in a big pond or vice versa?
- *Assessing available services using identified requirements.* Outsourced offerings are continuing to evolve and are beginning to approach the depth and breadth of custom solutions. However, there are still some gaps. Pay particular attention to service-level guarantees, integration with enterprise authentication methods and enterprise directories, mobile "push" technology, and calendaring. Also, consider other forms of electronic communication such as instant messaging and RSS feeds and determine how these fit with your e-mail strategy.

- *Preserving the chain of trust.* Security and compliance issues apply to e-mail as they do to other institutional applications. Be sure to evaluate potential solutions for compliance with federal and state regulations and with institutional policies and procedures. Avoid options that implement single sign-on via shared passwords. Also, consider how implementation of a particular solution will aid or preempt investigations by the university or by law enforcement agencies.
- *Planning for disaster recovery.* For many institutions, e-mail has become the primary means of communication. Be sure to consider your expectations and what you would do in the event of a disaster on campus or with the service provider. How would you recover this critical communication hub? Does outsourcing assist or detract from those goals? In the aftermath of Hurricane Katrina in August 2005, the University of New Orleans used an outsourced e-mail solution to quickly restore communication with students.

Key Questions to Ask

- What is the cost of providing e-mail for students at your campus?
- How has this cost changed in the past five years?
- In what ways are student attitudes and uses of e-mail changing as new communication technologies emerge?
- What new communication services are students requesting?
- To what degree is your campus prepared to deliver new communication services to students? Is outsourcing a viable option?

Where to Learn More

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Endnote

1. The CAN-SPAM Act of 2003, Controlling the Assault of Non-Solicited Pornography and Marketing Act, has four main provisions. It (1) bans false or misleading header information, (2) prohibits deceptive subject lines, (3) requires that your e-mail give recipients an opt-out method, and (4) requires commercial e-mail be identified as an advertisement and include the sender's valid physical postal address.

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