Summary

The Communications Services Task Force was created by Vice President Rahimi to assess the University's communication services needs and to provide a blueprint for the deployment of Information Technology to meet these needs. The Task Force report focuses on the following communication services:

- Information Services
- Messaging Services
- Directory Services
- Calendar Services

It also outlines basic requirements for desktop systems, the network infrastructure, user training and support, and technical training and support.

The report identifies opportunities to coordinate the use of existing communication services and steps to begin the process of establishing a University-wide infrastructure for communications service. It recommends the University move towards the adoption of communications services in three ways:

- Begin to adopt existing communications services for appropriate University business
- Establish the organization and management structure that will provide leadership for the evolution of communication services at Northwestern
- Initiate an evaluation of technologies that can be used to establish the infrastructure necessary to support University-wide communication services

Finally, the report suggests that in order to truly benefit from its investment in
Information Technology, the University will have to give up old ways of doing things and fully embrace the use of new communication services.

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Introduction

The NUNet expansion project, connecting 150 academic and administrative buildings and 34 student residences on the Evanston and Chicago campuses, was completed in November, 1994. An active data plug is now available for each student in the residence halls for connecting a computer to NUNet. Student rooms in graduate housing and in many of the fraternities and sororities will be connected to NUNet over the summer. A major effort is under way by academic and administrative units to either directly connect or provide appropriate access to NUNet for all faculty and staff by Fall, 1995. Off-campus access, provided by a modem pool, will be enhanced this Fall.

NUNet is already changing the way the University community communicates and conducts business. Information servers are becoming convenient sources of information and documents. Some announcements are routinely posted on electronic news groups. Electronic mail is being used by many to send messages and to share documents. Some units of the University are scheduling meetings using shared electronic calendars. Also under way are improvements to administrative systems that will take advantage of NUNet to make administrative information and transactions more readily available.

As this experience continues to stimulate interest in expanding the use of communication services made possible by NUNet, a number of issues and concerns are emerging about the availability and reliability of information and about the use of communication services to conduct University business. Many of these issues are not technical, but human and organizational. Addressing these concerns in an ad hoc manner could lead to efforts being duplicated, to creating competing solutions, and to investing in systems that will not scale up to meet the needs of the entire University. Failure to recognize these issues could interfere with realizing the strategic benefits of investments in Information Technology to enhance the instruction, research, and administrative mission of the University.

The Communications Services Task Force was created by Vice President Rahimi to assess the University's communication services needs and to provide a blueprint for the deployment of Information Technology to meet these needs. The goal of this blueprint is to empower users, to enable more effective collaboration, to improve the quality of what we do, and to realize greater efficiencies. The Task Force report focuses on the following communication services:

- Information Services
Information Services

User Requirements

Northwestern University currently invests considerable time and money in preparing and distributing documents and information, used internally by faculty, students, and staff and externally by prospective students and faculty, alumni, and other institutions. In order for the University to provide these materials electronically, they must be readily available on NUNet, wherever and whenever they are needed. Previous versions of information and historic documents should also be made available for reference and decision making. Even occasionally used reference materials, such as instructions for using the University phone system, should be available electronically.

Also needed is a clear organization of the information so it is easy to find. Ideally, one should be able to view the same information from different perspectives, depending upon one's information needs.

Making the search for information easy will require flexible search capabilities that involve specific constraints or only a general description of what one is looking for. The ability to automatically generate summaries of available information will facilitate broad searches and browsing through the many documents that might meet one's needs.

Documents should support electronic responses, including electronic forms, for submitting information, making requests, asking questions, and contacting the person responsible for the information.

Document Creation

Many of the requirements for preparing documents and information have already been met. There is clear responsibility for creating official University materials with processes established for content, editorial, and legal review. When used, professional layout and design assures that this information is attractive and easy to read.
A consistent design and set standards for University documents should be encouraged so electronic documents are easy to read and clearly distinguishable as official University materials. As appropriate, one should be able to create documents and information once for either print or electronic distribution with the same standard word processing and desktop publishing tools. Each document should identify who is responsible for maintaining the information, with creation and expiration dates clearly indicated.

People who prepare information need a consistent, easy-to-use interface for submitting documents. Such an interface would prevent unnecessary hand-offs of documentation, simply to have it posted. The creators of information should be responsible for keeping posted information current.

**Document Management Infrastructure**

Information service providers will be keeping track of thousands of documents in order to provide information to as many as 20,000 users. The requirements for moving documents through various approval processes and the need for advanced search and manipulation capabilities will require a document management infrastructure. This infrastructure should support not only current text-based documents, but graphics, sound, and eventually video as multimedia information becomes more common.

The technology should make it possible to automate such requirements as notification, request for action, and removing expired documents. A document management system should route documents electronically and automatically, as appropriate, for content, editorial, and legal review. It should enable the University to re-design existing processes and define new ones. The system should also control access to restricted information in conjunction with network authentication and authorization. It should be able to keep up with the anticipated increase in demand (number of users) and capacity (number and types of documents) through parallel and distributed computing technology. Perhaps most important, a document management infrastructure must remain stable while accommodating the evolution of user access tools, such as World Wide Web clients and commercial development tools.

The document management infrastructure should define standards and protocols for document preparation and control across the University. Documents should be "marked up" so they can be easily searched and manipulated, perhaps using SGML (Standard Generalized Markup Language). Such a process would allow for the creation of a repository of official long-term University documents containing catalogs, bulletins, handbooks, etc. that could be searched using sophisticated text processing tools and manipulated to create new composite documents. Local units and individuals would maintain information within a well-defined framework and could create new documents by integrating the relevant official material with information particular to their program.

Having control and responsibility for information does not necessarily mean having to
support an information server. In a distributed computing environment, where the information resides should make no difference to the user and the provider of information. A document management infrastructure should support both central and distributed services. Central services can maintain standards and document discipline and support the diverse needs of the University community as information service providers. Units of the University and individuals that wish to provide their own information services must be able to support document standards, guarantee reliability, and provide their own technical support and maintenance.

Benefits

Electronic information could be more convenient to use than paper if it is readily available, easy to find and search, and easy to read. Such steps should discourage the urge to print personal copies and reduce publishing and distribution costs. If electronic information can be more easily created, distributed, and used, duplication of efforts and shadow information systems could be eliminated. The electronic creation and submission of information would also make documents more up-to-date and complete, providing access to archival information to support decision making. And through the Internet, valuable information can be made available to prospective students, for faculty and staff recruitment, to alumni, and to support development efforts.

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Messaging Services

One-to-One: Electronic Mail for University Business

Today, electronic mail can support person to person communications and collaboration for the informal exchange of information and documents not requiring security, automatic confirmation that a message has been received, and that does not assume a message has been archived. This use of electronic mail parallels the manner in which telephones are used to conduct University business.

When electronic mail is used for official University business, users must adopt conventions similar to those of paper correspondence, such as requesting confirmation that a message has been received and archiving electronic messages for future reference. The demands for commercial Internet services should encourage vendors to address some security concerns by supporting electronic signatures to assure that a message is from the person indicated and document encryption to prevent anyone other than the intended recipient from being able to read a message.

If electronic mail is to be used by groups of people to review documents and information, a document management system will be required to enable the structured and secure
routing of messages that typical electronic mail systems do not support. The system would archive and manage messages and documents, with backup and security protection, so they will be available for future reference. Such a system could play an important role in re-designing various University review and approval processes.

**One-to-Many: Electronic Mail Announcements**

There are approximately 14,000 full-time students, 1,850 full-time faculty, and 3,100 full-time staff at Northwestern. The routine use of electronic mail to send the same message to thousands of people can undermine electronic mail performance and clutter electronic mailboxes. Specific lists of electronic mail addresses should be made available for sending official University announcements, just as mailing labels are available from Human Resources for sending notices via campus mail. Access to each list of electronic mail addresses could be restricted to people authorized to send messages to the list. For example, a dean's office would be allowed to send electronic mail to faculty, students, and staff in the school, while a department chair would be allowed to send messages only to faculty and students in the department. Those who are not authorized to do so could make special requests to send messages to these lists.

Electronic mail could be used to notify people who, because of their responsibilities or special interests, need to know that information has become available on an information server. Electronic mail could also be used to send announcements, such as emergency notifications that are currently faxed, to appropriate people with the expectation that a message will be read soon after it arrives. Users should be able to subscribe and unsubscribe to these types of specific electronic mail notification services, possibly through Directory Service.

**Many-to-Many: Collaboration**

Electronic mail, listServ electronic mail distribution, and electronic news groups do not provide good support for the structured needs of collaboration among members of the University community. A collaborative environment should empower users to easily create secure electronic workgroups for discussion, interaction, planning, and decision making that will support instruction, research, administrative, and community needs. The collaborative environment should be integrated with electronic mail and make it easy to organize and manage topics for collaboration and to share files as attachments.

**System Requirements**

With the volume and variety of electronic mail expected to increase, a messaging system should enable users to manage their electronic mail so high-priority messages and requested information can be automatically separated from less important messages not requiring immediate attention. It should support the mobile user so electronic mail and collaborative activity can be checked from different locations and computers. It must support the exchange of information and attached documents containing text, graphics,
sound, and video between individuals, groups, and applications on computers running standard desktop operating systems. The system should support the routine sending of messages to large numbers of recipients. If requested, it should automatically send confirmation when the recipient has opened a message.

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Directory Services

User Requirements

Access to a consistent, up-to-date database of information about the University community will play an important role in the University’s communication services. This should not only include information about faculty, staff, and students, but also enable schools, departments, administrative units, organizations, and programs to become registered in the Directory and allow users to include useful additional information about themselves. The Directory should automatically link default information, such as the departmental fax number, to a person's record.

Just as we depend upon listed phone numbers and campus addresses to routinely conduct University business, electronic mail addresses, including those not on public computers, will have to be easily registered in Directory Services. Because a person's electronic mail address, like his/her phone number, will be used for a variety of purposes, it is essential that people and organizations adopt an alias that will not change and is used to direct electronic mail to a current account, which may change. Directory Service should enable users to identify a proxy who will receive their electronic messages for them. Training and on-line information on how to take advantage of Directory Services will be necessary to assure that personal information is properly maintained.

System Requirements

Users should be able to browse through the Directory (at least by name), as they would the phone book, from any standard desktop operating systems. Search capabilities should include Boolean searches (to find someone on the Chemistry faculty named Mary), a glossary of nickname alternatives (so Robert Smith is searched for when Bob Smith is not found), and fuzzy logic that enables the user to search without having the exact information (the name sounds like Risninsky but is spelled Ryzinski).

People should be able to use the Directory to identify electronic mail addresses of specific groups of people for distributing announcements. It might be necessary to limit the number of recipients on such lists in order to control the impact of these mailings on the electronic mail system.
The Directory Service should provide for a user profile that makes it possible to subscribe/unsubscribe to specific announcement services. This could include emergency notifications for department coordinators, announcement of service disruptions for technical support personnel, and messages that certain information has been posted or changed on an information server. Some people should automatically receive certain types of messages based on the information in their Directory record and user profile.

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**Calendar Services**

**Usage**

A master University calendar to schedule meetings, events, and resources could be very useful to the Northwestern community. Course registration could appear automatically on a student's calendar and teaching schedules could appear on faculty schedules. A University calendar could be used for scheduling classes, lectures, and meetings and for reserving rooms and resources. It could be used by student and performing arts organizations to make schedules and event information readily available to the Northwestern community.

At least initially, there would be no guarantee that everyone would use the calendar in the same way or to the same degree. For example, administrators would keep their calendar current so meetings could be easily scheduled without numerous phone calls or electronic mail messages. Faculty might use their calendar to keep track of the courses they teach, office hours, departmental meetings, and academic events. They might also use calendars to schedule rooms for meetings and electronic classrooms for guest lectures. Students might use their calendar to keep track of recurring events, such as classes and jobs, and refer to public calendars to find out the dates and times of meetings, concerts, performances, lectures, and other University events.

**System Requirements**

A University calendar would need to be available as a combination of central and distributed services that can communicate with each other to negotiate meetings. Individuals must have control over how public or private their calendar is and over the scheduling of unsolicited meetings. The calendar must be dependable and secure, with regular backups for recovery in case of a system failure. The calendar must support mobile computing so people can bring their calendar with them on portable devices and update their schedules when they connect to NUNet. Resource and performance requirements, especially if multiple calendars are copied onto individuals' computers, should be carefully considered.
Basic Requirements

Desktop Systems

In order to realize the benefits of communication services, the University community must have appropriate access to networked computers capable of running all communication services. Applications must run on standard desktop operating systems from either on-campus or off-campus. Funds for maintenance and upgrading these systems should be a recurring budget item so desktop resources will keep pace with the University's evolving communication services needs.

New applications and improvements to communication services must be evaluated for their impact on the memory, storage, and processing requirements of existing equipment. Deployment of new services should be coordinated across the entire University in order to maintain universal access to communication services. Units of the University that do not adhere to University standards and guidelines for communication services should be expected to guarantee their own interoperability needs.

Network Infrastructure

NUNet must continue to evolve and remain ahead of the University's immediate communication needs. Evaluation and pilot testing of future networking technologies must be encouraged so network bottlenecks and the lack of network capabilities, especially to support multimedia, will not interfere with the development and benefits of University communication services.

User Training and Support

Training and support will be required to assure that all members of the University community know how to use communication systems, are aware of policies and guidelines for their use, and understand their responsibilities for using these services. New employees will need specific training in the use of all communication services before they assume their regular responsibilities. All students should be introduced to these services as part of New Student Week.

Technical Training and Support

Current technical staff and information providers will need to develop new technical skills if they are to begin to support necessary communication services for the University community. This experience will enable them to provide informed leadership for new
RECOMMENDATIONS

The University should move towards the adoption of communications services in three ways. First, it should begin to adopt existing communications services for appropriate University business. Second, it should establish the organization and management structure that will provide leadership for the evolution of communication services at Northwestern. Third, it should initiate an evaluation of technologies that can be used to establish the infrastructure necessary to support University-wide communication services.

Adoption of Communication Services

The adoption of communication services will involve a change in behavior for the entire University community. Just as people look at campus mail, read newspapers and magazines, listen to the radio, and watch television, people will need to become accustomed to referring to campus information servers to find information and to keep up-to-date about the University. Checking electronic mail will need to be as routine as reading campus mail, responding to phone messages, and picking up faxes. Directory service will have to become the natural place to look for how to contact a person or a unit of the University.

The cultural shift necessary for the adoption of communication services will begin when the University establishes a schedule with clear expectations for faculty, staff, and students for the way it intends to provide information and conduct business. The technical foundation for this transition to begin is already in place. Software recommended in Guidelines for Computer and Network Purchases for electronic mail, accessing information servers, and using the University electronic directory is readily available at no cost.

Assuming that all faculty and staff will have access to a computer connected to NUNet that is capable of running current communication services in the Fall, 1995, the University should begin to adopt the following procedures:

- Make important but non-essential University information available only in electronic form on campus information servers
- Expect units of the University to create and maintain electronically the information for which they are responsible
- Adopt electronic mail as the preferred means of routine, informal communication
- Establish electronic mail lists for sending University-wide announcements via
electronic mail

The University will need to clarify its expectations of how faculty, staff, and students should use communication services. These expectations should include:

- Checking electronic mail at least once a day
- Looking for official University information on an information server at least once a week
- Registering a current electronic mail alias and nicknames in the electronic directory
- Helping each other to become self-sufficient in using communication services

In order to begin the transition to using communication services for routine University business, the University will need to do the following:

- Establish guidelines and policies for the use of communication services
- Identify minimum competencies and provide users with the training to meet these requirements
- Provide support to users through the Information Systems and Technology organizations, Departmental Computer Support Representatives, and information providers
- Provide training to information providers and technical support personnel
- Adopt University-wide standards for communication services

It is important that an individual's first experience with communication services is a good one. Information that is made available only electronically must be easy to access, easy to find, and easy to read. The experience should demonstrate that electronic communication services can be easier and more convenient to use than paper documents. It should also encourage user input into planning for the expanded use of communication services.

**Organization and Management**

The University should begin to redefine the roles of existing organizations and to provide staff with opportunities for developing the expertise required to establish and support new communication services. To begin this process, units of the University will need to redirect staff responsibilities, provide training opportunities, and select strategic projects. Units of the University already involved in creating, distributing, and managing information should provide leadership and begin to coordinate processes for the adoption of communication services.

The Vice President for Information Systems and Technology should establish an oversight committee on which the following units of the University are represented: University Relations, because of its experience in document design and review; the University Library, because of its expertise in organizing and managing information; the Information Systems and Technology organizations, because of their experience
Coordinating efforts to develop information services
Reviewing policies and guidelines for the creation and use of information services
Developing consulting services for units of the University responsible for providing information and services
Identifying needs for training and support
Providing leadership for the evolution of communication services and for the development of an information management infrastructure

Technology Evaluation and Planning

Information Systems and Technology should assess current systems and their ability to support expanded University-wide communication services. It should evaluate appropriate technologies that can meet current and future needs while adhering to open standards in Northwestern's emerging distributed computing environment. The objective of this evaluation should be the development of a communication services infrastructure that can be used to integrate and manage information, messaging, directory, and calendar services. It must be able to meet the demands of 20,000 users and anticipate the migration to supporting multimedia services. This evaluation should include the following:

- Relational or object database technology as the foundation for creating a secure information management infrastructure that makes it possible to store, search, and manipulate documents, to automate functional requirements, and to support various review and approval processes.
- Document markup languages that can support advanced search and manipulation capabilities and provide a foundation for establishing a repository of official University documents and information.
- Messaging services that will meet official requirements for security, enable users to effectively manage their messages, support the exchange of attached files across standard desktop systems, enable collaboration among members of the University community, support the routine sending of announcements to possibly thousands of people, and provide for the structured review and approval of information.
- Integrated Directory Services with flexible search capabilities that can be linked to electronic messaging, information, and application services, and that enable users to subscribe and unsubscribe to appropriate communication services.
- Calendar services for managing personal schedules, official events, and resource reservations that can be linked to official information, such as course registration.
Conclusion

Realizing the benefits of communication services will require a cultural shift that will evolve through a combination of gradual change, the embracing of obvious benefits, peer pressure, and University-wide mandate. Expectations for this evolution should be guided by a realistic understanding of the resource, support, and technical implications of adopting these services. Some of the concerns about the reliability and use of communication services reflect potential shortcomings that also exist for paper, telephone, mail, and fax systems. Technical requirements described in this report are often inter-related and may impact a number of services. Some of these technical requirements will be addressed by vendors in response to commercial demands for communication services, while others may require internal development efforts. Some of the systems currently in use at Northwestern may not scale up to support the needs of the entire University and will have to be replaced. Finally, in order to truly benefit from its investment in Information Technology, the University will have to give up old ways of doing things and fully embrace the use of new communication services.

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