

Information Technology

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Distributed Computing Considerations

Harnessing the power of thousands of computers for large projects

Sound good?

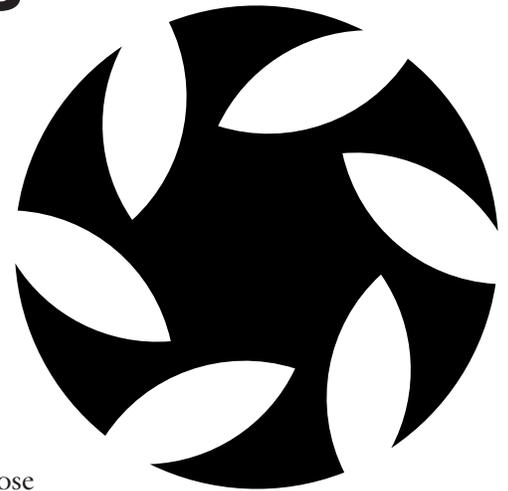
Recently a question came up about whether there are any University-wide policies, guidelines, or considerations in regards to running distributed computing projects on University PCs. For those unfamiliar with the term, distributed computing projects seek solutions to large problems by harnessing the computing power of thousands of desktop computers on the Internet. To do this they typically ask computer users to install software, such as a screen-saver, that allows use of their computer to participate in the project.

SETI anyone?

One of the best-known examples is the SETI@home project to search for extraterrestrial intelligence. (I would have suggested they start with terrestrial intelligence first, but they didn't ask me....).

Ownership

Individuals may think of their machines as "theirs" to do with as they want, and on a day-to-day basis this may be mostly true. But really these resources, the computer and



the network and the electricity, are to only be used for mission-related purposes — except, of course, for a little incidental use, such as occasional phone calls from home, a small amount of e-mail, etc. which are considered allowable.

In general individual employees are not empowered to commit University resources to others outside the University unless someone in a position of authority (delegated from the Board of Regents to the President, to the Chancellor, to the Dean, etc.) has approved the commitment.

To help think about this distributed computing question, think of an example without the computing angle. Perhaps an employee who thinks it is a good idea to give away University food or electricity to homeless people and proceeds to do so. Many of us would agree with the goal but would realize that the employee shouldn't do this without approval or should do it a different way, such as personal contributions. Examples such as this guide us to the answer for distributed computing too: use our existing approval processes.

Seek approval

Approval should be sought for computer and network use for projects such as the distributed computing projects. This approval should be by the usual suspects in your unit (Dean, Director, Department Head) and preferably in writing to prevent future misunderstandings. It is the approver's responsibility to review requests in the big picture of the unit and university mission, the requirements of various laws and policies, and to provide a broader perspective.

One reason we should use our normal approval process is that, inevitably, projects will come up in the future that are not as commonly accepted as recent examples and may even be extremely contentious. If each employee were empowered to decide, what would we do? Someone needs to watch out for institutional and other longer-term considerations. The best answer is to use our usual method for making wise decisions for allocation of resources and other such decisions for the University.

Security of University data

Although appropriate approval for the use of University resources is one important consideration with distributed computing, the security of University data

One reason we should use our normal approval process is that, inevitably, projects will come up in the future that are not as commonly accepted as recent examples and may even be extremely contentious.

is another. Increasingly, one needs to question the source and motives behind software downloaded from the Internet. What looks to be a download page for your favorite distributed computing project could, in fact, be a decoy page to download malicious software that steals your data or takes over your computer. As we've learned from the financial "phishing" scams, these "trojaned" web pages are enough of a problem that one must be very careful.

University resources

Another issue related to distributed computing that many may not think of is the use of University resources such as the data network, electricity, and air-conditioning. The person clicking "Yes, install the software now" rarely thinks about how its use may affect others on the University network, but this is a consideration. One client may not be noticeable but taken together several such clients may affect some other user's network experience. Electricity and air-conditioning costs can also be impacted. A computer in use for computation will eat electricity all night and all weekend and use yet more power to cool off the room in the summer. The University budget has to pay for that extra electricity and air conditioning.

Storing private data?

A final consideration is potential security problems because of software bugs. For example, being software (and subject to the usual number of software "bugs") the SETI@home screensaver had a vulnerability that was found in April 2003. According to the April 7, 2003 US-CERT announcement: "A buffer overflow vulnerability in the SETI@home client could allow a remote attacker to execute arbitrary code or cause the SETI@home client to fail. An exploit for this vulnerability is known to exist and may be circulating." SETI@home was patched a few days later; but for reasons such as this, distributed computing projects are a bad idea on University computers that store or access private data.

■ Ken Hanna, OIT Security and Assurance

“Thinking with Our Ears”

Enhancing Learning with Digital Audio

Each month, Digital Media Center (DMC) consultants publish a “Spotlight Issues” article on our web site about a current technology-enhanced learning (TEL) issue highlighted at sessions of the TEL Seminar Series, in our classes, or at our program or project meetings. This month’s article is excerpted below.

Our culture is dominated by the visual. Visual images and spectacles saturate popular culture, and our thoughts on education are unconsciously shaped by visual metaphors such as “illumination” and “enlightenment.” Visual images are of primary importance in technologies such as PowerPoint and the World Wide Web. Indeed, as educational activities have increasingly been mediated by the web, our sense of hearing has generally ranked second in importance — often as an intrusion to be blocked out so the learner can better focus on the course material before her or him. But does hearing deserve its secondary place in online pedagogy? Does the potential of audio and audio technologies in education exceed the delivery of recorded lectures? These questions are the touchstone for our February panel discussion.

February TEL seminar

Please join us:

Wednesday, February 1, 2006
402 Walter Library, East Bank,
Minneapolis, Twin Cities campus
12:00 P.M. to 1:30 P.M.

The seminar also will be available live online via Macromedia® Breeze™; sign up at <http://dmc.umn.edu/series/tel-seminar-breeze.shtml>.

Cristina Lopez, a senior educational technology consultant at the DMC, will moderate a discussion among the following panelists:

Jenise Rowekamp, Language Center, College of Liberal Arts, Twin Cities campus;

Thom Swiss, Institute for New Media Studies, School of Journalism and Mass Communication, Twin Cities campus;

Michael Hancher, Department of English Language and Literature, College of Liberal Arts, Twin Cities campus; and

Richard Reardon, Digital Media Center, Office of Information Technology, Twin Cities campus.

The panelists currently are working on projects to enhance students’ learning through the use of digital audio and will discuss uses of digital audio such as:

providing foreign language students with access to examples of diverse and authentic speaking styles and accents;

enabling learners and researchers to access primary source recordings that enliven content;

developing audio libraries that can help students access and review their own and others’ audio performances;

enabling students with visual and reading disabilities to access learning materials in alternative formats;

expanding use of audio in student assignments, such as through the development of digital storytelling projects, class presentations, and multimedia reports enhanced with audio annotations; and

enabling students to practice their foreign language skills in Web-based synchronous or asynchronous settings.

encoding, and syndicating files and points to a range of useful technical and teaching resources.

Bibliography

The following readings may help you prepare for the TEL seminar.

Bull, Michael, and Les Back. *The Auditory Cultures Reader*. New York: Berg, 2003.

Bull and Back present an edited collection intended to challenge the privileged status of vision in the hierarchy of the senses, to bolster the notion that “thinking with our ears offers an opportunity to augment our critical imaginations, to comprehend our world and our encounters with it according to multiple registers of feeling” (p. 2). To this end, the editors have collected works that cut across an array of disciplines, from the physical, cognitive, and imaginary domains, to the study of ambient sounds (“soundscapes”) and the ways in which they may reflect aspects of culture and society, to the acoustic cultures of professionals as diverse as doctors and jazz musicians.

A useful reference for expanding one’s thinking on the role of the senses in learning across the curriculum.

Gardner, Campbell. “There’s Something in the Air: Podcasting in Education.” *EDUCAUSE Review* 40, no. 6 (November/December 2005): 32–47. <http://www.educause.edu/er/erm05/erm0561.asp>.

Campbell describes a number of evocative scenarios in which podcasting could serve to motivate, engage, and inspire college students, including a biologist broadcasting a weekly “scholar’s diary” summarizing journal articles she read that week; students discussing the book of the week while practicing their language skills in an Arabic-language reading seminar; and Campbell’s own experiment in reading and commenting on the poems of John Donne.

Having established the potential of podcasting to enhance learning, Campbell provides a concise overview of the process of recording,

Hogan, Bryan J., and Peter Dooley. “Design and Deployment of a Computerized Audio Library with Internet Streaming for Students with Print Disabilities.” *Journal of Special Education Technology* 18, no. 4 (Fall 2003): 73–5.

Some students find reading difficult or impossible due to conditions such as blindness, visual impairment, cerebral palsy, or dyslexia; the use of audio recordings have proved to be one effective way to assist those with what the authors term “print disabilities” (p. 73). Digital delivery of recordings, with concomitant improvements in availability, portability, and capacity to support nonlinear navigation, offers further advantages. Hogan and Dooley discuss a system for digitizing, storing, organizing, and delivering such recordings.

Holmes, Glen, and Emet LaBoone. “The Importance of Culture When Creating Audio-Enhanced, Web-Based Instruction.” *TechTrends* 46, no. 2 (March/April 2002): 56–61.

Long before the advent of the web, radio played a role in distance education. As early as 1911, radio was used as an instructional medium at the University of Wisconsin (p. 56). Holmes and LaBoone’s application of web radio (“webio”), in their case the use of audio to create realistic decision scenarios to support classroom learning, succeeded



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through “the combination of familiar language, sounds, and music [to] help the learner identify with his or her surroundings” (p. 56).

Of particular interest in this study is the authors’ discussion of ways that formative evaluation can be conducted to improve the quality of learners’ experiences (p. 58).

Nwaeronu, N. G., and Gordon Thompson. “The Use of Educational Radio in Developing Countries: Lessons from the Past.” *Journal of Distance Education* 2, no. 2 (1987). http://cade.athabasca.ca/vol2.2/7_Nwaeronu_and_Thompson.html.

In their overview of research on educational radio that was conducted through the 1960s, 70s, and 80s, Nwaeronu and Thompson provide many instructive examples of radio as an educational medium that can promote active learning. Designing programming that addresses the interests and needs of the target audience is an important step, but research has revealed that radio programs do not have significant educational impact unless programmers also provide opportunities for discussion and guidance through the learning process.

Extension workers who designed and implemented the “Radio Farm Forum Project” in Thailand during the mid-70s reinforced the relevance of programming for their audience by creating opportunities for discussion and problem solving, and promoting a two-way flow of information between farmers and extension workers. Village forums in a similar project in Ghana provided listeners with the opportunity to discuss issues before the radio program and debrief after. Researchers found that villagers who participated in forums learned more than villagers who only listened to the radio programs. In short, educational radio worked best when programming was connected with sound pedagogy and a sensitivity to the cultural norms and practices of the target audience — a valuable lesson that is equally applicable today for faculty members contemplating the use of podcasting or other digital audio presentation of course content.

Campus resources

The following campus services and sources may help you further explore how digital audio can be used to enhance learning:

- ✓ Meet with one of our consultants. See <http://dmc.umn.edu/consultations/>.
- ✓ We provide fee-based video production services to on- and off-campus customers. These services include digitizing and compressing audio and video for Web and CD-ROM delivery. See <http://dmc.umn.edu/video/>.
- ✓ Many other instructors who have used our services or participated in our programs have worked on TEL projects designed to enhance learning with digital audio. To learn more about TEL Grant Program projects, see the project proposals linked from the Award Winners pages at <http://dmc.umn.edu/grants/>. To learn more about other campus TEL projects, see the Exemplary Projects section of our site at <http://dmc.umn.edu/projects/>.
- ✓ See our A Brief Guide to Podcasting in Education at <http://dmc.umn.edu/etf/podcasting.pdf>.
- ✓ Java and Web Services (JAWS) web hosts streamed media files. See <http://www.jaws.umn.edu/>.
- ✓ Podcasting is possible with the University Libraries UThink blogging tool. See <http://blog.lib.umn.edu/>.
- ✓ The College of Liberal Arts Language Center web site “Instructors” sub-page links to a number of sites with information and resources relevant to the use of digital audio in second language instruction. See <http://languagecenter.cla.umn.edu/>.
- ✓ Radio K offers professional studio audio recording services for a fee. For details call 612-625-3500 or visit <http://radiok.cce.umn.edu/>.

■ Cristina Lopez, Chris Scruton, and Christina Goodland, Digital Media Center

More About Sharing Bandwidth

▼ Bandwidth Management Implemented to Improve Internet Access

What problem are we trying to solve?

Internet bandwidth utilization at the University of Minnesota has seen growth similar to other institutions of our size. In recent years this has meant increases on an order of magnitude over the course of a single year. The University shares this bandwidth with the State of Minnesota. The Internet and all the resources that it brings to the University and the State of Minnesota is vital for core mission activities. For the University specifically, research and education. Clearly a strategy to manage this valuable and costly resource in necessary.

Recognizing that the annual increase in internet needs outpaces the University's ability to fund limitless growth, the Office of Information Technology (OIT) began to investigate prudent, generally accepted methods to manage consumption of internet bandwidth. (We are not alone in this problem. Many universities are challenged to manage costs by managing bandwidth. In fact, a whole business market has grown to produce tools to help manage bandwidth.

See

OIT's University Network Management Guidelines: <http://www.umn.edu/oit/policies/networkmanagementguide.html>

Information Technology Policies: <http://www.umn.edu/oit/policies/>

The culmination of OIT's investigation recommended a policy based approach using industry accepted tools to manage bandwidth consumption. The guiding principle that core mission traffic, used primarily for research and education purposes, would have priority over traffic and applications that could be considered mainly recreational.

What is OIT's approach to this problem?

OIT has implemented a policy of prioritizing and limiting traffic based on demographics of applications. An analogy may help here. Think of the internet as a multi-lane highway in a busy metropolitan area. The ramps (our internet border) often have signal lights to limit the total amount of traffic allowed onto the freeway in a given time. Without these limiting factors, freeways would soon become crowded and unusable (traffic jams). Further, there may be only so many special permits allowed on the freeway for certain applications of traffic or data (example- higher weight vehicles or high bandwidth recreational traffic) to avoid congestion during certain hours of the day.

The University of Minnesota is utilizing a bandwidth manager to prioritize and limit traffic in much the same manner as the freeway example. It manages the traffic to and from the internet based on time of day. The end result is that all types of traffic receive a fair and adequate level of service both to and from the internet; and mission critical traffic (education and research) receive priority.

In order to accomplish this goal, OIT will make management decisions to limit the total impact of certain applications. In the freeway analogy, these would be classified as special permit vehicles. For lack of a better term, we classify these applications as "High Bandwidth Recreational Applications." These applications often are Peer to Peer (P2P) applications such as KaZaA and are primarily used for recreational use. Often these applications will utilize all the bandwidth available to them causing congestion on the University's internet links.

Summary

By managing all types of traffic bound to and from the internet, we will ensure that all users

receive a very good quality of performance, while still protecting the University's primary functions: Research and Education. During the preliminary testing using the above configurations, it was noted that all University users experienced a level of service that was greatly superior to that of any non University residential connection at a fraction of the cost.

■ <http://www.umn.edu/nts/network/issues.html>



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Acceptable Use of Information Technology Resources: Academic/Administrative Policy 2.8.1

Excerpt

User's Rights and Responsibilities

Members of the University community are granted access to information technology resources in order to facilitate their University-related academic, research, and job activities. The Regents Policy on Academic Freedom extends to information resources that are available electronically. However, by using these resources, users agree to abide by all relevant University of Minnesota policies and procedures, as well as all current federal, state, and local laws. These include but are not limited to University policies and procedures related to harassment, plagiarism, commercial use, security, and unethical conduct, and laws prohibiting theft, copyright and licensing infringement, unlawful intrusions, and data privacy laws.

Users are responsible for:

- reviewing, understanding, and complying with all policies, procedures and laws related to access, acceptable use, and security of University information technology resources;
- asking systems administrators or data custodians for clarification on access and acceptable use issues not specifically addressed in University policies, rules, standards, guidelines, and procedures; and reporting possible policy violations to the appropriate entities listed in this document (in the Contacts and Procedures sections).

Excerpt

The University's Rights and Responsibilities

As owner of the computers and networks that comprise the University's technical infrastructure, the University owns all official administrative data that resides on its systems and networks, and is responsible for taking necessary measures to ensure the security of its systems, data, and user's accounts. The University does not seek out personal misuse. However, when it becomes aware of violations, either through routine system administration activities or from a complaint, it is the University's responsibility to investigate as needed or directed, and to take necessary actions to protect its resources and/or to provide information relevant to an investigation.

Individual units within the University may define additional conditions of use for resources or facilities under their control. Such additional conditions must be consistent with this overall policy but may provide additional detail, guidelines, and/or restrictions.

See the entire policy online at

http://www.fpd.finop.umn.edu/groups/ppd/documents/policy/Acceptable_Use.cfm

