

The University of Akron
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John J. Hirschbuhl



*An Audio Welcome
From John J. Hirschbuhl*

A. PROJECT SUMMARY

This proposal to the "Connections to the Internet Program", NSF 96-94, requests funds to provide a connection between The University of Akron (UA) and the Ohio Academic Resources (OARnet) Point Of Presence (POP) in North Royalton. This will provide UA with a high-speed vBNS connection in order to expand the University's communication within the research and educational community through several of its current and future research projects. Researchers at UA are involved with other high performance computer centers such as the Ohio Supercomputer Center and various NASA supercomputing facilities. In addition several of our faculty members have ongoing collaborations with faculty at other institutions which often require file transfers, display of graphics and animation across the network. Current bandwidth limitations have made it necessary to upgrade our current backbone to a state of the art ATM based backbone. However, bandwidth limitations off-campus continue to prevent effective collaboration over the network. This project will provide vBNS access to a number of NSF, NASA and DOD supported research projects.

The campus infrastructure will be upgraded to assure coordinated access by high bandwidth applications. The UA will include fiber optics directly connecting high performance workstation clusters to the University's ATM backbone. The vBNS backbone provides a QoS commitment to UA. Information Services has the primary responsibility for access and performance issues related to the campus network. UA's strong support for this project is shown by its 93% share of the costs for hardware, network infrastructure and line costs.

Our research faculty and others will use the vBNS connection to:

- 1) Share unique and expensive resources from our nuclear magnetic resonance (NMR) center which specializes in the development of techniques for the characterization of materials, synthetic polymers, dendrimers, and supramolecular structures.
- 2) Permit research teams working at three major universities to effectively utilize large spatial-temporal data sets compiled from NASA's high-resolution remotely sensed data, the extensive geographic information system (GIS) data sets, and advanced Web-based visualization techniques.
- 3) Develop interfacial motions in materials problems by comparing sharp interface models with phase field models in certain asymptotic parameter regimes that require large-scale computations which are transferred between NASA Lewis Research Center and UA.
- 4) Provide a data source for collaborative clinical outcome research, which will allow users to document patient problems and outcomes of care, by utilizing national and community health care data bases that contain large scale 3D colored CAT scans and other mathematical 3D reconstructions of 2D images.
- 5) Distribute broadcast quality (MPEG2) two way video, instructional sessions, locally, regionally, and nationally.
- 6) Advance research in computer simulations of static and dynamic physical properties of polymers.
- 7) Develop high speed parallel methods for generating and transporting very large primes in support of cryptology.

UA researchers are collaborating with researchers at nationally distributed locations including Ohio State University, The University of Illinois, Northwestern University, The University of Pittsburgh, The University of Maryland, NASA Lewis, DOD, DOW Chemical, Dupont and many others.

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C. PROJECT DESCRIPTION

C1. Introduction

The objective of the Internet2 project at The University of Akron is to enhance the research environment and the quality of education at UA by providing access to the vBNS backbone. This will enable UA researchers to have a high speed connection to facilities throughout the nation. Fourteen years ago, UA began the process of building a fiber based network infrastructure for the entire University community. The project established a commitment to provide high speed interaction on an intra level. UA is now making a commitment to collaboration on an inter level as key enabling technology for fulfilling its educational, research and service missions. UA is in the process of upgrading its FDDI backbone and enterprise network to an ATM-based backbone. The infrastructure investment will assure high quality vBNS access to the UA researchers in a cost-effective fashion.

In addition, UA is expanding its connection within the research and educational community through several of its current research projects. Many of these projects connect to national organizations such as NASA, NSF, DOD and others. These current and future projects require an ATM OC-3 (155 Mbps) connection to the vBNS Point of Presence (POP) in North Royalton. The recent infrastructure investments in Ohio and at UA will assure cost-effective, high quality vBNS access to UA researchers. During the next two years, the campus infrastructure will be managed and where necessary upgraded to assure coordinated access by vBNS applications. The university's commitment to the project is indicated by its large investment in its networking infrastructure, its percentage match in cost sharing and its request for funding for hardware and line costs for the first two years of operation

A variety of the research activities at UA involve parallel and distributed high performance computing, the analysis and visualization of complex data sets, and collaboration with colleagues at remote locations such as Northwestern University, The University of Illinois, The Ohio State University and others. These applications cover a range of disciplines and projects. They form a pattern of significant research efforts that depend on high performance computing and networking to solve problems in such areas as chemistry, polymers, geography, mathematics, education, engineering, and health sciences. In addition, the University supports research efforts in fields that are not involved in high performance computing and networking, but would take advantage of opportunities as such capabilities become more readily available within the campus.

Researchers at this university are involved with other high performance computer centers such as the Ohio Supercomputer Center and various NASA super-computing facilities. In addition, several of our faculty members have ongoing collaborations with faculty at other institutions which often require file transfers, display of graphics and animation across the network. Occasionally these are not feasible because the bandwidth limitations. These difficulties demonstrate the demand for an upgrade of our current backbone to state of the art ATM based backbone and a connection to vBNS such as the ones housed in other environments at institutions that have collaborations with our faculty. In short, we want to get up to speed with our colleagues.

Objectives of this proposal

- To provide UA researchers and educators access to high-speed vBNS connection in North Royalton.
- To support UA researchers collaborative efforts with other high performance computer centers by enhancing the research vBNS connection.
- To support the authentic evaluation of learning in science through the local, regional and national distribution of broadcast quality (MPEG2) two way video.
- To provide a method for selecting and supporting future meritorious projects for access to resources on the national vBNS network.

C2. Participant Description

C2.1. The University of Akron

The University of Akron is located in the heart of the City of Akron. UA serves the metropolitan area of Summit, Stark, Cuyahoga, Medina, Portage, and Wayne counties of northeast Ohio. The UA campus has an annual enrollment in excess of 25,000 students, including graduate enrollment in excess of 4,000. UA is a publicly assisted urban institution that offers comprehensive programs of instruction; 200 undergraduate majors or areas of study leading to associate or baccalaureate degrees, 69 Masters, 17 doctoral and four professional programs. IN addition, UA offers several interdisciplinary programs leading towards Ph.D. degrees. The University is the first one to offer a doctoral program in Engineering Applied Mathematics, which is jointly run by the Department of Mathematics and Computer Science and by the College of Engineering. The University also pursues a vigorous agenda of research in the arts, sciences, and professions and provides service to the community.

UA has recognized in its academic master plan, the critical importance of its network infrastructure and Internet connectivity to the education, research, service and outreach missions. This importance is reflected in its existing network infrastructure (as explained in C.4) as well as its current expansion to a 622 Mbps ATM network and in its membership in the Internet II consortium. An Internet ID is available for all UA students and can be accessed at any time. In addition, UA provides support to its academic and administrative users. The University has been recognized for its continued support and development of its Computer Based Education and Testing facilities (CBE & T). CBE & T's primary mission is to assist faculty in the acquisition, development, and implementation of instructional support software which enhances, enriches and evaluates its instructional activities. In addition, UA collaborated with Kent State University and Case Western Reserve University to form a consortium, which was awarded an NSF Science and Technology Center for Advanced Liquid Crystal Optical Materials (ALCOM)—the only NSF STC in Ohio.

UA has a policy of continuing the development and maintenance of its current and new technologies that support the University's instructional, research and service components in achieving its academic and institutional mission.

C2.2. Information Services

The Department of Information Services provides computing, networking, and telecommunications support to meet the educational, research, and administrative requirements for the University of Akron. Its services include the Applications Services, Client Services Network Services and Technical Services groups. Its facilities include a centralized computing platform which houses an IBM 9672-R41 with 256 MB of memory running MVS-ESA operating system, an IBM 4381-T92E running the VM-ESA operating system (which is connected channel to channel to the 9276), a Digital Alpha Server 1000 4/266, two DEC-300/300 LX's, A Dec system 5000-240, and an IBM RS/6000-390. Information Services maintains nine laboratories for student and faculty use throughout the campus. UAnet, the high speed campus network, provides access to 4,000 local computers for electronic mail, library catalogues, and access to the central computer. UAnet provides access to the Ohio Supercomputer Center and to external computer networks including the Internet. The Computer Based Education and Testing Lab is a component of the Client Services group. Its use is restricted to students enrolled in courses which utilize online testing capabilities.

C3. Meritorious Applications That Require the High Performance Connection

C3.1. Peter Rinaldi Chemistry

Multidimensional Nuclear Magnetic Resonance Studies of Materials

Peter L. Rinaldi, Professor of Chemistry and Director of the Molecular Spectroscopy Laboratory

Funding Sources

NSF DMR-9617477 and DMR-9310642, Dupont and ICI; Contracts- ca. 20 corporations across the US.

Description of the Project

There are two aspects to this part of the proposal: frontier research in the development of NMR methods for analysis of polymers and a research service operation based on the use of unique instrumental capabilities present in the Molecular Spectroscopy Laboratory (MSL).

Research

Much of the research work in our laboratory involves the development and applications of new, multidimensional-triple resonance nuclear magnetic resonance (NMR) techniques for the characterization of synthetic polymers, dendrimers, and supramolecular structure.¹⁻⁵ We have developed a suite of experiments which provide complete atomic connectivity information in synthetic macromolecules. Methods for determining interatomic distances in molecules which have well-defined three-dimensional structures are being developed. These NMR methods are parallel to those developed by structural biologists, over the past 10 years, to obtain solution structures of proteins. The detailed molecular structures obtained from these new NMR methods provides information about the initiation and termination processes of polymerization reactions, molecular structure defects, polymer chain branching, polymer chain functionalization, reactivity and molecular configuration. Because these structural details are important in defining the stability and properties of materials, the information from the new NMR methods being developed are finding many applications in basic and applied materials science research. While the primary objective of this work was to develop methods for studying polymers, researchers across the country have come to us for assistance in studying problems in many areas of chemistry and biochemistry because of the many unique capabilities present in the NMR instruments here at UA.

NMR is the most valuable and generally applicable of all the spectroscopic techniques in chemical sciences. Of all the spectroscopic techniques, it generally provides the most information about molecular structure, properties and motion. Unfortunately, it is also the least sensitive of all the techniques, which is its most significant limitation. In a second research area, we are working in collaboration with major companies to explore the applications of new, high-sensitivity, high temperature superconducting NMR probe technology at ultra high field (600 and now 750 MHz). In the winter of 1996-97 we received the first of these probes, for our 600 MHz instrument. With this probe, we were able to obtain spectra from sample quantities as small as 1-10 ng. By the time this proposal is reviewed, we will receive a similar probe for our 750 MHz instrument which will provide additional capabilities and further improvements in sensitivity. This new technology will have a significant impact on basic and applied research in materials science and metabolic studies required for approval of pharmaceuticals, insecticides and herbicides. In materials science specific applications include the ability to obtain solution NMR spectra for sparingly soluble polymers and to detect resonances from chain-end groups of very high molecular weight polymers.

The NMR center at The University of Akron is uniquely equipped to perform this research; the center has over \$5 million of NMR instrumentation and supporting equipment, including an array of workstations which are networked via Fast Ethernet switches. Among the instruments is a 750 MHz NMR, which is one of only 10-15 in the country. **It is unique in that it is the only one of its kind in the world which is dedicated to materials science research** (other 750-800 MHz instruments are used for protein structure determination and are equipped with accessories for that work). The 750 MHz instrument at the UA has over \$0.5 million worth of special probes and accessories, which have been specifically designed to study synthetic macromolecules, and which are not found on other similar instruments. The facility was established in 1987 as a regional resource, and has been used by researchers at over 30 academic research groups and 40 industrial research laboratories.

The primary mode of operation involves collection of data from samples which have been sent to us. The data files are then transferred via ftp to remote users. **Typical two dimensional (2D) data files are 10-100 Mbytes and three dimensional (3D) data files are 0.5-5 Gbytes.** File transfers are usually very bothersome and often require multiple attempts, which can each last up to several hours (limitations to transport of data are off campus, within our campus, file transfers proceed rapidly). The instruments in the laboratory are capable of producing several 3D files/day and several dozen 2D files/day. In this mode of operation, it is desirable to have the highest bandwidth possible, so that users can transfer files, can process data remotely, examine the data, and advise us to rerun experiments if the information they want is not present. If timely examination of the data isn't possible, additional instrument time must be scheduled at a future date to rerun the spectra using different experimental conditions. This process can often take several iterations, necessitates repeated reconfiguration of the instrument, and requires months before the needed information is obtained.

Projected Benefits of the Project

The preferred mode of operation would be to have the sample submitter involved with the setup of the experiment. This would lead to more useful datasets, more efficient instrument use, and faster solution of research problems. In this mode, the remote users would operate the instrument from their sites, examine the initial data as it comes from the instrument, and provide real-time feedback for optimizing instrument conditions. We have successfully used remote control of the instruments from within our building, which has a high-speed network. Any computer (PC, MAC or Unix workstation) can be adapted for this purpose by the addition of software which costs ca. \$200. **This mode of operation requires high bandwidth (many graphics files of several hundred kbytes each must be transferred and remotely displayed in real time), low latency and quality of service.** Once the instrument conditions have been optimized and the experiment is run; the completed dataset could be transferred via ftp to the remote site where processing and analysis would be performed or processed at UA with remote visualization of the of the resulting 3D graphics file.

The proposed network will also enable us to explore a new class of 4D NMR experiments which are not possible with our existing hardware. The amount of extractable information, and therefore the complexity of the molecules which can be studied, increases with the dimensionality of the experiment. Furthermore, unique information is available from the simultaneous correlation of 4 frequencies in a 4D experiment, which is not available in any combination of 3D experiments.

Collaborations

Researchers who have received data from our facility or with whom faculty affiliated with our facility plan collaborations in the near future include scientists at the following institutions which have connections to high speed a network: NASA-Lewis, Dupont Central Research, Case Western Reserve University, Kent State University, Ohio University, Miami University (Ohio), Georgia Institute of Technology, Syracuse University, and University of Illinois at Urbana-Champaign.

C3.2. Richard Klosterman, Geography and Planning

Planning Support Systems: Data Acquisition, Database Design, Modeling, and Visualization

Richard E. Klosterman, Professor of Geography and Planning and Director of the GIS Research Laboratory

Funding Sources

NASA Space Commercialization Funds (Pending)

Description of the Project

This research will be conducted jointly with the Ohio State University's Center for Mapping and Arizona State University's Center for Environmental Studies. The major funding will come from a continuation of the Center for Mapping's on-going NASA Space Commercialization project, in conjunction with Arizona State University's Central Arizona-Phoenix Long-term Ecological Research (LTER) Center (NSF Grant

DEB-9714833).

The three-year research project will explore the use of high-resolution (sub-meter resolution) remotely sensed data and advanced image interpretation techniques to support the four components of the planning support system (PSS) development process: (1) data acquisition and evaluation, (2) database design and construction, (3) space-time forecast modeling, and (4) product visualization.⁶⁻¹⁰ PSS extend traditional computer-based decision support systems (DSS) to: (1) incorporate a range of different types of information (most notably spatially-referenced information) and information technologies (primarily geographic information systems (GIS), expert systems, and the Internet); (2) consider a broad range of long-term ten-to-twenty impacts of public policy choices; and (3) facilitate the participation of the public and interest group representatives in the public policy-making process.

The project will utilize very large spatial-temporal data sets compiled from NASA's high-resolution remotely sensed data and the extensive geographic information system (GIS) data sets for the City of Phoenix compiled by the LTER project. **Both data sets are several hundred gigabytes in size.** The project will: (1) explore the use of advanced image interpretation techniques and high-resolution remotely sensed images to acquire detailed and current PSS data; (2) develop robust and flexible object-relational data structures for efficiently storing and utilizing these data; (3) apply a range of spatial-temporal analysis and forecasting models to the data bases; and (4) develop dynamic three-dimensional Web-based techniques for displaying current information and the results of model-generated simulations. The project will develop procedures for utilizing newly available high resolution remote sensed data, advanced image interpretation techniques, and sophisticated Web-based data visualization techniques to help inform and improve the public decision-making process.

The project will involve the simultaneous use of extremely large data sets and advanced Web-based visualization techniques by research teams working at the University of Akron, the Ohio State University, and Arizona State University. The primary data sets, which consist of extremely large remote-sensed images and spatially-referenced GIS data sets, will be stored at the Ohio State University and the University of Arizona and accessed via the Internet by researchers working at the University of Akron. The first, second, and fourth components of the research project — image interpretation, data base design, and visualization — will be conducted at Ohio State University. The third component — the spatial-temporal modeling and forecasting — will be done at University of Akron. All four components of the research will be accessed via the Internet by researchers working on PSS-related research at MIT, The University of California, Berkeley, The University of Illinois at Urbana-Champaign, and other research institutions across the United States. As result, a reliable very high-speed vBNS connection is essential for the project's success.

Projected Benefits of the Project

The University of Akron's component of the research will be conducted in the GIS Research Laboratory, located in the Department of Geography and Planning. The GIS Research Laboratory currently has a dedicated file server with 12 GB of disk space, four Windows NT work stations, a Unix workstation, and several large-format, high-quality input and output devices. This equipment is connect by a 100 Mbps local area network which has a direct fiber connection to the campus backbone. This equipment is well suited for the Laboratory's current research efforts but is totally inadequate for dealing with the extremely large spatially-referenced data sets and dynamic three-dimensional graphic images that are the core of this research project. As a result, additional UA funding will be used to purchase a larger and faster server and higher speed network connection between the server and the campus ATM backbone.

Collaborations

The primary partners in this project are at The Ohio State University's Center for Mapping and the Arizona State University's Center for Environmental Studies, which already have access to the Internet 2 network.

Researchers at the following institutions that currently have Internet 2 access will also be working with the data bases, models, and visualization results to be developed by this research: (1) Georgia Institute of Technology; (2) Massachusetts Institute of Technology; (3) The University of California, Berkeley, (4) The University of California, Santa Barbara, and (5) The University of Illinois at Urbana-Champaign.

C3.3. Gerald Young Mathematics

C3.4. S.I. Hariharan Mathematics

Modeling of Problems in Materials Science

G. W. Young and S. I. Hariharan

Funding Sources

NASA Grant NCC3-494

NSF DMS-953201 (G. W. Young)

Ohio Super Computer Center

NASA (Cray)

Description of the Project

This project involves the development of interfacial motions in materials problems. Specifically phase transition problems are of key interest. We are comparing sharp interface models with phase field models in certain asymptotic parameter regimes which can be analyzed without large-scale computations. Outside these regimes large-scale computations will be needed. The analysis of development of solidifying fronts as applied to thin films formation have received considerable attention in recent times. In our earlier work¹⁷, we investigated a practical situation of chemical vapor deposition (CVD) in conjunction with a vertical CVD reactor. The solution methodologies considered here have the potential of analyzing the thin film formation in a CVD reactor. Other ongoing related work are found in references.¹⁶⁻²⁰

In addition, full three-dimensional time dependent flow models in open domains, flow optics as well as general open domain problems that arise in electromagnetics are also being investigated. The details of these works are found in references.¹¹⁻¹⁵

High Performance Computing Source

This project requires high speed network access for computations, file transfers and a great deal of interactive compiling on remote supercomputers. Our connection is through the Ohio Super Computer Center and NASA (Cray).

Projected Benefits of the Project

Projected benefits include determination of choice of these models for a given processing configuration. **Currently, data files that are transferred between NASA Lewis Research Center and the Applied Mathematics Computation lab can be of the order of 2-4 Gigabytes depending upon the model. These large sets of data are being transported via tapes.**

Collaborations

We have ongoing collaborations with the University of New Mexico, University of Notre Dame, Northwestern University, Boston University, and NASA Lewis Research Center. These collaborations often require high speed network access for computations as well as for file transfers.

C3.5. Wayne Mattice Polymer Science

Static and Dynamic Physical Properties of Polymers

Wayne L. Mattice

Polymer Science, University of Akron

Description of Project

Computer simulations play a dominating role in our investigations of the static and dynamic physical properties of polymers. A substantial part of this work is performed in collaboration with academicians in other countries. Examples from Germany, Korea, Spain, Switzerland, and Turkey are cited below, in the order of the beginning date of the collaboration:

- Enrique Saiz, Professor, Departamento de Química Física, Universidad de Alcalá, Alcalá de Henares, Spain. 14 refereed publications coauthored with Prof. Saiz over two decades, 1978-1998. The first and most recent publications are cited.^{21,22}
- Francisco Mendicuti, Professor, Departamento de Química Física, Universidad de Alcalá, Alcalá de Henares, Spain. 35 refereed publications coauthored with Prof. Mendicuti and his highly productive group over the decade 1988-1998. The first and most recent publications are cited.^{22,23}
- İvet Bahar, Director, Polymer Research Center, Bogazici University, Istanbul, Turkey. 15 refereed publications coauthored with Prof. Bahar between 1988-1997, the first and most recent are cited.^{24,25}
- Tiirkan Haliloolu, Associate Professor, Department of Chemical Engineering, Bogazici University, Turkey. 12 referred publications coauthored with Prof. Haliloglu, 1993-1998, with the first and most recent cited.^{26,27}
- Ulrich Suter, Professor, Institut für Polymere, Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology), Zurich, a book and two major reviews, 1994-1998.²⁸⁻³⁰
- Julio Bravo, Associate Professor, Departamento de Ingeniería Industrial, Carlos III Universidad, Leganés, Spain. refereed publications coauthored with Prof. Bravo, 1994-1996, with the first and most recent cited.^{31,32}
- Burak Erman, Professor, Department of Civil Engineering, Bogazici University, Istanbul, Turkey. 4 refereed publications coauthored with Prof. Erman, 1996-1997, with the first and most recent cited.^{25,33}
- Junhan Cho, Assistant Professor, Department of Polymer Science and Engineering, Dankook University, Seoul, Korea. 2 refereed publications, in 1997, and a submission in 1998.^{34,35}
- Kurt Binder, Professor, Institut für Physik, Johannes-Gutenberg-Universität, Mainz, Germany, 1998.^{35,36}
- Kurt Kremer, Director, Max-Planck-Institut für Polymerforschung, Mainz, Germany, 1998.

Projected Benefits of the Project

Various portions of the collaborations with Saiz, Bahar, Haliloglu, Suter, Erman, and Binder have been supported, in part, by grants from the Division of International Programs of the National Science Foundation. Several publications that developed from these international collaborations involve the computation by Molecular Dynamics or Monte Carlo techniques, and subsequent analysis, of enormous files that contain the history of models of dense polymers. The computation might be carried out in one country, but some (or all) of the analysis conducted in another country. Rapid transmittal of large files facilitates this type of collaboration.

C3.6. Elizabeth Kinion Nursing

Nurse Managed Center: Primary Care at Satellite Sites

Elizabeth S. Kinion, ED, RN, CNP
Professor of Nursing
Director Center for Nursing,
Ekinion@uakron.edu

Funding Sources

DHHS grant IDIONU30212-01
AHEC grant #20-S-2 Summit Portage Area Health Education Network

Description of the Project

The focus of this project is to expand primary health services offered by the center for Nursing. The services augment an already well-established nursing center by providing linkages between the Center and medically under-served, vulnerable populations. Three outreach satellite clinics have been established to provide direct access to care. The clinics are co-located with other services such as food bank, social services, child development education, emergency housing, and HIV testing programs. The primary focus of this project is interdisciplinary education of health care providers. Care providers include registered nurse students, graduate nursing students, dietetic students, social work students, medical students and residents from North Eastern Ohio Universities College of Medicine and residents from Barberton Family Practice. Local collaboration includes, but is not limited to, Cuyahoga Falls General Hospital, Akron Children's Hospital, Summa Health System, Akron General Hospital, The Akron City Health Department and the Summit County Health Department.³⁶⁻⁴⁰ Provide a data source for collaborative clinical outcome research, which will allow users to document patient problems and outcomes of care, by utilizing national and community health care data bases that contain large scale 3D colored CAT scans and other mathematical 3D reconstructions of 2D images.

Collaborations

Of special interest is our database of client care, the Omaha System Data. This community health database allows users to document patient problems and outcomes of care. Our goal is to combine **our database** with other national nursing centers that use the Omaha System Data. This will then serve as data source for collaborative clinical outcome research, which will impact social policy development. Initial collaboration will occur with the University of Delaware, the University of Wisconsin, Madison, and other universities will be added annually. A high performance network connection will make this possible. Other institutions will be able to participate in this project as they obtain connections to the vBNS backbone.

Projected benefits of the Project

The inter connections of geographically distributed supercomputers via high speed networks will allow users to access the needed high performance computer power needed for large complex applications; users would no longer be limited by resources available at only one site. In addition to collaborative research projects a high performance network has the potential to facilitate medical/clinical care to the patients. Access to images in these records requires transmission of multiple Gbyte files within 10-15 sec.

C3.7. Kathy Liszka Mathematics

Parallel Algorithms for Generating Large Tables of Primes

Kathy Liszka

Associate Professor of Mathematical Sciences

Funding Sources

NSF Grant CCR-9634559

Description of the Project

The search for efficient algorithms to produce large primes is motivated largely by the needs of cryptologists and number theorists.⁴¹⁻⁴³ The focus of the project is to investigate variations on sieving algorithms to generate very large tables of primes efficiently using parallel architectures. Testing and implementation of the algorithms are based on selected mapping and communication structures that are determined to be optimal. Of special interest is insight into the scope of memory limitations that must be addressed in order to generate primes to 10^{18} . Break even points between various algorithms are being identified to determine how feasible it is to reach a certain point given a particular algorithm.

High Performance Computing Sources

This project requires high-speed network access for moving large file of primes, both for initial setups in some algorithms, and for the final results on remote computers. The connections are to the Ohio Super Computer Center and Purdue University.

Projected Benefits of the Project

Currently it is not feasible to store data files of the size needed for primes up to 10^{13} or larger, at the remote sites. It is necessary to transport the data back to the local site so that testing may be done on the data to verify correctness. This application requires visualization of 10-40 Mbyte files within 10 seconds.

Collaborations

John K. Antonio, Texas Tech University

H.J. Siegel, Purdue University

Samuel S Wagstaff, Purdue University

C3.8 Steven Myers, Office of the Provost

Lynne Pachnowski, College of Education

Thomas Bennett, University Libraries

The MedinaLink Virtual Branch Campus

Steven Myers Associate Vice President for Information Services

Lynne M. Pachnowski

Asst. Professor, Dept. of Curricular and Instructional Studies

Thomas Bennett, Director of Audio Visual Services

Funding Sources

Line item appropriation, Ohio Board of Regents, \$500,000

Schoolnet Electrical Infrastructure, State of Ohio \$3,000,000

Description of the Project

The University of Akron is building a Virtual Branch Campus in Medina County, adjacent to the county in which the University of Akron resides. With funding from the Ohio State Legislature, UA has created a very high bandwidth link to the county using *ATM over fiber optic cable*. The pilot phase of The Virtual Branch Campus project consists of an interactive, two-way audio-visual distance classroom located within the University of Akron's library which is linked to an identical room in a Medina County high school. Starting Fall 1998, four Medina County sites will be operational and by the year 2000, the university will have multiple university-housed rooms linked to seven Medina County high schools and three other Medina County sites. Currently, the university offers undergraduate core courses to community residents early in the day and graduate education coursework later in the day. By the year 2000, two-year college courses, undergraduate core courses, and graduate courses from relevant colleges such as nursing and education will be available to the Medina County community through the use of these classrooms.⁴⁴⁻⁴⁹

Studies conducted and planned for the 1998-1999 school year seek to determine the most effective and efficient manner to deliver collegiate coursework using this alternate delivery system. Research questions being considered include the amount of content a MedinaLink student is able to process the level of classroom participation, and the level and amount of interaction between the student and the instructor. Several MedinaLink professors have attempted to measure their students' performance levels in order to determine instructional weaknesses and improve instruction through this medium.

Dark fiber has been leased from the local cable television companies to build a robust OC12 backbone connected to each classroom via an OC3. The video and audio are encoded in MPEG2 in order to maintain

full broadcast television standards. The MPEG2 is encapsulated in ATM packets and transported over the Cisco based ATM network. ATM is needed to provide a QoS guarantee that is needed to deliver consistently high quality audio and video. With a teacher site and four remote sites more than 72 megabits of bandwidth are consumed

Projected Benefits

Through the implementation of this project, the residents of Medina County will have the convenience of pursuing undergraduate, graduate, or continuing education studies within their home county and also have access to all university library resources through on-line technology. Furthermore, “virtual field trips” bring resources from all over the world to the residents of this growing county.

Besides the benefits of the program to the current and potential students of Medina County, the instructors who teach in the distance learning classroom self-report improvement in their teaching skills and methodology. The superior technology available in the classroom consistently challenges the instructors to find new and better ways to present media-enriched material to their students and to encourage participation from students at remote sites.

We have demonstrated the ability to use the rooms and the network to conduct remote scientific collaboration as well.

Collaborations

Both technological and educational aspects of the project have been designed in collaboration with the Medina County Schools and the individual school districts who are or will be hosting the technology. NASA-Lewis Research Center has been a pilot remote site for a physics course and has, in return, presented NASA resources to Medina County teachers using the classroom technology. Also, several state, college and local educational institutions have initiated communication with the university to discuss the possibility of sharing or receiving academic programs. Since the network is being built to ‘internet2’ standards, requires QoS, MPEG-2 and ATM and offers extremely low latency and jitter, we believe that this technology can be the future standard for real-time visual interactive communication with other schools on the vBNS. Finally, other Universities, such as Case Western University, have already expressed interest in adopting these standards

C4. Special Criteria for High Performance Connections

C4.1. Applications Summary

The applications detailed in this proposal consist of significant scientific research, which has received external review and is funded through federal, state and business agencies. They represent a range of activities from nuclear magnetic resonance, networking, scientific computing, distributed computing and other networked imaging and animation applications. This proposals bandwidth needs are presented in terms of data size and time constraints for delivery. Our calculations for each research project were consistently above 10 MB/sec, and in some cases as high as 88 MB/sec. The following is a brief summary in tabular form.

PROJECT	SECTION	BANDWIDTH NEEDS	SUPPORT
Rinaldi Multidimensional Nuclear Magnetic Resonance Studies of Materials.	3.1	2D, 3D, and 4D data sets, .5 to 5 GB size, within one minute 83 MB/sec. Remote Instrument Operation 10MB/sec	NSF DMR-9617477 NSF (Pending) Ind. Research Labs (10-12)

Klosterman Planning Support Systems Data Acquisition, Data Base Design, Modeling, and Visualization	3.2	Hundreds of GB to be delivered in minutes. 33-66 MB/sec	NASA SCP (Pending) OBR Investment Fund
Hariharan & Young Modeling of Problems in Mathematical Sciences	3.3 3.4	2 to 4 GB depending on the model with visualization 33-66 MB/sec	NASA NCC3-494 NASA (Pending) NSF DMS-9532021 NASA Pending
Mattice Static and Dynamic Physical Properties of Polymers	3.5	Monte Carlo Methods with visualization require 25 MB/sec desirable	FAA NSF DMR NSF EPIC NSF (Pending) NSF DMR (Pending)
Kinion Nurse Managed Care at Satellite Centers	3.6	On demand transfer requirements of multiple GB files within 10 to 15 seconds 10MB/sec	DHHS IDIONU30212-01 SPHEN #20-S-2 AHEC
Liszka Parallel Algorithms for Generating Large Tables of Primes	3.7	Visualization requires no latency 10 to 40 MB files in real time 5-20 MB/sec	NSF RPG
Myers, Pachnowski, Bennett Virtual Branch Campus MPEG2 distance learning technology	3.8	Video data streams requiring QoS guarantees 72 Mb/sec	OBR State of Ohio

C4.2 Project Contribution to Emerging National/Global High Performance Network Infrastructure

The connection between UA and the OARnet POP to the vBNS backbone will expand the utilization of scarce resources and research on the structure of materials, MPEG2 distance learning technology, cryptography, visualized patient records, and dynamic properties of polymers on a global/national basis. One of UA's visions is to encourage collaborations across the national research infrastructure. Several of our faculty members have ongoing collaborations with faculty at nationally distributed institutions. UA's high-sensitivity, high temperature superconducting NMR probe is unique, and its real time research into molecular structures will be made available to others on the vBNS backbone. UA's innovative MPEG2 broadcast quality distance learning facilities will also be made available on the network and can be the prototype for future projects and collaborative instruction for vBNS sites.

C4.3. Network Engineering, Planning, and Participants.

Local network engineering, planning and implementation is directed by Mike Donnelly, Wide Area Network Project Leader and his staff.. Planning participants include Debra Keller, network architect, Joe Massey, network hardware configuration advisor, Peter Rinaldi, networked NMR specialist and Wayne Mattice, global networking advisor. The wide area connection will be planned by the above group with Eugene Wallis, Director of Technology at OARnet. The UA Information Systems representatives Debra Keller, Assistant VP of Information Systems, and Mike Donnelly have been an integral part of planning this proposal and will be responsible for integrating the connection with the campus ATM network.

OARnet agreed to be responsible for the engineering, implementation, and operation of the connection from Akron to the vBNS Gateway. OARnet's Network Operations Center will monitor the entire network and provide a help line on a 24 by 7 basis, and provide engineering support and usage reports. The OARnet Support Center will be responsible for assisting users and local campus engineers in the use of the network. (See attached letter.)

The time line for implementation of the network is:

Jan 1999	Anticipated Award Date	Oct 1999	Progress Report to NSF
Feb 1999	Akron-UA Connection	Mar 2000	Annual Report to NSF
May 1999	Installation of Akron-North Royalton connection	Sept 2000	Progress Report to NSF
July 1999	Configuration and testing completed	Mar 2000	Annual Report to NSF

C4.4. Current Network Environment

The UA main campus has a fiber backbone to all of the major buildings. The campus network, called UAnet, has more than 4,000 networked computers, approximately 1,000 of which are in student labs. Approximately two-thirds of the residence hall rooms have network connections. The network has an FDDI backbone and a switched Ethernet 100 Mbps backbone with endpoints being switched or shared Ethernet. The network is connected to OARnet, the regional Internet service provider, with four T1 lines. There are 288 PPP dialin lines. The regional campus, Wayne College, is connected to the main branch's network with one T1 line for data and one T1 line for voice.

The UA was one of the first institutions to invest in fiber optic cable and has been systematically laying fiber throughout campus since 1984. The University has invested every year and built a robust cable plant such that 57 of the 62 buildings on main campus have fiber connections, including all of the academic buildings. The University subscribes to a continuous improvement philosophy for the cable plant and network in addition to one-time expenditures, demonstrating a commitment to information exchange and recognition that the information infrastructure is strategic. This cable plant allows UA to take advantage of network technology by simply adding or swapping network components. Thus, UA, installed an Ethernet backbone in 1988 and upgraded to an FDDI network in 1992, added Ethernet switching in 1996, and is now adding ATM to the existing cable plant. This philosophy will continue into the future.

UA is now a member of UCAID and is involved in the Internet 2 project. A high performance campus computer network backbone for research and education is being installed during the summer of 1998. Cisco ATM switches and Cisco management software are being installed this summer to provide a separate OC12 (622 Mbps) backbone for those projects which need high bandwidth and/or quality of service (QoS). The network will provide an ATM connection to each of the six buildings involved in this proposal, and switched 100 Mbps Ethernet to each desktop. UA is upgrading the equipment of these researchers to support this high bandwidth at the desktop.

UA is also spending \$3.5 million to build a fiber based, OC12 & OC3 ATM network to connect high schools in neighboring Medina County. This segment of the network will provide higher education courses to qualified high school students, teachers, and adult learners, broadening the number of people who have easy access to higher education. This project, which will be operational by the fall of '98, and was funded by the State of Ohio.

A high performance connection from the North Royalton, Ohio vBNS gigapop will be interconnected with our local network because of the following planned change in our local infrastructure. UA will connect to OARnet's Akron point of presence (POP) using an OC12, which in turn will be connected to the OARnet gigapop using an OC3. This will enable the UA to take full advantage of the existing vBNS

connection proposed by OSU/OSC/OARnet (already funded, NSF NCR 0613909), the KSU proposal (which was funded in Jan., 1998), and OARnet's backbone network from Akron to North Royalton. This cost sharing provides a sustainable model for high-speed research networking in Ohio and reduces the cost of this proposal for both NSF and UA. UA's OARnet Internet2 fees, which are based on cost recovery, will be substantially reduced because NSF has already funded the vBNS connection to the OARnet gigapop. We are requesting funding for hardware and service provider line charges for each year of the proposal. In addition we are requesting funding for OARnet Internet 2 fees for each of the two years of the proposal.

C4.5. Quality of Service

ATM adds new dimensions to managing switched internetworks. Because ATM is connection-oriented, our gigapop provider will need to set up virtual circuit connections, monitor link statistics, and report usage. OARnet will do this through its AtmDirector. The AtmDirector automatically discovers and illustrates the topology of the ATM network, displays real-time circuit information, facilitates ATM network interrogation and troubleshooting by allowing selection of any virtual connection on an ATM link, tracking its entire path, and providing an intuitive interface in creating Permanent Virtual Circuits (PVCs) across the ATM network.

Researchers who choose ATM will be able to use the built-in QoS features of permanent virtual circuits and switched virtual circuits. Researchers who choose switched Ethernet to the desktop will also use the ATM backbone to the building and a minimum of 100 Mbps switched Ethernet to the wall jack, which will be monitored and bandwidth increased if it reaches saturation. Cisco's work on QoS over Ethernet can be tested and compared to that of ATM. This configuration will efficiently manage and operate networking at the campus, regional and national level by identifying those projects requiring high bandwidth and QoS to be separated and placed onto the new ATM network for distribution through the vBNS connection.

C4.6 Technical Expertise in Computer Networking

The University has played and continues to play a leading role in network services in Ohio. The Assistant Vice president for Information Services, Debra Keller, chaired the OARnet technical advisory committee, while a former Associate Vice President chaired the task force which created OhioLINK, the statewide library system, during the organization's formative years. Debra Keller is now vice-chair of the OARnet steering committee and is a member of the executive committee and the finance committee. Michael Donnelly is UA's Wide Area Network Project Leader. He and his staff have built a campus network that includes 5000 nodes, in 85 buildings with an FDDI Ring. There are also 300 dial-in ports over an access server and an Internet connection, which is setup over four T-1 lines. In addition Donnelly and his staff have installed Cabletron Ethernet hubs, Cisco Catalyst 5500 and 1010 switches using ATM. Donnelly has attended training on Cisco LAN switch configurations and Cisco ATM solutions.

C4.7 Plan to Make Service Broadly Available

As additional qualified users are identified, they can be added to the network. (Qualified Users are UA constituents who have research and/or education applications, which need high bandwidth and/or QoS, or need access to high bandwidth application through other institutions, which are available through this national network.) If the backbone needs to be upgraded, other OC12 rings can be added. Because UA already has a robust campus network in place, the projects requiring high bandwidth and QoS can be segregated on the new ATM network. UA has committed resources to continue this connection beyond the grant period.

C4.8. Cost Effectiveness and Cost Sharing

This project complements the Ohio State University (OSU), Ohio Super Computer Center (OSC), and Kent State University (KSU) projects already funded because our researchers have collaborative efforts with OSU & KSU and use the OSC facilities. Because we will all share one vBNS connection, the network in Ohio is very cost-effective design and builds on NSF funds already allocated within the State.

Because UA is less than one mile away from the Akron OARnet hubsite, the circuit cost between UA and OARnet is relatively low priced. Hundreds of thousands of dollars are saved by using OARnet's circuits between Akron and the vBNS connection in North Royalton Ohio.¹

The UA has already committed more than \$3 million for equipment and off campus fiber to extend the ATM network on campus and into nearby Medina County for synchronous and asynchronous education. ATM will be provided to each building in this proposal. UA routinely spends more than \$500,000 every year in operating costs, upgrading the campus network, fiber and network maintenance. Additionally, UA will provide funds needed to extend the high speed network to servers in those research groups which justify vBNS connections.

C4.9. Evaluation and Dissemination.

UA will evaluate usage of the high bandwidth and QoS applications on campus, within Ohio, and outside Ohio through realtime logging of message size, performance levels, and destination. UA will also evaluate research and educational perceptions as to whether this adequately services the needs. We will benchmark performance on the commodity Internet and compare performance with the high bandwidth network. UA will compare QoS on ATM endpoints with emerging QoS standards over Ethernet. UA will provide periodic QoS summary reports.

UA will attend conferences and present, as appropriate, information regarding this project. UA will also maintain an unsecured web page for access by any interested parties with up dates and information. UA researchers and educators, who are leaders in their field, will present their findings at national and international conferences and in refereed journals.

C5. Benefits

UA is currently upgrading network hardware to support an OC12 circuit to UA with OARnet vBNS. The UA will also make staff available to support researchers in establishing and maintaining their vBNS connectivity. This support will benefit research at UA, the greater Akron region, and across the country in a number of ways including:

- More effective and efficient collaboration through more efficient sharing of expensive campus resources with UA off campus collaborators.
- Better access to UA resources, such as the NMR Center, The Mass Spectrometry Center, GIS, and The Mathematics Computer Graphics and Computation Center.
- Innovative broadcast quality video conferencing facilities for instructional activities and collaboration throughout UA and its virtual branch campus and extension of this facility to all vBNS universities running native ATM.
- Make new opportunities possible for researchers and educators not currently involved in high performance computing or requiring high-speed networking.

¹ Simultaneously with using the vBNS the researchers at UA will be able to collaborate with other universities within Ohio.

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- [49] "Keeping Pace With Expectations," Opening Keynote Address, *Ohio Association of Registrars and Admissions Officers*, November 12, 1997.(Myers)

E. BIOGRAPHICAL SKETCHES

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EDUCATION

B.S. Polytechnic Institute of New York, 1974
Ph.D. University of Illinois at Urbana-Champaign, 1978

EXPERIENCE

The University of Akron, Professor and Dir., Molecular Spectroscopy Lab, 1992-present
Associate Professor and Dir., Molecular Spectroscopy Lab, 1987-92
Varian Assoc., Mngr. of Field App. Lab, 1985-87; Senior Applications Scientist, 1984-85
Case Western Reserve University, Assistant Professor, 1980-83
University de Liege, Liege, Belgium, Postdoctoral Research Fellow with P. Laszlo, 1979
Florida State University, Postdoctoral Research Fellow with G. C. Levy, 1978-80

SCIENTIFIC SOCIETY MEMBERSHIP AND AWARDS

National Institutes of Health Postdoctoral Fellow 1978-80
American Chemical Society
University of Akron, Outstanding Faculty Recognition, 1992
University of Akron, Outstanding Faculty Research Award, 1994

PROFESSIONAL ACTIVITIES

Instructor American Chemical Society Short Course on 2D-NMR, 1990, 1991
NSF & NIH served on various chemical instrumentation review panels 1990-95.
University of Akron Representative to OARnet (Ohio Academic Resources network) Faculty Advisory Committee, 1990-present
Organizer of the Annual Midwest NMR Users' Conference, University of Akron. 1988-present.
Co-Chair, Technical Program, 27th ACS Central Reg. Meet., Akron, OH, May 31-June 2, 1995.
Consulted for Wyeth-Ayerst, Ciba-Geigy Plastics, Ricerca, Ashland Chemical Co., BOC, British Petroleum, American Cyanamid, W. L. Gore & Assoc., ICI, Univ. of North Carolina at Greenville, Dupont Central Research & Development.
Instructor-Varian Basic and Advanced NMR Instrument Training Courses (7/year) 1990-1997.
Instructor Practical Aspects of 1D-, 2D- and 3D-NMR Short Course, Eastern Analytical Symposium, November 16-17, 1994, November 16-17, 1995, November 21-22, 1996, November 20-21, 1997.
Instructor Introduction to 1D-NMR Short Course, Eastern Analytical Symposium, November 19, 1996, November 19, 1997.

STUDENTS: 7 Ph.D. Dissertations, 6 Postdoctoral & 1 Visiting Scientists

CURRENT STUDENTS: 7 Graduate Students, 2 Post Doctoral Fellows, 1 Visiting Professor

THESES AND POSTDOCTORAL STUDENTS (past 5 years)

Joseph Marcinko, Ph.D. 1992.	Dale G. Ray, III, Postdoc, 1993-95
Darlene R. Henseley, Ph.D.1994.	William A. Daunch, Ph.D.1998, expected.
Vincent E. Litman, Ph.D.1995.	Lan Li, Ph.D. 1996.
Neil G. Walsh, Ph.D.1996.	Takeshi Saito, Ph.D. 1997.

Takeshi Saito, Postdoc, 1997-98

Yahong Sun, Postdoc. 1994-96.

VISITING SCIENTISTS:

W. Ritchey,

T. Green

PUBLICATIONS (5 recent or related to project)

- (1) T. Saito and P. L. Rinaldi, "Evaluation of 3D-NMR Pulse Sequences for Characterization of Polymer Chain-end Structures", *J. Magn. Resonance.*, (1998) **132**, 41.
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- (2) T. Saito, R. E. Medsker, H. J. Harwood, and P. L. Rinaldi, "Characterization of Chain End Structures in Diphenylphosphinyl Radical Initiated Polymers Via 3D-PFG $^1\text{H}/^{13}\text{C}/^{31}\text{P}$ Correlation NMR", *J. Magn. Resonance A*, (1996) **120**, 125.
- (3) L. Li, D. Ray, H.T. Wang, H.J. Harwood, and P.L. Rinaldi, "Microstructural Characterization of Fluoropolymers via Two-Dimensional $^1\text{H}/^{19}\text{F}/^{13}\text{C}$ Triple Resonance NMR Spectroscopy", *Macromolecules*, (1996) **29**, 4706.
- (4) L. Li and P. L. Rinaldi, "Tacticity of Poly(1-chloro-f-fluoroethylene) Fluoropolymer Determined Using $^1\text{H}/^{19}\text{F}/^{13}\text{C}$ Triple Resonance 3D-NMR", *Macromolecules*, (1996) **29**, 4808.
- (5) H. J. Harwood, L. Christov, M. Guo, T. V. Holland, A. Y. Huckstep, D. H. Jones, R. E. Medsker, P. L. Rinaldi, T. Saito, and D. S. Tung, "Investigation of Statistical Block and Graft Copolymerizations Using NMR-Sensitive Initiators and Macroinitiators", *Macromol. Symp.*, (1996), **11**, 25.

THESIS ADVISOR: William H. Pirkle, Univ. of Illinois, Urbana-Champaign

POSTDOCTORAL ADVISORS: George C. Levy & Pierre Laszlo

COLLABORATORS (last 5 years)

John Blackwell
S. Z. D. Cheng
Ashok Cholli
Michael F. Faron
L. Fetters
Laurine Galya
T. Green
Chang D. Han
Joan Hansen
H. James Harwood
Howard Hill

Robert Hirst
Stephen D. Hudson
Alex M. Jamieson
Paul Keifer
Joseph P. Kennedy
Neocles Leontis
Morton Litt
Werner Maas
Wayne Mattice
Peter Mirau
Virgil Percec

William Ritchey
C. Rosenblatt
R. F. Savinell
Claire Tessier
Wiley Youngs
Pelletier
James Visintainer
S. Q. Wang
Phillip Westerman
Richard Withers

E2. RICHARD E. KLOSTERMAN

Professor, Department of Geography and Planning
Professor, Urban Studies
The University of Akron
Akron, Ohio 44325-5005
Phone: (330) 972-8037
E-mail: Klosterman@Uakron.edu

EDUCATION:

Ph.D., City and Regional Planning, Cornell University, 1976
B.S., Civil Engineering, Purdue University, 1969

POSITIONS HELD:

Professor, University of Akron: 1992 to Present
Visiting Fellow, University of Hong Kong: 1994
Visiting Professor, University of Illinois at Urbana-Champaign, 1993
Visiting Scholar, Massachusetts Institute of Technology, 1990
Associate Professor, University of Akron, 1983 to 1992
Assistant Professor, Florida State University, 1976 to 1983

AWARDS:

Listed in *Men of Achievement, Annual Edition* 1994 to Present
Cornell University Fellowships: 1973-1975
Public Health Service Fellowships: 1971-1072
Tau Beta Pi: 1968
Chi Epsilon: 1968

PUBLICATIONS RELATED TO PROJECT:

- (1) *Planning Support Systems: Information, Models and Visualization*. New Brunswick, NJ: Center for Urban Policy Research: In press.
- (2) Planning Support Systems: A New Perspective of Computer-Aided Planning. *Journal of Planning Education and Research* 17 (1997): 45-54.
- (3) The What if? Collaborative Planning Support System. In *Computers in Urban Planning and Urban Management*, eds. P.K. Sikdar, S.L. Dhingra, and K.V. Krishna Rao. New Delhi: Narosa Publishing House, 1997.
- (4) *Spreadsheet Models for Urban and Regional Analysis*. New Brunswick, NJ: Center for Urban Policy Research, 1994 (Edited with Richard K. Brail and Earl G. Bossard).
- (5) *Community Analysis and Planning Techniques*. Savage, MD: Rowman and Littlefield, 1990.

OTHER SIGNIFICANT PUBLICATIONS:

- (1) Loosely-coupled Modeling with GIS and a Spreadsheet. *International Planning Journal*. (With Yichun Xie). 2:2 (1997): 175-192.
- (2) Planning in an Information Age. In Frank So, Charles Hoch and Linda Dalton, eds. *The Practice of Local Government Planning, Third Edition*. Washington, DC: International City Management Association, In press.
- (3) Guest Editor: Large-Scale Urban Models: Retrospect and Prospect. *Journal of the American Planning Association*. 60 (1994): 3-44.
- (4) Evolving Views of Computer-Aided Planning. *Journal of Planning Literature* 6 (1992): 249-260.
- (5) Microcomputers in Urban and Regional Planning: Lessons from the Past, Directions for the Future. *Computers, Environment and Urban Systems* 14 (1990): 177-185.

COLLABORATORS:

Mike Batty, University College, London
Richard Brail, Rutgers University
Joseph Ferreira, Jr. Massachusetts Institute of Technology
Britton Harris, University of Pennsylvania
Lewis D. Hopkins, University of Illinois at Urbana-Champaign
John Landis, University of California, Berkeley
Jay Lee, Kent State University
Duane Marble, Ohio State University
Mark Salling, Cleveland State University
Michael Wegener, University of Dortmund
Yichun Xie, Eastern Michigan University
Anthony Gar-On Yeh, University of Hong Kong

THESES AND DISSERTATION ADVISEES:

Last five years: None
Total: Three dissertations and approximately 10 theses

GRADUATE ADVISORS:

Dr. Pierre Clavel, Department of City and Regional Planning, Cornell University
Dr. David Lyons, Sage School of Philosophy, Cornell University
Dr. Frank Young, Department of Rural Sociology, Cornell University

E3. S. I. HARIHARAN

Professor
Department of Mathematical Sciences
The University of Akron
Akron, OH 44325

EDUCATIONAL DATA:

Ph.D. - 1980 - Carnegie-Mellon University - Mathematics
M.S. - 1979 - Carnegie-Mellon University - Mathematics
M.Sc. - 1978 - University of Salford, England - Computational
Methods & Fluid Mechanics
B.Sc. - 1975 - University of Sri Lanka - Mathematics

EXPERIENCE:

8/90 - present - Professor – Dept of Math. Sciences, The University of Akron
9/95 - 8/97 - Program Director, Division of Mathematical Sciences, NSF
8/85 - 8/90 - Associate Professor – Dept of Math. Sciences, The University of Akron
8/83 - 8/85 - Assistant Professor - University of Tennessee Space Institute
8/80 - 8/83 - Staff Scientist - ICASE, NASA Langley

AWARDS:

1993 Outstanding Researcher of the Year Award, The University of Akron

PUBLICATIONS RELATED TO PROJECT:

- (1) "Flow Effects in a Vertical CVD Reactor", with G. W. Young and R. Carnahan, *SIAM Journal of Applied Mathematics*, Vol. 52, No. 6, 1992, pp. 1509-1532.
- (2) "On the Accurate Long-Time Solution of the Wave Equation in Exterior Domains: Asymptotic Expansions and Corrected Boundary Conditions" with T. M. Hagstrom and R. C. MacCamy, *Mathematics of Computation*, Vol. 63, No. 208, pp. 507-539 (1994). Also a supplement to this article, pp. s7-s10.
- (3) "A Framework for Evaluating Boundary Conditions", with D. K. Johnson, *Journal of Computational Acoustics*, Vol. 3, No. 3, 1995, pp. 241-259.
- (4) "Transmission of Light Waves through Normal Shocks", with D. K. Johnson, *Journal of Applied Optics*, Vol. 34, No. 33, 1995, pp.7752-7758.
- (5) "Progressive Wave Expansions and Open Boundary Problems", With T. Hagstrom, *IMA Volumes in Mathematics and its Applications - Computational Wave Propagation*, Vol. 86, 1997, Eds. B. Engquist and G. A. Kriegsmann, Springer Verlag, pp. 23-43.

OTHER SIGNIFICANT PUBLICATIONS:

- (1) "A Formulation of Asymptotic and Exact Boundary Conditions using Local Operators", with T. Hagstrom, to appear in the *Journal of Applied Numerical Mathematics*.
- (2) "Direct Simulations of Unsteady Vortical Flows", with S. P. Grace and H. Atassi, to appear in *Journal of Computational Acoustics*.
- (3) "A Systematic Approach for Constructing Asymptotic Boundary Conditions for Wave-like Equations", with T. Hagstrom, to appear in the proceedings of IUTAM Symposium, University of Colorado at Boulder, July 27-31, 1997.
- (4) "Accurate Boundary Treatments for Maxwell's Equations and their Computational Complexity", to appear in the proceedings of The Applied Computational Electromagnetics Society (The 14th Annual

- Review of Progress in Applied Computational Electromagnetics, March 16-20, 1998, Naval Postgraduate School, Monterey, California), with T. **Hagstrom**, **B. Alpert** and L. Greengard.
- (5) "On the Stability of a Uniform Bend Freedericksz Configuration in Nematic Liquid Crystals", with D. Golovaty, L. Gross and E. C. Gartland, to appear in the Proceedings of the Second International Conference on Nonlinear Problems in Aviation and Aerospace, April 29- May 1, 1998, Daytona Beach, FL.

RECENT COLLABORATORS:

H. Atassi, S. Grace, D. Golovaty, L. Gross, E. C. Gartland, J. N. Scott, K. Kreider, B. Alpert, L. Greengard, T. Hagstrom. and G. W. Young.

ADVISOR AND ADVISEES:

Advisor - R. C. MacCamy, Carnegie-Mellon University

Recent Graduate Students - David K. Johnson, David Watkins, Edward Stenger

E4. GERALD W. YOUNG

Professor
Department of Mathematical Sciences
The University of Akron
Akron, Ohio 44325-4002
(330) 972-5731
FAX: (330) 374-8630
email: GWYOUNG@UAKRON.EDU

EDUCATION:

Ph.D. - Engineering Sciences and Applied Mathematics Northwestern University - Evanston, IL - June 1985 Dissertation: "Dynamics and Stability of Flows with Moving Contact Lines".
B.S. - Applied Mathematics - The University of Akron, Akron, Ohio - June 1981.

PROFESSIONAL EXPERIENCE:

9-85 8-89	Assistant Professor
9-89 9-92	Associate Professor
9-92 Present	Professor
	Department of Mathematical Sciences The University of Akron Akron, Ohio
1-85 8-85	Post-Doctoral Fellow
	Engineering Sciences and Applied Mathematics Northwestern University Evanston, Illinois

AWARDS:

1981-1984	National Science Foundation Graduate Fellowship.
1989	National Science Foundation Presidential Young Investigator Award - Applied Mathematics.
1989, 1993	University of Akron Faculty Recognition Award
1994	University of Akron Outstanding Teacher of the Year Award

RELEVANT PUBLICATIONS:

- (1) "Surface Tension Driven Heat, Mass, and Momentum Transport in a Two-Dimensional Float Zone", G. W. Young and A. Chait, *Journal of Crystal Growth*, Vol. 106 (1990), pp. 445-466.
- (2) "Flow Effects in a Vertical CVD Reactor", G. W. Young, S. I. Hariharan, and R. Carnahan, *SIAM Journal on Applied Mathematics*, Vol. 52 (1992), pp. 1509-1532.
- (3) "Plasma Carburization of an Axisymmetric Steel Sample", M. Gegick and G. W. Young, *SIAM Journal on Applied Mathematics*, Vol. 54 (1994), pp. 877 - 906.
- (4) "An Asymptotic Model of the Mold Region in a Continuous Steel Caster", J. DiLellio and G. W. Young, *Metallurgical Transactions*, Vol. 26b (December 1995), pp. 1225 - 124 1.
- (5) "Modeling the time-dependent growth of single-crystal fibers", G. W. Young and J. A. Heminger, *Journal of Crystal Growth*, Vol. 178 (1997), pp. 410 - 421.

OTHER PUBLICATIONS:

- (1) "Anisotropic Interface Kinetics and Tilted Cells in Unidirectional Solidification," G. W. Young, S. H. Davis, and K. Brattkus. *Journal of Crystal Growth*, Vol. 83 (1987), pp. 560-571.
- (2) "Morphological Instabilities in Directional Solidification of a Binary Alloy: End Effects," G. W. Young and S. H. Davis. *SIAM Journal on Applied Mathematics* Vol. 49 (1989), pp. 152164.

- (3) "Morphological Instability in a Float Zone," L. B. Humphreys, J. A. Heminger, and G. W. Young. *Journal of Crystal Growth*, Vol. 100 (1990), pp. 31-50.
- (4) "Modelling of the Edge Defined Film Fed Growth Process", G. W. Young and J. A. Heminger, (Submitted to *Journal of Engineering Mathematics*).
- (5) "An Asymptotic Approach to Mathematically Modeling Ohno Continuous Casting of Cored Rods", S. A. Morman and G. W. Young, (Submitted to *Journal of Engineering Mathematics*).

RECENT COLLABORATORS:

None other than those listed in the above publications

ADVISOR AND ADVISEES:

Advisor - Stephen H. Davis, Northwestern University

Graduate Students - Robert Carnahan, Mary Gegick, Brad Huff, Bin Liu, Pei Qing Luo, Stephanie Morman, Jane Zhang

E5. WAYNE L. MATTICE

Polymer Science
University of Akron
Akron, OH 44325-3909

EDUCATION

B. A., Chemistry, Grinnell College, 1963
Ph. D., Biochemistry, Duke University, 1968, with Prof. Ronald C. Greene
Postdoc, Chemistry, Florida State University, 1968-70, with Prof. Leo Mandelkern

FACULTY POSITIONS

- Louisiana State University, Baton Rouge
Biochemistry: Asst. Prof., 1970-74; Assoc. Prof., 1974-78
Chemistry: Assoc. Prof., 1977-79; Professor, 1979-85; Boyd Professor, 1985-86
- The University of Akron
Polymer Science: Alex Schulman Prof. & Ohio Eminent Scholar, 1986-present

TEMPORARY APPOINTMENTS

- Visiting Scholar, Stanford University, 1976-77, with Prof. Paul J. Flory
- Visiting Professor, Cornell University, 1983-84, with Prof. Harold A. Scheraga
- Gastprofessor, ETH, Zurich, 1993, with Prof. Ulrich W. Suter

AREA OF RESEARCH

Physical Chemistry of Macromolecules Two books and 290 refereed articles on: Biopolymers, Block Copolymers, Molecular Dynamics, Monte Carlo, Photophysics, Rotational Isomeric State Model, Simulations

JOURNALS

Assistant Editor for *Macromolecules*; current Editorial Advisory Boards for *Bipolymers*, *Computational and Theoretical Polymer Science*, and *Macromolecular Theory and Simulation*.

FIVE PUBLICATION MOST CLOSELY RELATED TO THE PROPOSED PROJECT

- (1) Rapold, R. F.; Mattice, W. L. "Introduction of Short and Long Range Energies to Simulate Real Chains on the 2nd Lattice" *Macromolecules* 1996, 29, 2457-2466.
- (2) Cho, J.; Mattice, W. L. "Estimation of Long-Range Interactions in Coarse-Grained Rotational Isomeric State Polyethylene Chains on a High Coordination Lattice" *Macromolecules* 1997, 30, 637-644.
- (3) Doruker, P.; Mattice, W. L. "Reverse Mapping of Coarse-Grained Polyethylene Chains from the Second Nearest Neighbor Diamond Lattice to an Atomistic Model in Continuous Space" *Macromolecules* 1997, 30, 5520-5526.
- (4) Doruker, P.; Mattice, W. L. "Simulation of Polyethylene Thin Films on a High Coordination Lattice" *Macromolecules* 1998, 31, 1418-1426.
- (5) Haliloglu, T.; Mattice, W. L. "Mapping of Rotational Isomeric State Chains with Asymmetric Torsional Potential Energy Functions on a High Coordination Lattice: Application to Polypropylene" *J. Chem. Phys.* **1998**, 108, 6989-6995.

FIVE OTHER SIGNIFICANT PUBLICATIONS

- (1) Mattice, W. L.; Suter, U. W. *Conformational Theory of Large Molecules. The Rotational Isomeric State Model in Macromolecular Systems*, John Wiley & Sons, Inc.: New York, **1994**, 449 pages. ISBN 0471-843385.

- (2) Rapold, R. F.; Mattice, W. L. "New High Coordination Lattice Model for Rotational Isomeric State (RIS) Polymer Chains" *J. Chem. Soc. Faraday Trans.* **1995**, 91, 2435-2441.
- (3) Doruker, P.; Rapold, R. F.; Mattice, W. L. "Rotational Isomeric State Models for Polyoxyethylene and Polythiaethylene on a High Coordination Lattice" *J. Chem. Phys.* **1996**, 104,8742-8749.
- (4) Rehahn, M.; Mattice, W. L.; Suter, U. W. "Rotational Isomeric State Models in Macromolecular Systems" *Adv. Polym. Sci.* **1997**, 1311132, 460 pages, filling both volumes.
- (5) Baschnagel, J.; Binder, K.; Doruker, P.; Gusev, A. A.; Hahn, O.; Kremer, K.; Mattice, W. L.; Muller-Plathe, F.; Murat, M.; Paul, W.; Santos, S.; Suter, U. W.; Tries, V. "Bridging the Gap between Atomistic and Coarse-Grained Models of Polymers: Status and Perspectives" *Adv. Polym. Sci.*, to appear.

COLLABORATORS (last 48 months) not employed by Univ. Akron or named in other sections

Alcoa Chemical: Dr. K. Rodrigues. *Bogazici University:* Prof. I. Bahar, Prof. B. Erman, *Case Western Reserve University:* Prof. J. Blackwell, Prof. S. Hudson Prof. H. Ishida, Prof. A. Jamieson, Prof. J. Koenig, Prof. J. Lando, Prof. V. Percec, Prof. C. Rosenblatt. *Ecole Supérieure de Physique et Chimie:* Prof. L. Monnerie. *GE:* Dr. D. Brunelle, Dr. P. Hubbard. *GenCorp Research:* Dr. C. Kausch. *Hoechst- Celanese:* Dr. H. Wu. *Rose-Hulman Institute of Technology:* Prof. L. Tilstra. *Sandia National Laboratory:* Dr. J. Curro. *Southern Forest Experiment Station:* Dr. R. Hemingway. *Universidad de Alcalá:* Dr. O. Martín, Dr. J. Pozuelo, Prof. E. Saiz. *University of Cincinnati:* Prof J. Fried, Prof. E. Mark, Prof. R. Roe. *University of Houston:* Prof. R. Rajagopalan. *University of Minnesota:* Prof. M. Tirrell. *University of the Orange Free State:* Prof. D. Ferreira, Prof. J. Steynberg. *University of Sydney:* Prof. D. Napper. *University of Toledo:* Prof. S. Varanasi. *Xerox:* Dr. M. Georges, Dr. J. Noolandi, Dr. P. Sundararajan

UNDERGRADUATE STUDENTS (23 total)

Last Five Years (6):

Mr. D. Bartlett, Mr. C. Cole, Mr. J. Stephens, Mr. D. Stevenson, Ms. L. Tang, Mr. T. Yeoh

GRADUATE STUDENTS (32 total)

Last Five Years (16):

Ph. D. completed (10): Dr. R. Balaji, Dr. C. Helfer, Dr. E. Kim, Dr. W. Kim, Dr. M. Matties, Dr. U. Natarajan, Dr. M. Nguyen-Misra, Dr. Q. Ou, Dr. J. Sun, Dr. L. Xing

Current students (6):

Ms. E. Akten, Ms. K. Guzan, Mr. J. Jang, Mr. S. Lee, Mr. R. Ozisik, Mr. V. Vao-soognern

POSTDOCTORAL SCHOLARS (37 total)

Last Five Years (16):

Prof. J. Bravo, Prof. J. Cho, Dr. T. Clancy, Dr. P. Doruker, Prof. T. Haliloglu, Dr. D. He, Dr. C. Helfer, Dr. M. Ko, Prof. F. Mendicuti, Dr. S. Misra, Dr. R. Rapold, Dr. G. Tanaka, Prof. Y. Wang, Dr. Y. Zhan, Dr. N. Zhang, Dr. R. Zhang

GRADUATE AND POSTDOCTORAL ADVISORS

Prof. R. C. Greene, Prof. L. Mandelkern

E6. KINION, ELIZABETH S.

Professor of Nursing
Director, Center for Nursing
Fellow, Institute for Life Span Development and Gerontology
Graduate Faculty.: Category II

EDUCATIONAL DATA:

<u>Institution</u>	<u>Date</u>	<u>Degree Major</u>	<u>Functional</u>
Montana State University Bozeman, Montana	1964	B.S.N.	Nursing
The University of Akron Akron, Ohio	1978	M.S.Ed.	Supervision
Kent State University Kent, Ohio	1981	M.S.N.	Clinical Specialist
The University of Akron Akron, Ohio	1987	Ed.D. Educational	Higher Education
The University of Colorado Denver, Colorado	Jan. 1997 Post-Doc.	Family Nurse Practitioner	National Certification

PROFESSIONAL EXPERIENCE:

<u>Institution</u>	<u>Date(s)</u>	<u>Rank</u>
The University of Akron Akron, Ohio	1996-present	Professor
The University of Akron Akron, Ohio	1992-1996	Associate Professor
The University of Akron Akron, Ohio	1987-1992	Assistant Professor
Aultman Hospital School of Nursing Canton, Ohio	1981-1987	Assistant Director/Medical Surgical Nursing
Aultman Hospital School of Nursing Canton, Ohio	1978-1981	First Level Curriculum Coordinator

PUBLICATIONS (Recent) Journals:

Issue Editor
Kinion, E. & Capers, C. Holistic Nursing Practice 14(2) Aspen Publishing -Publication date January, 2000.

REFERRED PUBLICATIONS (RECENT):

- (1) Kinion, E.; Campbell, J.; Linc, L. Decreasing Neuroleptic Doses in Older Adults with Schizophrenia. Journal of Clinical Geropsychology. (In press.)
- (2) Collier, J. & Kinion E., Brodbeck, C. (1996, May). The Evolving Role of the CNS in Developing Risk Anchored Preventive Interventions. Clinical Nurse Specialist: The Journal for Advanced Nursing Practice. 100) p. 131-136.
- (3) Wineman, M. & Kinion, E. (1995, Oct.). Socializing faculty as researchers: From neophyte to expert. Journal of Nursing Education, 34(7), p. 1-4.

- (4) Kinion, E., Jonke, N., & Paradise, N. (1995, April-June). Descriptive ethics and Neuroleptic Dose Reduction. Perspectives in Psychiatric Care, 31(2), p. 11-14.
- (5) Neff, D. & Kinion, E. (1995) The geropsychiatric clinical nurse specialist in Home health care: A case presentation. Journal of Home Health Care Practice. 7(2) p. 73-79.

E7. KATHY J. LISZKA

Associate Professor
Department of Mathematical Sciences
The University of Akron
Akron, Ohio 44325-4002
Phone: (330) 972-8017
E-mail: liszka@uakron.edu

EDUCATION:

Ph.D., Computer Science, Kent State University, 1992
M.S., Computer Science Kent State University, 1986

PUBLICATIONS RELATED TO THE PROJECT:

- (1) "On the Parallel k-th Extension of the Sieve of Eratosthenes", Liszka, K. J. and Quesada, A. R., Parallel Algorithms and Applications, vol. 10, October 1996, pp. 111- 125.
- (2) "Factoring Large Numbers on the MPP", McCurdy (Liszka), K. J., Proceedings of the Phoenix Conference on Computers and Communications, February 1987, pp. 78-81.
- (3) "The Factorization of Large Composite Numbers on the MPP", McCurdy (Liszka), K. J. and Wunderlich, M. C., Proceedings of the First Symposium on the Frontiers of Massively Parallel Scientific Computation, September 1986, pp. 265-269.
- (4) "Problems with Interconnection Network Comparisons (How Do You Compare an Alligator to an Armadillo?)", Liszka, K.J., Antonio, J. K., and Siegel, H. J., IEEE Concurrency, vol. 5, no. 4, pp. 18-28, Oct.-Dec. 1997.

OTHER SIGNIFICANT PUBLICATIONS:

- (1) "An Associative Calculus Data Structure", Potter, J. L., and Liszka, K. J., to appear in Journal of Parallel and Distributed Computing, 1998.
- (2) "An Associative Calculus", Potter, J. L. and Liszka, K. J., 11th Annual International Symposium on High Performance Computing, July 1997, pp. 495-503.
- (3) "Metrics for Metrics: Or How Do You Compare an Alligator to an Armadillo?", Siegel, H. J., Antonio, J. K., and Liszka, K. J., Proceedings of the New Frontiers, A Workshop on Future Directions of Massively Parallel Processing, edited by I. Scherson, IEEE Computer Society Press, October 1993, pp. 97-106.
- (4) "A Generalized Bitonic Sorting Network", Liszka, K. J. and Batcher, K. E., Proceedings of the 22nd International Conference on Parallel Processing, August 1993, pp. 105-108.
- (5) "A Modulo Merge Sorting Network", Liszka, K. J. and Batcher, K. E., Proceedings of the Fourth Symposium on the Frontiers of Massively Parallel Computation, October 1992, pp. 164-169.

RECENT COLLABORATORS:

John K. Antonio, Texas Tech University
H. J. Siegel, Purdue University
Samuel S. Wagstaff, Purdue University

GRADUATE ADVISORS:

Kenneth E. Batcher, Kent State University
Jerry L. Potter, Kent State University

E8. LYNNE M. PACHNOWSKI

Asst. Professor, Department of Curricular and Instructional Studies
The University of Akron
Akron, OH 44325-4205
330-972-7115
330-972-5636 (fax)
imp@uakron.edu

EDUCATION:

Ph.D., Educational Administration, Boston College, 1994.
M.Ed., Math Education, John Carroll University, 1989.
B.A., Math Education, John Carroll University, 1986.

EXPERIENCE:

Asst. Professor, The University of Akron, 1993 to present.
Student Teaching Supervisor, Boston College and Brandeis University, 1990 to 1992.

CERTIFICATIONS AND HONORS:

Nominated, College of Education Teaching Award, 1997, 1998.
Nominated, College of Education Service Award, 1997, 1998.
Ohio Grades 7-12 Math Teaching Certificate
Ohio Computer Science Teaching Certificate
Ohio Grades 9-12 Principal Certificate
Ohio Supervisor Certificate

PROFESSIONAL SOCIETIES:

Phi Delta Kappa, 1991 to present.
National Council of Teachers of Mathematics, 1986 to present.
International Society of Technology in Education, 1995 to present.

PUBLICATIONS RELATED TO PROJECT:

- (1) Pachnowski, L. M. (1998). "Two Dichotomous Environments: Connecting a University and High School Through Distance Learning." Manuscript in preparation for submission to Cause/Effect.
- (2) Olson, S. J. and Pachnowski, L. M. (1998). "High School Students in the Virtual Classrooms between the University of Akron and Wadsworth High School" The OATYC Journal. (In press.)
- (3) Olson, S. J. and Pachnowski, L. M. (1998). "Preparing technical instructors for the virtual classroom: Lessons learned." Manuscript submitted for publication to The ATEA Journal.

OTHER PUBLICATIONS (RECENT):

- (1) Swingle, D. A. and Pachnowski, L. M. (1998). "Filling in the Gaps: Modeling Incomplete CBL Data with a Graphing Calculator." Manuscript submitted for publication to Mathematics Teacher.
- (2) Pachnowski, L. M. (Fall, 1997). Using the World Wide Web: Suggested Applications and Precautions for Teaching Multiple Linear Regression. Multiple Linear Regression Viewpoints.

DOCTORAL ADVISOR:

Ron Nuttall, Boston College

DOCTORAL ADVISEES:

Two doctoral candidates, four doctoral students.

E9. DEBRA S. KELLER

Assistant Vice President for Information Services
Information Services
The University of Akron
Akron, OH 44325-3501

EDUCATION:

Master of Public Administration
The University of Akron 1996

Bachelor of Science, Computer Science
The University of Akron 1981

Bachelor of Science, Applied Mathematics
The University of Akron 1981

EMPLOYMENT:

1982 to Present The University of Akron, Akron, Ohio

1996 to Present Assistant Vice President of Information Services

Direct areas of information technology including applications programming, client services including help desk, personal computer support, training and computer based testing, voice, video, and data networks, cable plant, technical services including operations, mainframe and distributed servers. Direct a staff of approximately 90 people. Manage an annual combined budget of approximately \$7 million. Provide strategic planning and direction for the University concerning information technology.

1991-1996 Director of Network Services

Managed the departments of Telecommunications, Wide Area Networks, Local Area Networks, and Electronic Repair. Managed approximately 20 staff members and a combined annual budget of approximately \$3 million.

1990-1991 Manager of Office Automation

Managed a team of up to eight people. Installed and managed a TCP/IP based network on and off campus for access to the Ohio Supercomputer Center in Columbus, Ohio. Managed an office automation network connecting multiple local area network servers. These two networks were later merged to form the basis of the campus network.

1987-1990 Information Center Project Leader

Supervised a team of three people to select and install an office automation network of UNIX servers.

1982-1986 Senior Analyst

Consulted with faculty, staff, and students concerning their usage of computing resources. Computer languages primarily supported included SAS, SPSS, Fortran, COBOL, Assembler, and JCL. Supported the College of Engineering and the Department of Mathematics and Computer Science on a Prime 850 running PRIMOS and installed the University's first local area network, IBM's Cluster Program.

1983-1986 Instructor
Taught several upper level undergraduate courses in the Electrical Engineering and Computer Science departments, including 370 Assembler, APL, and COBOL.

MAJOR ACCOMPLISHMENTS

Directed the technology required to provide fiber and ATM equipment to the high schools in Medina County for distance learning applications.

Consolidated the help desk, personal computer support., training, computer based testing, and personal computer sales into one division, client services, for consistent and cohesive client support.

Established an oversight committee of university faculty and administrators to prioritize requests for service according to the University's overall mission, goals, and objectives.

Managed the growth of a data network from inception to its current size of more than 4,000 hosts in more than 60 buildings on two campuses.

Managed the installation of fiber to all major buildings and most other buildings on campus.

Managed the technological integration of the branch campus in Orrville, Ohio to the main campus through seamless integration of the voice and data systems.

Managed the rewiring of more than 75% of residence hall rooms to provide a data connection per residence hall student.

Manage the Internet connectivity of several K- 12 schools in the area.

Instituted inventory controls and a standardized rate structure for electronic repair which resulted in a 20% savings in equipment and supplies.

Managed the installation of a 4,000 line PBX on time and within budget. PBX cutover was completed in one weekend, including the installation of 3,000 new phones in over 60 buildings.

Reduced University long distance rates by 30%.

Reduced the cost of telephone adds, moves, and changes by more than \$250,000 annually.

RELATED EXPERIENCE

Vice-Chair of the OARnet Steering Committee from 1997 to present.

Secretary of the OARnet Steering Committee from 1996 to 1997.

1992 Recipient of UA's Administrator of the Year award.

Nominee for CAUSE Management Institute's 1993 Network Manager of the Year

Data network upgrade to FDDI was featured in 1992 Network Management magazine.

Chair of the OARnet technical committee at its inception, from 1988 to 1990.

Presentation and Publication in Proceedings "The Design and Implementation of a Campus-Wide Authentication Service", Keller, D. and Wiggins, R., CUMREC 96, May 1996.

ACM Peer Review team member for Albany University (1998), Alfred University (Team Leader,1996), Youngstown State University (1993), University of Evansville (Team Leader, 1993).

E.10 THOMAS B. BENNETT

Director Audio-Visual Services
The University of Akron
Akron, Ohio 44325-1704

EDUCATION

B.A. The University of Akron, 1976

EXPERIENCE

The University of Akron, Director Audio-Visual Services, 1994-present
Head Instructional Support Services 1985-1994

PROFESSIONAL MEMBERSHIPS

Consortium of College and University Media Centers,
Immediate past chair Emerging Technologies Committee
Inter-University Council of Media Directors
Medina Technology Committee, Chair
Distance Learning Steering Committee

RELEVANT ACCOMPLISHMENTS

Designed and implemented Technology Enhanced Classrooms
Implemented multi-stream broadcast standard Virtual Classroom Project
Specified changes in MPEG2 encoder/decoder units, which were implemented.
Evaluator for Tektronix Beta version of MPEG2 encoder/decoder and software.
Designed and coordinated multi-vendor software interface for scheduling
of technology in real time.

E11. STEVEN C. MYERS

Interim Associate Vice President for Information Services
Associate Professor of Economics
The University of Akron
Akron, Ohio 44325-4740
E-mail: myers@uakron.edu
Phone: (330) 972-7421 (330)
Phone: 972-8122 (secretary)
FAX: (330) 972-8824

EDUCATION:

Ph.D., Economics, The Ohio State University, 1980,
M.A., Economics, The Ohio State University, 1976;
M.A., Economics, West Virginia University, 1974;
B.S.Ec., Economics, West Virginia, 1973

EXPERIENCE:

Interim Associate Vice President and Chief Information Officer since Nov. 1996
Associate Professor of Economics since 1984.
Acting Head, Department of Economics, Nov. 1992 to Aug. 1994
Graduate Research Associate, The National Longitudinal Surveys, Center for Human Resource
Research, The Ohio State University, 1974 to 1979.

RESPONSIBILITIES:

Oversight of Computer Center, Telecommunications, and University Libraries
President's Cabinet
Council of Deans
Governing Board, Ohio Supercomputer Center, vice President Ruebel
Governing Board, OhioLINK, vice Provost Leathers
Advisory Committee, Virtual Branch Campus, Medina Fiber Optics Network
Administrative Programming Oversight Committee
Distance Learning Steering Committee
Web Team
Web Policy Committee

SELECTED ACCOMPLISHMENTS:

Led and wrote policy for Acceptable Use of University Information Resources and the University's
WWW Information Publishing Policy.
Caused the formation of an Academic technology center, called the New Media Center to be a central
support for faculty in the use of instructional technology.
Helped found a project to create 50 Technology Enhanced Classrooms connected by a fiber
backbone to a media distribution headend.
Helped in the creation of the Virtual Branch Campus Project.
Caused to be written: Guidelines for Distance Learning Education at The University of Akron.
Held a competition for faculty to acquire multimedia laptops putting 20 laptops in faculty hands over
the last 2 years and supporting them with multimedia producers in the New Media Center.

SELECTED PUBLICATIONS AND PRESENTATIONS RELATING TO THE PROJECT:

- (1) "Building a Virtual Branch Campus of The University of Akron," Keynote Address, ETTCon 98, Dallas, May 11, 1998.
- (2) "Building a Virtual Branch Campus to Serve Medina County," presented to the Medina County Superintendents, May 11, 1998.
- (3) "Keeping Pace With Expectations," Opening Keynote Address, Ohio Association of Registrars and Admissions Officers, November 12, 1997.
- (4) "Faculty Behavior, Grades, and Student Evaluations," (with R. Stratton and R. King) invited paper by the National Council on Economic Education, A.S.S.A. meetings, Jan. 1994.
- (5) "Self-Interest, Grades, and Student Evaluations," (with R. Stratton and R. King) presented to the Midwest Economic Association Annual Meetings, St. Louis, April 4, 1991.

MOST RECENT PUBLICATIONS NOT RELATED TO THE PROJECT:

- (1) "Faculty Behavior, Grades, and Student Evaluations" Journal of Economic Education, 25 (1) Winter 1994:5-16 (with R. Stratton and R. King).
- (2) "The Demand for Abortion by Unmarried Teenagers: Economic Factors, Age, Ethnicity and Religiosity Matter," American Journal of Economics and Sociology 51 (April 1992):223-35 (with R. King and D. Byrne).
- (3) "The Short Term Labor Market Consequences of Teenage Pregnancy," Applied Economics 23 (12) December 1991:1819-1827 (with D. Byrne and R. King).
- (4) "Evaluating the Effectiveness of a Court Sponsored Abuser Treatment Program," Journal of Family Violence 4 (4) (1990):309-322. (with H. Chen, C. Bersani, and R. Denton)
- (5) "Forecasting the Economy Using the Composite Leading Index, Its Components, and a Rational Expectations Alternative," in SAS Users Group International Conference Proceeding, SAS Institute Inc. (Cary) 1988, pp. 181186. (with L. Lin)