High-Performance Network Connection
in Support of Meritorious Research at Wichita State University

C. Project Description

C.1 Introduction

Wichita State University proposes to connect its campus network to NSF's Internet2 as part of the "High Performance Network Connections" Program (NSF 01-73). WSU researchers have long been involved in collaborations with colleagues at other research and education institutions, but have been severely hindered by the limitations of wide area network connectivity over the commodity Internet. Transfers of multi-gigabyte to terabyte sized data files, synchronization of distributed computations, visualization, video conferencing, and even at times a simple telnet session to a remote supercomputer facility have proven to be at best prohibitively slow, if not impossible. Access to high-speed low-latency Internet2 connections to other institutions is essential to the future success of and would greatly accelerate the progress of numerous research projects at WSU.

WSU has a 107-year history of teaching, research, and outreach. In fiscal year 2000, WSU's total research awards totaled $21.2 million, including 16 new National Science Foundation grants totaling $1.2 million. Aviation research funded by NASA and the FAA is especially significant at WSU, in part the result of close ties to the four major aircraft manufacturers located in Wichita. This, along with strong collaborations within the state's scientific community fostered by the state's EPSCoR programs, positions WSU to quickly and effectively share the results of its meritorious Internet2-supported projects and thereby contribute to the emerging national and global high performance computing and communications infrastructure.

WSU's proposed project to connect to the Internet2 involves four components described in the following sections. First, meritorious research applications with high bandwidth and/or bounded latency requirements are described. Secondly, the local campus network infrastructure must reach the researchers' servers and desktops with guaranteed levels of service adequate to meet the special requirements of their applications. The third component involves the state-wide Kansas Research and Education Network (KanREN) that will connect the campus to a regional collection point at high speeds and its connection to the regional collection point (GigaPoP) of the Great Plains Network (GPN). Finally, this GPN GigaPoP routing node, located in Kansas City, connects to the nearest Internet2 connection point.

C.2 Meritorious Research Projects Requiring High Speed Network Connectivity

As an example of the many research projects at Wichita State University with high speed network connection requirements not readily satisfied by the commodity Internet, one research project (KBRIN) will be described in detail. Much excitement was generated when the WSU research community was apprised of the possibility of connecting to other institutions over the Internet2. As a result, several other research projects are listed that would benefit greatly from a Internet2 connection since they are limited by current wide area technologies and involve collaboration with researchers at other major institutions. These projects are listed in section C.2.2.
In 1999, Wichita State University created the High Performance Computing Center (HiPeCC) to raise the level of research within the university. The mission of HiPeCC is to provide large scale numerical computing services for faculty, staff and student research at WSU. HiPeCC currently operates a 24-processor SGI Origin 2000 computer that is utilized by more than 100 faculty and students. Several user groups at HiPeCC have begun the process of graduating to the facilities of the national Computational Science Alliance. HiPeCC serves as an information center for computational and networking solutions requiring large scale local or remote machine access.

C.2.1 KBRIN

Kansas – Biomedical Research Infrastructure Networks (KBRIN). David McDonald, Department of Biology, Wichita State University; William Hendry, Department of Biology, Wichita State University; Joan Hunt, Project Director, University of Kansas Medical Center; R. Denell, Kansas State University; M. Madden, University of Kansas; & R. Hanzlik, University of Kansas.

The Kansas Biomedical Research Infrastructure Network (KBRIN) project has been recently funded by a $6 million grant from the National Institutes of Health for the development of statewide resources required for performing frontline biomedical research. The project is designed to address two key elements with the goals of enhancing biomedical research in the State of Kansas: Recruiting and training promising students and increasing and strengthening the cadre of competitive biomedical researchers. The transition from the first element to the second is facilitated by initiating methods for improving communications and interactions among researchers and their trainees.

The specific aims of this project are as follows:

1. To identify and recruit promising undergraduate science students into careers in biomedical research
2. To develop an interactive communications network to increase and strengthen inter-campus biomedical research and facilitate training of students.
3. To establish a communications center which will enable faculty and students to access networks and mine biomedical data.
4. To strengthen the current academic, biomedical research environment by recruiting new science faculty and supporting the efforts of in-place Kansas investigators to become competitive for external funding.

Of these specific aims, number 2 and 3 are the most directly related to our need for Internet2 and thus shall be selected out for explanation in greater detail.

Specific aim 2 detail

Communication is a key element of this program and is a basic function of its administrative core. The core will be responsible for facilitating proven pathways for improving interactions among the participants in this application such as email bulletins and will also prepare four all-day thematic symposia per year to bring researchers together. These symposia will feature keynote speakers and presentation of KBRIN student and faculty research. This core will also
oversee the development of the TeleResearch Network, a novel element of our plan, which will:

1. serve an educational function, with lectures and scientific discussions transmitted statewide for the benefit of both educators and science students,
2. serve as a data distribution and management resource for all campuses, and
3. comprise an interactive research site for the development of networks among students and faculty.

The overall objective of the Teleresearch Network is to provide a functional unit that coordinates the entire research operation of the investigators and students at all universities within the KBRIN. The primary goal of this network is to enhance the level of research of the faculty and students in the participating institutions. This will be accomplished by providing a functional communications network that establishes real time video and audio communications among KBRIN students and faculty. Specific research problems, plans, and data will be discussed over the communications network. After logging on to the network students and faculty will be able to visualize data e.g., autoradiographs, and other forms of data. Participants will be able to discuss problems, decide on the next experiments, correct technical difficulties, and propose future directions over the network.

Specific aim 3 detail

Bioinformatics and computational biology were defined in a November, 1998 meeting of the National Institute of General Medical Sciences as the use of theory and computer implementation for application to the full spectrum of basic research in the biomedical sciences. The terms include analysis of molecular sequence, structure, molecular function, cellular function, physiology, genomics and genetics extending to computational modeling of complex biological systems. Thus, bioinformatics goes well beyond sequence analysis, its original utilization. It is now considered to incorporate statistical modeling of the output of functional genomics technology – biological data management and analysis.

This new science is required for contemporary approaches to research. Therefore, the long range goal of this aspect of the KBRIN is to establish a center of excellence in bioinformatics and computational biology on each of the four central campuses (Kansas University, Kansas University Medical Center, Kansas State University and Wichita State University).

A bioinformatics core that will have two basic functions will undertake this specific aim. One function is to serve as a library or repository of software and training in its usage and the second function is database generation. Thus we anticipate that the core will serve as a learning center for undergraduate and graduate trainees as well as for faculty instruction in both on-campus and outreach workshops.

The objectives of the bioinformatics core are to:

1. establish and maintain a comprehensive bioinformatics website for KBRIN participants on the Kansas University campus that will have both informational and data-gathering aspects;
2. to extend the services of this site to KBRIN participants (faculty and students) in the
three other graduate degree-granting institutions (Kansas State, Kansas University Medical Center and Wichita State University);

3. to develop outreach to all of the KBRIN participants in undergraduate institutions through educational programs and workshops.

Support for the establishment of a group of bioinformatics centers within the state of Kansas is particularly timely because this technology is essential to the conduct of contemporary biomedical research and is poorly developed in our state.

The creation of the KBRIN bioinformatics core will bring state-of-the-art bioinformatics to a statewide network. This core will be developed in two phases and at two levels of expertise. One level will focus on instructing undergraduate institutions (students and their faculty) on basic concepts and applications of bioinformatics. The second level will focus on the application of cutting-edge bioinformatics in biomedical research at the four Ph.D. granting KBRIN institutions. Phase 1 will focus on developing a comprehensive and user friendly website to disseminate bioinformatics and hold campus-specific workshops, geared at meeting the diverse needs and interests of both undergraduate and graduate/research institutions. Phase 2 will require the expertise of bioinformatics specialists and their hiring as a result of this proposal.

Phase 1: The first goal is to design and implement a website to allow easy access to bioinformatics databases, search engines and refinement tools and educational resources. Our website will be designed to also meet the specific needs of undergraduate institutions. We will construct a consolidated website that integrates web-based bioinformatics to provide “one-stop shopping” for faculty and students (graduate and undergraduate) interested in understanding and utilizing bioinformatics. Such an integrated site is necessary given the enormous number and volume of bioinformatics sites on the web and will greatly facilitate use of such sites. The KBRIN bioinformatics core website will be accessible on high-speed Internet2, currently functional at Kansas University, Kansas University Medical School, Kansas State University. Wichita State University is the only participating research institution that currently lacks Internet2 access.

Phase 2: One of the main goals is to quickly integrate a newly hired specialist into the Core to develop novel bioinformatics capacities and develop workshops to optimize our research faculty’s exposure and use of bioinformatics. The Director and Co-Directors will recruit a bioinformatics specialist at the Research Assistant Professor level. The mandate for this individual will be to develop and maintain an integrated bioinformatics and computational biology network/facility to serve the research community and promote scholarly collaborations among researchers and educators. Initially, the specialist will purchase and maintain on the server bioinformatics analysis software and databases such as the Genetics Computing Group package, VectorNTI, access to various commercial proteomics databases and genome project databases. Thereafter, in collaboration with participating bioinformatics faculty, the specialist will design new database analysis methods customized for specific needs, such as gene or protein family and structure searches and complex multiple sequence alignments.
C.2.2 Other Research Projects That Would Benefit from an Internet2 Connection

Much interest in high-performance wide area network connectivity was generated when the research community at Wichita State University was apprised of the possibility of a high speed connection to their collaborators via the Internet2. The following applications would benefit from a Internet2 connection because they involve collaboration with other major research institutions and have network communications requirements not currently satisfied by the commodity Internet. The diversity of these projects reflects the broad range of disciplines at WSU that would benefit from the proposed Internet2 connection.

• **Quantum Neural Networks.** [BEHRM00] [BAREN95] [HAN00] [CHAND01]
  Elizabeth C. Behrman, Department of Physics, Wichita State University; James E. Steck, Aerospace Engineering, Wichita State University; and Steven R. Skinner, Electrical and Computer Engineering, Wichita State University are beginning a collaboration in quantum computing with Siyuan Han, Department of Physics, University of Kansas, and Dan Ventura, Department of Computer Science, University of Utah, toward responding to the NSF request for proposals in the Quantum and Biologically Inspired Computing (QuBIC) program. Drs. Behrman, Steck and Skinner, working with Dr. Ventura, will be extending their current theoretical and computational work on quantum neural networks which will be modified for and implemented on the SQuID system by adapting the experimental work on SQuID hardware by Dr. Han. Behrman, Steck and Skinner’s work on quantum neural networks is currently funded by the NSF and Han’s experimental work on SQuIDs is currently funded under a DEPSCoR grant. Broadband communications including real time audio and video would be indispensable for exchanging data, allowing the WSU team to be virtually present to observe the experiments at KU, and allow video conferencing during weekly research meetings with the investigators and the graduate students working on the project at both campuses.

• **Molecular Modeling of Ionic Liquids.** [CARPE96] [LARIV95] [LARIV98] W. Robert Carper, Department of Chemistry, Wichita State University and Cynthia K. Larive, Department of Chemistry, University of Kansas. The overall objective of this research is to provide a molecular level of understanding of the physical interactions that occur in ionic liquids. This includes interactions that occur between the ionic liquid ion pairs. In addition, the interactions that occur between catalysts and substrates will also be studied. The molecular modeling requires the use of Gaussian 98 (program) to do *ab initio* and DFT (density functional theory) calculations. The input for these calculations comes from semi-empirical calculations using AM1 and PM3 methods. The *ab initio* calculations uses 3-21G*, 6-31G* and 6-31G** basis sets to evaluate the models. The theoretical results are compared with experimental data obtained from NMR (nuclear magnetic resonance) experiments. It is essential that high speed communication is available for this collaboration so that we can examine and update calculations from both locations in a very short time frame.

• **Collaborative Design Techniques for Integrated Product Development.** [CALLA00] [HALL99] [HALPE00] [TOOLE] Krishna Kumar Krishnan, Dept. of Industrial & Manufacturing Engineering, Wichita State University; S. Hossein Cheraghi, Dept. of Industrial & Manufacturing Engineering, Wichita State University; and Warren Liao,
This project aims to develop a proof-of-concept for collaborative product design using collaborative product commerce (CPC) systems. The system to be developed will use existing product lines at local aircraft industries to demonstrate collaborative design approaches for aerospace components using Design for Manufacturability techniques. A demonstration of the proof of concept will be made to aircraft industries to help promote the concept of collaborative design and the use of CPC software systems. The feasibility of integrating collaborative design approaches with engineering and manufacturing business processes will also be pursued. The proof-of-concept will also demonstrate cost savings that can be achieved by using these techniques through the improvement of part standardization and quality, reduction of cost and reduction of product development and fabrication times. The metrics that will be used to validate the system would be reduction in cycle-time, and number of iterations. Cost savings will also be included, although, the impact can be measured much more easily using the other two criteria. Faster access to data and multi-casting are vital to the success of this project. It uses digital libraries, with multiple revision capabilities required.

Low Temperature Astrophysics. [HAUSC99][ALLAR97][FERGU01] David Alexander, Jason Ferguson, Department of Physics, Wichita State University; Collaborators (one per school) include Tom Cravens at U. of Kansas, Jorge Ballester at Emporia State U., Bill Reay at Kansas State U., Peter Hauschildt at U. of Georgia-Athens, & France Allard at Ecole Normale Superieure-Lyon. Computational low temperature astrophysics research at WSU is focused on modeling the opacity of molecules and small particles and understanding the atmospheric structure and spectra of cool stars. Objects of interest include red giant stars, lower main sequence stars, brown dwarfs, extra-solar giant planets, and the narrow-line regions of active galaxies. The Low Temperature Astrophysics in Galactic Environments (LOTAGE) consortium which Alexander leads involves ten collaborators at five colleges and universities in Kansas interested in astrophysics at low temperatures. Network needs include software and data management and distribution between WSU, U. of Georgia-Athens, and ENS-Lyon, as well as videoconferencing among collaborators distributed over a wide geographic region.

C.3 Network Engineering Plan

C.3.1 Current Wichita State University Infrastructure

C.3.1.1 Network Core and Distribution

The core of Wichita State University’s current network is a high speed combination switch/router which provides wire-speed routing capabilities via Virtual LANs. The Cabletron SmartSwitch Router (now Enterasys X-Pedition 8600) allows switched ethernet connectivity at high speeds to each connected device, whether that be a centrally located server or another switch installed in another campus building. Routing is implemented between connected devices at layer 2 or 3 via virtual LANs. This combination switch/router at the core relays traffic across a collapsed ethernet backbone at speeds of up to 1 Gbps. The architecture of the campus network is shown in Figure 1.
Distribution to each campus building is via single and multi-mode fiber optic cabling. Multiple strands of each type of optical cabling provide redundancy as well as room for potential growth. Buildings with lower bandwidth requirements (as demonstrated by actual traffic loads and patterns) are connected to the core router at 10 Mbps. Buildings with higher bandwidth requirements for connectivity back to the central computing resources and off-campus WAN connections are connected to the switch-router at full duplex 100 Mbps. In addition, to date four campus buildings have been identified as having significantly greater bandwidth needs to the core. These buildings, which house the Departments of Computer Science, Physics, Engineering (including computer engineering), the Computing Center, and the National Institute for Aviation Research, are connected via a 1Gbps connection to the core router.

The core router supports the implementation and use of Virtual LANs to route traffic between devices and buildings attached to it. By localizing IPX, Appletalk, and other protocols to specific buildings, or by setting up a virtual LAN connection between their department in a remote building to their server (housed centrally in the computing center), traffic performance is greatly improved, as is the level of security.

Three remote campuses are connected to the main campus via leased T1 lines. These lines

Figure 1. WSU Campus Network Infrastructure
connect to a centrally located Cisco 4500 series router, then to the core router at full duplex 100 Mbps.

C.3.1.2 Infrastructure within buildings

Network connectivity within individual buildings is a mixture of 10 Mbps, switched 100 Mbps, and even 1Gbps ethernet. As with connectivity back to the core, equipment within each building or remote campus has been selected and implemented to meet bandwidth demands of the users and the nature of the needed resources within and outside of the building. Buildings identified with typically lower bandwidth requirements or with localized network resources may have a shared 10 Mbps hub as the core network device, and utilize a mixture of Category 3 and Category 5 twisted pair wiring. The majority of campus buildings utilize single or multiple ethernet switches, connected to desktops and servers via switched 100 Mbps. These switches have been selected for their speed and versatility - generally capable of being upgraded as needed to a variety of connectivity technologies, including gigabit ethernet, ATM, FDDI, etc.

Buildings which have switched 100 Mbps to the desktop utilize Cat 5 and 5e twisted pair wiring. In addition, newer installations are supported by Category 6 copper wiring and multiple strands of single and multi-mode fiber optic cabling are used for risers between floors, supporting speeds of up to 1Gbps between wiring closets. An upgrade to the switches and wiring within Hubbard Hall (which houses the Biology Department), as well as to the connection back to the core router, is an important part of this proposal, and would be implemented during the first year of this project to support the KBRIN collaboration as a meritorious research application.

C.3.2 Current Wide Area Network Connectivity

Wide area networking connections from Wichita State University to the other Kansas educational institutions and the commodity Internet are provided by the Kansas Research and Education Network (KanREN).

C.3.2.1 Kansas Research and Education Network (KanREN)

The Kansas Research and Education Network (KanREN, http://www.kanren.net) is a consortium of institutions of higher education, K-12 school districts, and other non-profit organizations within the state of Kansas. KanREN provides connectivity to other member institutions as well as the commodity Internet. Funding for KanREN is provided solely by fees to member institutions. Technical support is provided by KanREN paid employees, including two network engineers and a system administrator who oversee all installations, monitoring, and troubleshooting of the network.

The KanREN backbone currently consists of OC-3 and DS-3 circuits between major institutions (who act as PoPs) and the commodity Internet, plus a variety of slower connections between smaller institutions and the regional PoPs. The current KanREN network is shown in Figure 2.

Wichita State University is currently a POP for KanREN, supporting all KanREN member institutions within the 316 and 620 area codes (approximately the entire southern one-half of Kansas). Circuit speeds for all institutions are currently supported by a partial DS-3 circuit of
approximately 20 Mbps of bandwidth. This bandwidth is currently provided via Southwestern Bell Internet Services. In addition, two separate T1 circuits connect WSU to KanREN institutions in the northern half of Kansas, providing backbone traffic support and backup routes for emergency situations.

The University of Kansas (KU), Kansas State University (KSU), and University of Kansas Medical Center (KUMC) in Kansas City are all member institutions of KanREN, as well as members of the Great Plains Network (GPN). These institutions contract with GPN to provide connectivity to the Abilene network via connections to their KanREN circuits. Both KSU and KUMC connect to GPN (and thus to Abilene and the commodity Internet) via DS-3 circuits, while KU recently upgraded to an OC-3 level circuit for their connectivity.

Figure 2. Current WSU Wide Area Network Connectivity

C.3.2.2 The Great Plains Network (GPN)

The Great Plains Network (GPN – [http://www.greatplains.net](http://www.greatplains.net)) is a consortium of midwestern universities, including KSU and KU, as well as research universities in Nebraska, Oklahoma, Arkansas, and North and South Dakota. GPN provides connectivity to the commodity Internet for several institutions, but more importantly, GPN acts as a GigaPoP for UCAID (Internet2) member institutions to connect to the Abilene network.
Initial funding for GPN came from an EPSCoR / NSF grant awarded in August, 1997. It became one of the first GigaPOPs to connect to the Abilene network in August, 1998. Currently, the connection to the commodity Internet is 90 Mbps with two OC-12 links to the Abilene network – one at its PoP in Kansas City, MO, and the other in Minneapolis, MN.

GPN monitors and manages all connections to the GigaPoP and coordinates communications with all connected networks, including KanREN and Abilene. GPN and its member institutions are dedicated to maintaining the network in support of the research community throughout the region. As an active participant in Internet2, GPN will support the protocols necessary to bring advanced services such as QoS, multicast, and IPv6 to the network as quickly as possible. One of the major goals of those associated with GPN is to remain on the cutting edge of network technology, working together in support of the high performance network infrastructure. The membership is expected to participate actively in this process through research projects as well as cooperative technical and educational support. The knowledge and expertise shared is vital for implementing both local and state networks.

**C.3.3 Proposed High Performance Network Connectivity**

The proposed implementation of a high performance networking infrastructure and wide area connectivity will require new and/or upgraded equipment and circuits to the existing WAN connections as well as to the campus infrastructure.

**C.3.3.1 High-speed WAN Connectivity**

Wichita State University is committed to becoming a member of UCAID and the Abilene network. Application for membership in both UCAID and the Abilene network has been submitted. Successful participation in Internet2 and Abilene will rely on the successful implementation of connectivity to a high performance network as described in this proposal.

The proposed high performance network would be built upon the existing networking consortiums already in place within the state of Kansas and modeled after successful implementations of neighboring schools, including the University of Kansas and Kansas State University. The proposed changes to the KanREN network are shown in Figure 3. These changes have been endorsed by both KanREN and GPN (see section 3.5).

The primary backbone for connecting to Abilene would be a new DS-3 circuit installed between Wichita State University and the Great Plains Network GigaPoP in Kansas City, MO. This circuit would actually be a part of the KanREN infrastructure and would support both commodity Internet as well as Internet2 traffic from WSU to the Kansas City GigaPoP. Wichita State University would contract with KanREN to provide the circuit.

Traffic to the commodity Internet would also flow across this DS-3 circuit, but would be routed via permanent virtual circuits to a GPN router providing such access. Internet2 traffic would likewise flow via a permanent virtual circuit to other Internet2 schools, including KU and KSU. Use of the DS-3 circuit would be restricted to WSU-related traffic only, with one possible exception. Emporia State University, another Kansas Regents’ university, is also exploring a proposal for high performance network connectivity. If this project is funded for ESU, they
would initially share the DS-3 circuit for connectivity to Abilene. Based on current information and historical experience, the amount of traffic needed to support their applications would not significantly impact the availability of sufficient bandwidth for the meritorious research applications at Wichita State University, for which this network is primarily intended.

The installation of the new DS-3 circuit would eliminate the need for two T-1 circuits which currently connect Wichita State University to KSU and KUMC. These circuits currently carry a minimal amount of KanREN backbone traffic to connect the northern and southern halves of the KanREN network. This negligible amount of traffic would now flow over the new DS-3 circuit. The elimination of the two T-1 circuits does not result in any savings for WSU with regards to its WAN connectivity costs.

Certain equipment must be purchased by both KanREN and Wichita State University for this change to take place. A more detailed list of such equipment has been identified in the budget justification.

C.3.3.2 High-Speed Campus Infrastructure

Short-term plans for the Wichita State University campus infrastructure include retaining and
expanding the core switch/router configuration that currently supports the campus ethernet backbone. As bandwidth demands increase on a per-building or per-user basis within a building, upgrades to the connected buildings will include switched 100 Mbps connectivity to the desktop (with the technological capability for 1 Gbps to the desktop when needed) with corresponding increases in connectivity back to the core router at speeds up to 1 Gbps.

All buildings involved in the support of meritorious research projects would be supported between the building and the core at a minimum of 1 Gbps. In some cases, this would potentially require an upgrade to existing infrastructure according to the standards described earlier.

**C.3.4 Guaranteeing Quality of Service**

By creating a connection to the high performance network, users should then have a reasonable expectation of reliable high-speed connectivity to collaborators at other similarly connected institutions. Mechanisms to ensure quality of service will be important to guaranteeing efficient use of the infrastructure.

Initially, Quality of Service guarantees will be provided on the local campus simply by over-provisioning. Connections to researchers who need high performance network connections will be at least switched 100 Mbps to the end node, with progressively greater bandwidth toward the core in ample amounts to avoid performance limitations. The Technical Services group in University Computing and Telecommunications Services (UCATS) at Wichita State University will work with the researchers to monitor performance and improve connectivity where necessary to ensure that the requirements of the meritorious applications are met.

Existing equipment within the Wichita State University campus backbone is capable of QoS guarantees, including implementation of the 802.1p standard for prioritizing packets at Levels 2-4. This equipment includes the core switch-router, as well as many of the more recent smart-switches that have been deployed in the more performance-demanding buildings throughout campus. Although WSU is not currently utilizing these QoS capabilities within the local network, the potential exists for ensuring prioritization of traffic to those applications which have been determined to require high speed connectivity.

With regards to wide area connectivity, KanREN and the Great Plains Network are committed to providing QoS guarantees to Abilene traffic by provisioning shared circuits. Wichita State University will work closely with KanREN and GPN to coordinate QoS efforts. In addition, there are a number of approaches available (including commercial products) for ensuring QoS across the WAN which will be explored if necessary.

**C.3.5 Planning Process**

Wichita State University is committed to joining UCAID and the Abilene network and has begun the process of seeking approval for admission to both organizations. To this end, UCATS at WSU has begun the planning process to define networking specifications and requirements.

Wichita State University has already involved both KanREN and the Great Plains Network in planning for the proposed high speed connection. KanREN and GPN both have a great deal of
experience in connecting institutions via high bandwidth connections to the Abilene network. Several meetings have already occurred during the preparation of this proposal. Future coordination will occur as needed as the project progresses.

Management of the campus data network at Wichita State University is the responsibility of the Technical Services group in UCATS at Wichita State University. Physical implementation of the wiring infrastructure is the responsibility of the Telecommunications group, also within UCATS. The two departments meet at least weekly for coordination and planning.

C.3.6 Project Management

C.3.6.1 Administrative and Technical Staff

Implementation of the local infrastructure upgrades are under the administrative management of Gary Ott, Executive Director of UCATS at Wichita State University. Oversight of the technical and operational activities of the project will be carried out by the Technical Services group within UCATS under the leadership of Mike Erickson, Assistant Director of UCATS and Manager of Technical Services and Operations. Joe McLeland, senior network analyst for UCATS, will provide technical oversight and hands-on network installation and management. This staff will work closely with the management and technical staff of both KanREN and the Great Plains Network to implement the high-speed Abilene connection via the GPN GigaPoP in Kansas City. Cooperation between WSU’s technical staff and that of both KanREN and GPN has historically been at a high level and is expected to continue in this manner.

Researchers with meritorious applications requiring high-performance networking will be aided by the High Performance Computing Center (HiPeCC) under the leadership of David Alexander, Director and John Matrow, System Administrator/Trainer. The mission of HiPeCC is to provide large scale numerical computing services for faculty, staff and student research at WSU. These services include access to local and remote high performance resources as well as training and consulting in application development. As such, HiPeCC endeavors to inform the research community of opportunities in their research areas with respect to hardware, software and/or networking. HiPeCC will serve as liaison with UCATS to install LAN upgrades as needed, will encourage faculty to develop research applications which utilize high performance network facilities, and will assist them in the application of those resources to their projects.

C.3.6.2 Project Schedule

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<tr>
<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>June, 2001</td>
<td>Expected approval of membership by UCAID and Abilene</td>
</tr>
<tr>
<td>August, 2001</td>
<td>WSU wan connectivity upgraded to DS-3</td>
</tr>
<tr>
<td>January, 2002</td>
<td>Upgrades to campus network infrastructure for meritorious applications</td>
</tr>
<tr>
<td>March, 2002</td>
<td>Routing of Abilene traffic for meritorious applications</td>
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C.3.6.3 Evaluation and Dissemination of Results

The success of this project will be determined more by the development and success of meritorious research projects rather than in the network infrastructure itself. Consequently,
dissemination of results of this project will include the published results of the meritorious applications. Furthermore, the highly collaborative nature of both the research projects and the network connectivity ensures wide dissemination of results, especially among the membership of KanREN, the Great Plains Network, the Abilene community, and Internet2 project members.

UCATS will monitor traffic use across the high-speed network connection, as well as within the local campus infrastructure, and will provide feedback to the users of the meritorious research applications for their use.

UCATS, jointly with HiPeCC, will on a semi-annual basis during the grant period evaluate and report on progress of the project in relation to the proposed schedule. The text of this proposal, the progress reports, along with other documentation concerning the development of high-speed connectivity for Wichita State University will be documented on the world wide web at [http://ucats.wichita.edu/internet2](http://ucats.wichita.edu/internet2).