

The Northeast Research and Education Network (NEREN)

Developing a High Speed “Digital Highway” for Research and Education for the Northeast Region

The Proposal

Throughout the Northeast many local fiber optic rings or loops have been constructed to provide the internal digital connectivity for various universities and in some cases linking several universities together in a collaborative network. Some of these rings are confined to specific geographic areas like Amherst, Worcester, Boston, and limited regions of Vermont, New Hampshire and Maine while others are statewide networks like New York, Rhode Island and, soon, Connecticut. These rings comprise the infrastructure that allows advanced research and computer applications requiring greater bandwidth for high speed connectivity to function within a respective institution and through the Internet. Over the past five years, these rings have been constructed and enhanced quietly, becoming the best kept secret with respect to digital networking in the research and education (R & E) communities in the Northeast. (Attachments A. and B.)

Over the past year, the idea of integrating these independent rings into a powerful and robust advanced, high speed, R & E network infrastructure has emerged throughout the region. The idea is a simple and exciting one: connect the existing fiber optic rings by filling in the gaps between them. The resulting possibilities for cooperation and collaboration among the region’s research and education community is immeasurable. And that community can include every public and private university, every local school system, hospital, museum, library and public safety organization (police, fire, emergency medical services) in the Region. Preliminary planning around the design of the ***Northeast Research and Education Network, or NEREN***, has taken place with strong participation from state and regional R & E network organizations such as: Northern Crossroads (Boston), OSHEAN (Rhode Island), NYSERNet (New York), The Connecticut Education Network, and The University of Massachusetts, Amherst. Importantly, Northern Crossroads is the point-of-presence for Internet2 for New England, as is NYSERNet for the State of New York. (Attachment C.)

It is estimated that the cost of constructing NEREN is in the range of six to eight million dollars – *and that covers the entire Northeastern Region, inclusive of Connecticut, New York, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine.* When the cost of NEREN’s build-out is compared to the current investment value of the individual optic rings that will be connected under this proposal – amounting to many tens of

millions of dollars (Connecticut's network ring will cost over twenty million dollars alone once completed) – along with the increased capacity, security, speed and collaborative research capabilities that will result from NEREN, the return-on-investment in this proposal is extraordinary. Furthermore, if initiated with expediency, current economic and market conditions in the telecommunications industry (discussed below) can be capitalized upon which will increase the ROI even more.

The Benefits

The Northeast would quickly derive a vast array of benefits through the construction of NEREN and its accompanying expansion of bandwidth that impact the areas of education, advanced research, economic development and homeland security. Some examples follow:

Education and Research

- *Access to Internet2 by elementary, secondary, post-secondary and post-graduate programs as well as by hospitals, libraries, even the corporate community.* Internet2 today allows students access to video conferencing and such national enrichment programs such as the Jason Project and the Harvard Smithsonian Center for Astrophysics. Students are able to communicate live by voice and image to other students in schools around the globe. NEREN will facilitate students being able to observe surgical procedures at hospitals as part of their science programs, view activities inside major corporations as part of career educational programs and take a virtual stroll through the finest museums and galleries throughout the region and the world.
- *Access to Grid technologies that allow collaboration among researchers from multiple institutions.* “Virtual laboratories,” or networked research test beds can be created where feedback and input on common topics can be aggregated in real time across institutional and state lines. Also, through the use of Grid computing, the capacity of several powerful computers located states apart can be harnessed across Internet2 to solve very complex computational problems.
- *Strengthening of the Northeast's research and development competitiveness.* NEREN can provide a deep well of networked resources and expertise that can be leveraged in the pursuit of increasingly competitive private and federal research and education grants. Also, there can be significantly greater opportunities for collaborative applications and initiatives that build upon the unique strengths of the participating institutions across the Northeast.

Homeland Security

- *A common network infrastructure, system redundancy, and coordinated management.* NEREN can provide a robust regional network that can be utilized as a powerful back-up system, would provide a powerful platform for homeland security and disaster planning by integrating data and information from police, fire, emergency medical services, hospitals, airports and federal law enforcement agencies throughout the Northeast. It can also be a platform for the development of advances in Internet security for the entire region.
- *Integration with Intelligent Traffic Systems.* Many states in the Northeast are developing systems such as the Amber Network that can be readily networked through NEREN, vastly increasing their effectiveness.
- *Development of a common emergency communications system.* On September 11th when the World Trade Center Towers collapsed, virtually all communications in Manhattan and those linking it to the rest of the country were severed. One network, however, The Research and Education Network in New York, called NYSERNet, maintained its connectivity. The strength and resiliency of these network rings during times of emergency can receive no larger testimony. These same attributes can be transferred throughout the Northeast through NEREN.
- *Isolating key network hardware.* Key network equipment, such as computers, data storage facilities and telecommunications systems, now located inside most of the existing rings, can be relocated more than 100 miles from central cities and accessed through NEREN, thus protecting individual local, state and federal assets.

Economic Development

- *Increase the research and development capacity of the region through synergy and collaboration.* With the development of NEREN, the Northeast can effectively link many of the most renowned and respected research institutions in the world. In addition, it can provide the means for organizing and managing divergent research strengths and talents, allowing for greater opportunities for collaborative research across a wide range of emerging and cutting edge fields and disciplines. With NEREN, the region can increase its ability to attract businesses, particularly start-up companies, representing many different industry clusters and emerging technology fields. NEREN can also expand location options for new or expanding companies, and provide greater flexibility in their location

needs, and a wider research and development network to support them now and into the future.

- *Building the most talented workforce in the nation.* Because NEREN will link elementary and secondary schools with technical and research universities across the region, as well as large-scale educational programs with global reach (e.g., The Jason Project), the resulting integration of the full K-20 educational continuum will significantly augment the development of student skills and competencies, particularly in the areas of science, technology, engineering and math (the STEM skills). The economic vitality and competitiveness of the Northeast is directly dependent upon the quality of our education and training programs. NEREN can have a huge impact in making the region's educational and workforce programs second to none, turning the region into an economic development magnet for company relocations and start-ups.
- *Enhancing the region's technology backbone.* To effectively compete in the global marketplace, productivity is key. This is probably no more true than in the Northeast where housing, energy, labor, and healthcare costs, coupled with a high rate of population out-migration, all contribute in making workforce efficiency critical to competitiveness. Technology has been and will continue to be the great equalizer and NEREN's backbone and access to top-end institutional research capabilities will advance its impact significantly. It can also provide the platform upon which corporate technology needs can be built and/or enhanced. It can do the same for researchers, students and families, creating a technology-friendly regional community that is very attractive to business and industry; particularly those involved in emerging and growth technologies.

The Opportunity

There presently exists a significant economic window-of-opportunity for the design and development of NEREN, but it is a narrow one and needs to be taken advantage of quickly. The current market conditions in the telecommunications sector of the economy – nationally as well as regionally – provide a wonderful advantage in linking the optic rings across the Northeast. Overcapacity in telecommunication carriers' infrastructure – conduit as well as fiber optic cable – combined with the continued weaknesses in demand, have made fiber optic resources much more available and affordable to end-users such as Research and Education Networks. Some of these assets are now available well below cost. Most experts agree that these favorable purchasing conditions will only exist for a short time. Moving forward now in constructing NEREN will greatly reduce the overall costs associated with building this fiber-optic backbone, permit much deeper penetration into the rural areas of the Northeast and allow for purchase and lease arrangements rather than requiring the much more costly services of a large utility company.

The justification and rationale for building the Northeast Research and Education Network is very powerful – market opportunity, a solid business case with a very high ROI, and regional domestic needs, particularly in the areas of homeland security and economic development, combine to make it an imperative. But the window of opportunity for taking full advantage of current market conditions and the clearly demonstrated collaborative interest across the Northeast is a narrow one. There is too much to gain to let this special opportunity slip by.