

## **Virginia Tech's eCorridors Program – Draft 8/29/2002**

### **Overview**

Access to advanced communications and network infrastructure has become critical for ensuring economic competitiveness in today's global economy. Beyond standard telephone systems and basic Internet access, communities are suddenly finding that businesses and other stakeholders are making specific demands for access to fiber optic infrastructure with very explicit route diversity and fiber specification requirements. Communities with advanced fiber, wireless, and “next generation” Internet infrastructure will have a distinct competitive advantage. Those without such infrastructure will fall behind in ways that may not be recoverable over a period of decades (such as difficulty attracting and retaining sustainable job creation opportunities).

The objective of Virginia Tech's eCorridors Program is to work with communities, private-sector, and municipal partners to facilitate rapid development of advanced, fiber optic, wireless, and “next generation” Internet infrastructure across the Southern region of Virginia, and expanding into the eastern and northern regions. Through multiple community and regional based initiatives, this program proposes to put the world's most advanced communications infrastructure within reach of every community in Virginia within 10 years. See <http://www.ecorridors.vt.edu/> for the latest update on the eCorridors Program.

The overriding goal of the program is to serve as a catalyst for the deployment of affordable access to fiber optic network infrastructure that is needed to create economic and educational opportunities for citizens and businesses. Fiber optic network infrastructure is needed to support current high-speed (10/100/1000 Mbps) data access for a range of business and community applications and for future higher speed applications. Fiber may also be needed to support both analog and digital applications. The infrastructure should be open to all service providers and private sector based. It can enable the emergence of a new economy and network industry in Virginia. This new industry, in its infancy, combines high capacity optical and wireless technologies with the Internet protocol and Ethernet to enable an extraordinary advantage in cost and communications power.

The eCorridors Program also serves educational communities. It enables research and development of network technologies and solutions for business, education, and other programs on a 'real world,' large-scale network. For the past 15 years, Virginia Tech has developed network infrastructure strategies aimed at dramatically lowering the cost of broadband network access (see <http://www.networkvirginia.net/>). The proposed large-scale community oriented network combines the resources and expertise of education, private sector partners, municipalities, and non-profit entities to provide a unique opportunity for all involved. The program has created significant and widespread interest from municipal leaders and legislators. This level of visibility helps build long-term relationships. Another benefit is the provision of a statewide, truly high-speed network over a diverse route infrastructure that otherwise would not be affordable. A network infrastructure is needed for the economic opportunity and the viability of communities as they develop networked economies.

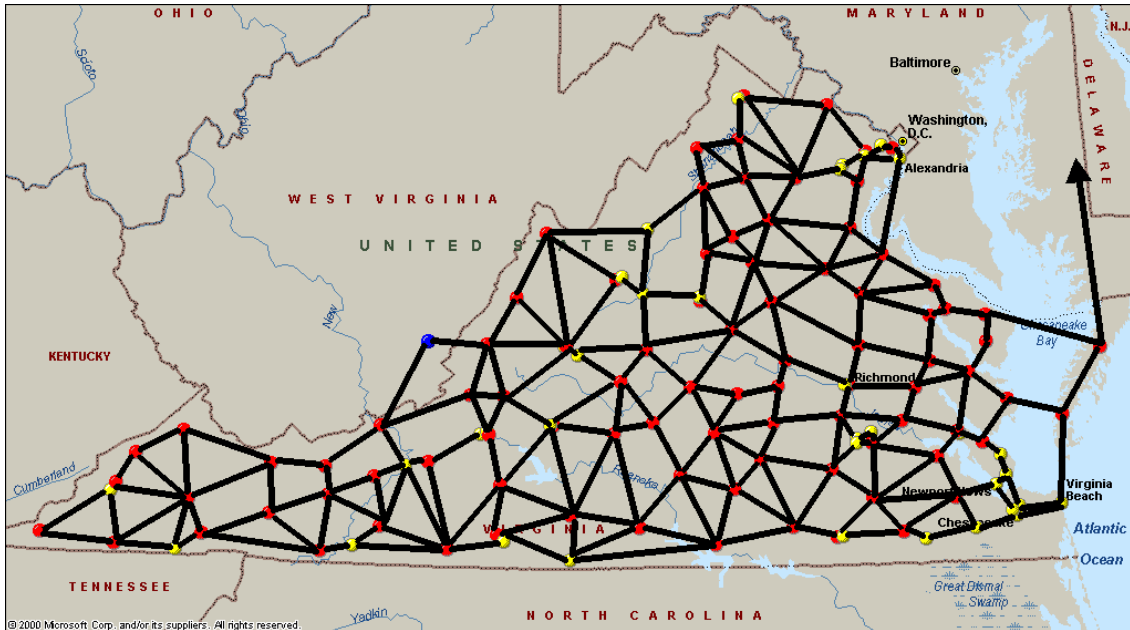
### **eCorridors Strategy**

The eCorridors strategy is to provide knowledge information to communities to enable an understanding of what communications infrastructure is needed to compete in the information age and how to leverage it for economic development and the benefit of citizens. It requires a new

approach to networking on a local and regional scale. This approach leverages current infrastructure, new network technologies, efficient construction methods, combinations of optical and broadband wireless media, and innovative organizational and market structures, to extend access to scalable, high-speed data services throughout Virginia. Goals include, 1) minimum cost, 2) true bandwidth capacity, 3) scalable capacity for future needs, 4) high performance, 5) high reliability through diversity, 6) leverage Internet protocols, 7) open access for services, and 8) effective management.

The typical network infrastructure being deployed today, such as cable modems and digital subscriber lines are restrictive and do not adequately meet future needs. Optical fiber to the user is needed to support high-speed 10/100/1000 Mbps, symmetrical, data services, which is the current state-of-the art. Higher speeds are needed for backbone networks. Fiber optic circuits can support today's needs and higher speeds in the future. Today, fiber is often deployed to reach large business customers and to interconnect carrier centers, but not for the great majority of users who are left out. Long haul fiber is deployed between relatively sparse metropolitan areas and is not typically accessible at affordable prices to rural communities through which it passes. Fiber that has been deployed is generally monopolized by carriers for their business purposes and it is not made available to deliver minimum cost, high-speed, services to users. Since carrier business models do not enable them to deliver the affordable services needed, communities must find other ways to make services available. Also, some communities are not served by diverse route, network facilities, which have resulted in total loss of all wire-line and wireless communications in a county wide region after a fiber cut—mobile phones typically interconnect over cable facilities. Diverse alternate fiber network infrastructure is needed for reliability and for the potential need of disaster recovery.

The eCorridors Program will provide the knowledge and specifications to enable communities and partners to design and build a fiber optic network infrastructure to deliver reliable, diverse route, interconnectivity between all communities in a region. By keeping the infrastructure open to all service providers, it creates opportunities for new business ventures and services. Ultimately, the network will interconnect access nodes for all communities within a target area with fully meshed, fiber optic facilities. Each community would be served by fiber connecting it to at least two other communities for increased reliability. The fiber optic architecture is called a "Geodesic Network Mesh"--a representation is illustrated below. The mesh will interconnect multimedia services access points (MSAPs) throughout regions to form an open access, intercommunity network infrastructure. A key strategy for successful implementation is that the fiber optic mesh network should be owned and operated by a provider-neutral entity. The eCorridors Program and partners are exploring a number of business models to facilitate this strategy.



A great deal more is needed for economic development and improved quality of life in a region in than communications infrastructure. Advanced fiber optic infrastructure is needed along with roads, work space, electricity, water, sewer, and other facilities. Also, it is essential to provide education and training to the populace for how to use the network infrastructure to be producers, not just consumers. There is a “chicken and egg” problem in that advanced communications infrastructure is needed in order to compete and to create new business opportunities, but the infrastructure does not exist, or is prohibitively expensive, because there are not enough subscribers that can pay the relatively high prices to current providers to justify deployment given their established business models. It is critical for community economic development that the optical network infrastructure and training be available along with other facilities to lay the foundations needed. In addition to training and educational programs from schools, colleges and universities, the eCorridors Program offers training through Virginia Tech’s Electronic Villages Program (<http://www.bev.net/>). The eCorridors and Electronic Village programs work with communities to encourage and develop workforce training and apprenticeship programs to provide opportunities for an array of people.

As the eCorridors Program takes root and expands, participating regions can become focal points for the world’s most advanced communications infrastructure designed to enable users to be *producers*, not just consumers of network content and services. Full development of the envisioned infrastructure has the potential to create an integrated economic engine for merging regions, currently among the nation’s poorest, from Virginia’s Tidewater to the Appalachians and other areas, to form a new economy along eCorridors. It will create the critical mass of subscribers and resources needed to support economic development. The initiative will yield large economic benefits at a fraction of the cost of traditional infrastructure (such as highways) through multiple public/private partnerships. It will create competitive advantage for about 2.5 million citizens in the Route 58 region and for the region’s businesses.

### The Role of Communities

Virginia Tech, as a land-grant university, has a legacy of public service and outreach in addition to its mission of education and research. However, *the university is NOT going into the*

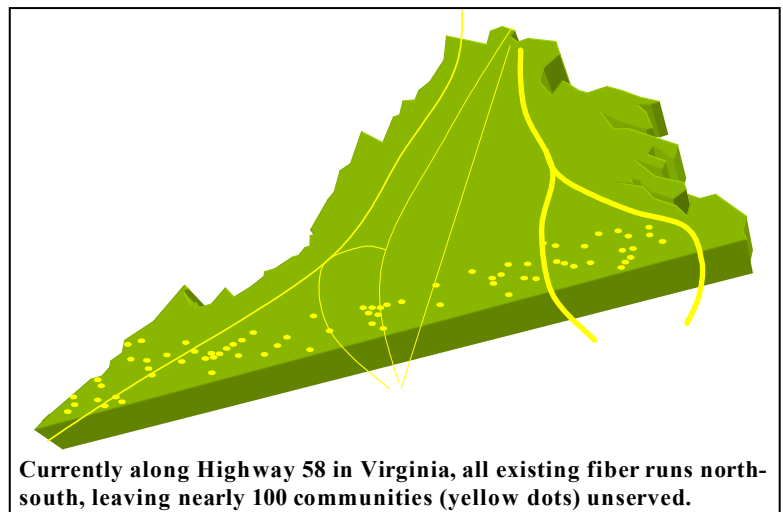
*telecommunications business!* Virginia Tech's eCorridors Program serves as a catalyst to bring together the right mix of community resources, private sector expertise, and other economic development entities to assist communities that are interested in their economic future. By aggregating the needs and assets of communities on a region-by-region basis, the program is able to leverage municipally-owned resources, such as rights of way and other utilities infrastructure, to maximize regional impact and competitiveness.

The eCorridors Program will work with communities that initiate a relationship with Virginia Tech for the purpose of facilitating the development of advanced network infrastructure. Communities need to find a local 'champion' interested in pursuing the possibilities for public-private partnerships that will yield the right blend of expertise, resources, and business case options. Communities need to foster and support the deployment of fiber optic infrastructure within the municipal leadership committees, councils, and utilities operations. The community must make available space and rights-of-way for MSAPs and the fiber optic infrastructure. Support from municipal leadership is critical to the ongoing success of an infrastructure development endeavor. eCorridors offers to help educate communities about applications, technologies, planning, engineering, management and other issues with respect to deployment of advanced telecommunications infrastructure.

Finally, communities wishing to participate in the eCorridors Program must encourage and promote regional development. Rural communities, in particular, often find that they must compete with nearby communities for economic development advantages. However, telecommunications infrastructure gains value as it gains connectivity to subscribers over an ever-expanding geographic area that interconnects all users, including business and residential. In addition, significant benefits in terms of reducing costs and building an aggregate market for attracting high technology industry and service providers are enhanced if communities collaborate regionally.

### **"E-58": An eCorridors Prototype**

Like many states, Virginia has a large number of rural communities that are left out of the network economy due to lack of affordable access. In many areas, the only access is dial-up modems. In Virginia, virtually all available fiber paths run north-south and none travel along the east-west border of the southern part of the state coinciding with Highway 58. This entire region comprises communities that have been the hardest hit economically and are desperately struggling for survival against such high tech regions as Northern Virginia, Hampton Roads, and Research Triangle Park. In addition, these 100 communities are situated within the tobacco-growing regions of the Commonwealth and are seeing their agricultural livelihoods and manufacturing industries rapidly deteriorating. Unemployment and brain drain are very real threats to these communities. For this reason, the eCorridors Program, along with the Virginia Tobacco Indemnification and Community Revitalization Commission chose the Highway 58 corridor as its prototype region for implementation. With the enthusiastic

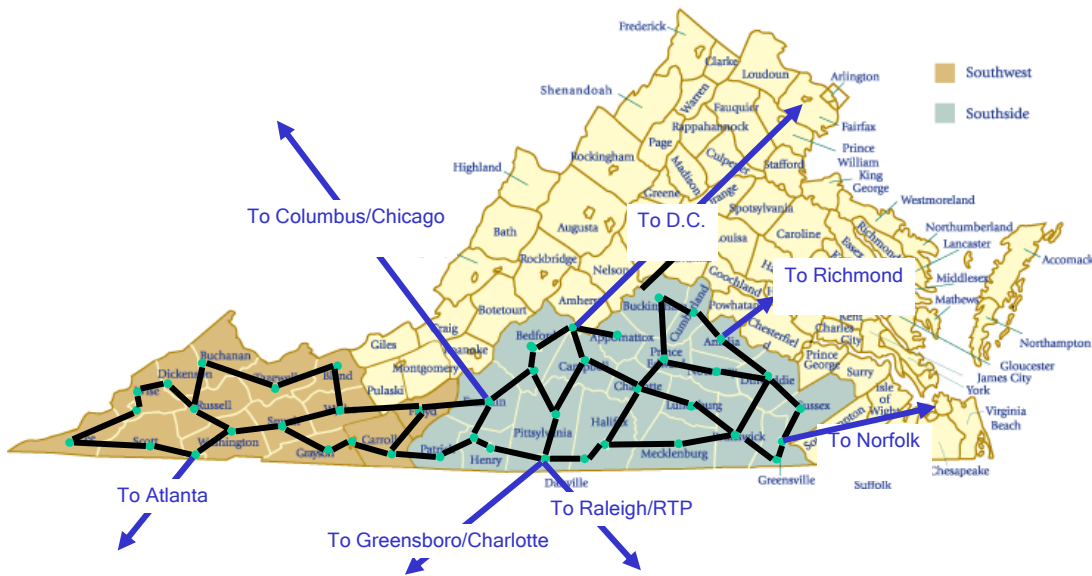


support and leadership of people in the Danville/Pittsylvania County area, the eCorridors Program began aggressively promoting the concept of an "E-58 Corridor."

The Virginia Tobacco Indemnification and Community Revitalization Commission endorses e58 as an effective economic development strategy and established an e58 Task Force. That Task Force conducted an evaluation of the proposed telecommunications corridor and issued a Vision Statement and Program Announcement (see [http://www.vatobaccocommission.org/e58vision\\_form.html](http://www.vatobaccocommission.org/e58vision_form.html)). In collaboration with Virginia Tech's eCorridors Program, the Tobacco Commission envisions funding a number of proposals each year that contribute infrastructure, leadership, equipment, expertise, municipal assets, etc. to the overall regional effort.

The objective is to develop *coordinated* community efforts and public-private partnerships for the

### Tobacco Commission Counties Southside and Southwest



Links SW = 21 SS = 33  
Nodes SW = 17 SS =

Conceptual Representation. Actual routes pending detailed analysis.

creation of an east-west, dark fiber, mesh backbone with on-ramps in every community along the way. Each community needs to build a "multimedia services access point" to provide a local peering point for access to services and to inter-community transport. It serves to keep local traffic local and improve performance while reducing costs to participating service providers.

A goal of e58 is to demonstrate: 1) how to funnel and shape regional public funding support for economic revitalization initiatives; plus, 2) influence private investments in advanced network infrastructure, services, and applications, so that *any* community in the tobacco growing region, if they choose, can participate and compete in the information economy.

## Danville/Pittsylvania County - A Prototype eCorridors Community

As mentioned, a key to success for an eCorridors region is the active participation and endorsement of local community leaders with a local 'champion' that is positioned to move the effort forward. Danville and Pittsylvania County, located on the southern border of Virginia, just above the North Carolina Research Triangle, provided the impetus for the eCorridors pilot project with the help of a local non-profit organization called the Future of the Piedmont Foundation. This Foundation is made up of business leaders from the city and county -- representing the interests of both equally. The Foundation approached Virginia Tech and requested the university's assistance in developing a plan to create a competitive advantage for the Dan River region. Several initiatives were proposed by the university, one of which was the creation of an advanced network infrastructure--an 'eCorridor'. The Foundation worked with the eCorridors group to propose deployment of regional fiber optic infrastructure to the Virginia Tobacco Indemnification and Community Revitalization Commission. That proposal was funded (a copy is available on [www.ecorridors.vt.edu](http://www.ecorridors.vt.edu) "working paper #4") for \$2 million over two years.

The eDan proposal consisted of 5 elements:

- Inter-Community Next Generation Optical Link (Danville – Chatham)
- Gigabit Gateways
- 2 Multimedia Services Access Points (MSAPs)
- Pilot Projects: Local “1st Mile” access (e. g. LMDS, 802.11a, 802.11b, fiber to the home)
- Business Plan: Dan River Region to Tier 1 Internet Backbone

A stated objective of the Dan River Region eCorridors Pilot project is to reduce barriers to entry for new economy businesses, telecommunications providers, and local entrepreneurs. The next step after receiving funding for the project was to begin creating partnerships with local and regional private sector companies wishing to participate. The eCorridors Program aims to create economic benefit to communities and regions by encouraging local companies to begin efforts to supplement their traditional manufacturing and agricultural focus with a New Economy orientation. It was important that local companies have an early opportunity to participate in pilot projects. A second goal was to attract new businesses and service providers, so participation was invited from a wide range of participants.

The Foundation issued a Request for Collaborators, which was published in the local newspaper and sent directly to 50 companies. The request included an invitation to attend an information session in Danville to learn more about the project and how companies can get involved. The meeting was held on October 17, 2001 and was attended by about 75 companies. Seven were national companies and three were international. Several of the attendees represented new business start-ups that were looking for a location to establish their dot-com business. This was a significant turn-out that created visibility for this rural community to companies that otherwise would not have participated. The company representatives spent four hours listening to presentations about the technical elements of the project and participated in a question and answer session. Representatives of the Foundation, the eCorridors Program, and city and county officials were on hand to support the project and to answer questions and establish contacts with interested companies. The information session closed with an invitation to work together to develop proposals from either individual companies, or groups of companies, having complementary expertise and submit them to the Foundation.

The Foundation received a number of proposals from a diverse range of interested partners. With assistance from the eCorridors team, the Foundation evaluated proposals and determined funding

levels. Several companies participated in local technology demonstrations to the community. The City of Danville and RACO, a local contractor, are building a 40 mile, 60-fiber route linking Danville to Chatham and Gretna. Danville is building a fiber optic backbone within the city. Access drops are planned for serving industrial parks, education, and others. Gamewood, a local ISP, is building the MSAP communication sites and will operate them for the communities. Space was provided by the communities, who also worked together to make available rights-of ways. The MSAP facilities will deliver gigabit Ethernet peering and collocation space for service providers that will provide local access to users. Task forces were created with representatives from the communities and eCorridors team to address public relations, applications, inter-community fiber build, rights-of-ways, and MSAP facilities.

The resulting private sector investments multiply the value of the initial local investment. More importantly, the participation represents extraordinary value in terms of sustainable economic development potential. Every additional company that takes a serious look at this region and begins to learn of the many advantages it can offer will add to the attractiveness of the region and will aid in building a critical mass of market demand for advanced network access and services. Over time, it will be possible to change the region's characterization as a manufacturing and tobacco-growing region to that of a "wired", high technology region.

The eCorridors Program emphasizes an integrative approach to assisting communities in adopting new economy practices and reducing barriers to entry for new players. The network infrastructure and new, competitive, telecommunications providers will benefit the region, if its citizens and business owners understand how to effectively leverage these resources. Working with Danville Community College and Averett University, as well as the city and county K-12 public schools, Virginia Tech is developing a number of educational programs, including faculty development, to enable the community to educate its citizens and teachers. In addition, a series of ongoing hands-on technology demonstrations, open and widely promoted to the public, will aid in promoting the new technologies. It is expected that the Danville-Chatham-Gretna optical network infrastructure will be completed by the end of 2002. The region must continue to foster community-wide participation, expanded local access, networked services, and e-business training for its citizens.

## **Lee County, City of Norton, Wise County and Scott County Pilot Project**

The LENOWISCO Planning District Commission (<http://www.lenowisco.org/>) proposes to put the world's most advanced communications infrastructure within reach of every business and citizen in the LENOWISCO area within 10 years or less, depending upon funding availability. The overriding goal of the project is to act as a catalyst in creating substantial economic, educational and health care improvement opportunities for citizens of the region and competitive advantage for its businesses through the development of very high speed, reliable network infrastructure at a fraction of currently available prices. This infrastructure will be private sector based as a means of ensuring its sustainability and economic viability, and will enable the emergence of the newly developing communications and network industry in southwest Virginia.

The immediate goal is to provide 125 miles of optical fiber network and extend that by an additional 100 miles for subsequent phases. The fiber would be buried alongside the planning district's water lines using an innovative conduit that allows fiber to be blown all the way through to the end user building site. The first 125 mile phase Total Project Cost has been estimated to be \$5.3 million and has already begun with installation of conduit throughout the planning district

wherever water lines are in construction. Crews started laying the innovative new information pipeline June 26, 2002. in trenches alongside the water lines for the Tito and Jasper water projects. In addition, project partner Scott County Telephone Cooperative has provided use of 70 miles of fiber optic cable in that county.

The underground plastic data pipeline that is being used for the first time in the nation can serve as: a conduit for massive amounts of data transmission from present and future users; developing cottage industries; educational, law enforcement and court sites; medical facilities; residential customers.

The Virginia Tobacco Indemnification Commission provided a \$200,000 grant to engineer the project, and a \$445,000 loan to fund the installation. LENOWISCO also plans to seek funds from other sources including Rural Utility Service and federal sources of funds.

#### Project Objectives

- Create a competitive marketplace
- Encourage private investment
- Reduce data and telecom costs for all
- Reduce overbuilding and redundant facilities
- Create local markets for new services

LENOWISCO does not intend to offer services through the network. Instead, private companies will be able to offer high-definition television, cable TV programming, Internet access, telephone service and other programs by leasing the network. Physicians will be able to use the broadband network to treat patients hundreds of miles away, consult with a specialist, or participate in continuing education classes. Future phases may extend into western Lee County and the Cumberland Plateau Planning District Commission's service areas, including Dickenson, Buchanan, Russell and Tazewell counties.