

Broadband Initiatives: Enhancing Lives and Transforming Communities



Broadband Initiatives: Enhancing Lives and Transforming Communities

Alliance for Public Technology

Communications Workers of America

Alliance for Public Technology

The Alliance for Public Technology (APT) is a nonprofit organization of public interest groups and individuals. APT's members work together to foster broad access to affordable, usable information, communications services, and technology. APT can be found online at <http://www.appt.org>

Board of Directors:

Robert D. Atkinson, Ph.D.
Lynne Bradley
Karen Buller
Matthew Chase
Larry Goldberg
Paul Hernandez
Karyne Jones

Jeffery H. Keefe, Ph.D.
Helena Mitchell, Ph.D.
Kenneth Peres, Ph.D.
Adrienne Pon
Hilary O. Shelton
Jenifer Simpson
Karen Peltz Stauss

Communications Workers of America

The Communications Workers of America (CWA) is the union for the Information Age, representing 700,000 workers in communications, media, airlines, manufacturing and public service. CWA sponsors the Speed Matters: High-Speed Internet for America campaign and can be found online at <http://www.cwa-union.org/> and <http://www.speedmatters.org>

Appreciation

APT and CWA wish to thank the representatives from the programs profiled here for their help in constructing the case studies and their dedication to their communities. Their work is the embodiment of the true value of broadband. Our thanks also to those who reviewed drafts of the document and contributed to its production.

About the Author

Peter Backof is a Research Associate at the Alliance for Public Technology. His primary responsibilities include the research and writing for updates of two APT reports, *A Broadband World: The Promise of Advanced Services* and *A Nation of Laboratories: Broadband Policy Experiments in the States*, of which this is the first. Mr. Backof has worked in the editorial departments of the Center for American Progress, the City Paper in Baltimore, Dickinson College's magazine The Square, and several other publications. He has also worked in community technology centers in Carlisle, PA, and Sacramento, CA, the latter as part of a year of service in Americorps. Mr. Backof received his B.A. in Political Science and Creative Writing from Dickinson College.

TABLE OF CONTENTS

- Introduction..... 4
- Community Development..... 10
 - Edgewood Terrace..... 11
 - Fort Wayne..... 14
 - Further Examples..... 17
- Disability Access..... 20
 - Broadband Video..... 21
 - Further Examples..... 24
- Education..... 26
 - Hayward e-District..... 27
 - Megaconference, Jr. 30
 - PEBBLES..... 32
 - St. Lawrence..... 35
 - Further Examples..... 37
- Health Care..... 39
 - AFHCAN..... 40
 - ANGELS..... 43
 - Winona Health..... 46
 - Further Examples..... 48
- Labor & Economic Growth..... 51
 - Beyond Tobacco..... 52
 - CWA/NETT Academy..... 55
 - Further Examples..... 58
- Public Safety..... 59
 - WARN..... 60
 - Winston Salem Fire..... 62
 - Further Examples..... 64

INTRODUCTION

Broadband Is Essential

Broadband services are an essential tool in today's world, improving the ways in which we live, work, and learn. The power of broadband can be used to expand the boundaries of the possible among diverse populations and across the entire landscape of society. Broadband services can improve health care, open educational opportunities, stimulate economic development, forge community and social bonds, improve access to communication systems for people with disabilities, and enhance public safety.

The Alliance for Public Technology (APT), a coalition of individuals and public interest organizations, has been advancing the need for universal deployment of and access to broadband networks and services for almost two decades. During this period, broadband deployment has expanded, yet we are still far from realizing the full benefits of high-speed networks and all too many households still do not have full and equitable access to the technology.

This report documents specific examples of communities using high speed broadband to tackle local problems and maximize available resources. Some of the highlights include students in Iowa who use broadband technology to share live interactive learning with their peers in Singapore; expectant mothers in rural Arkansas who receive advanced prenatal care from specialists in Little Rock over high-speed networks; and first responders in our nation's capital who have instantaneous access over wireless broadband to an unprecedented amount of critical information so they can protect us better.

The highlighted programs and applications utilize different platforms and different speeds. They target diverse audiences. But all share a common need for high-speed high-capacity networks, and they all strive to improve the quality of life for their constituencies. This report is not meant to be an exhaustive accounting of all the ways that broadband is used for the public good, but it does provide a sampling of the wide ranging possibilities, such as:

- **Community Development.** Entire cities and individual neighborhoods today provide high-speed interactive communication tools to enable citizens to come together, solve common problems and improve services.
- **Disability Access.** People with visual impairments can search through large volumes of text using digital networks. Deaf and hard-of-hearing individuals use live video sign language. Broadband enables these people to gain greater independence, integration and privacy.

- **Education.** Teachers, administrators, and parents are able to share more information and children who are forced to miss long periods of class time can stay connected to their home classrooms through high-capacity networks. Students interact with people in foreign cultures and participate in advanced scientific projects because distance is no longer an obstacle.
- **Health Care.** Patients and providers are interacting in a variety of ways, expanding the reach of urban specialists, improving the quality of care, eliminating the need for extensive travel, reducing costs and saving lives. In addition, medical records and health information stored over broadband networks are helping improve care and manage resources more efficiently.
- **Labor and Economic Growth.** Broadband technologies are making worker training and continuing education more relevant and more accessible. Communities are also using broadband to revitalize their economies and encourage business growth.
- **Public Safety.** First responders have immediate, on the ground access to critical data and resource sharing.

Findings

The report includes 14 in-depth case studies and 38 annotated descriptions of innovative broadband programs and applications. The technology is being used to address a wide range of issues. Local communities are empowered to meet their particular needs. Many underserved populations gain access to new and expanded resources. Broadband technology increased the effectiveness of programs while, in most of the cases studied, also lowered costs.

Public funding was essential to the success of most of the programs. Much of this funding was distributed through federal programs like the Commerce Department's Technologies Opportunities Program, the Universal Service Fund's E-Rate program, and Rural Utilities Service grants. Additional funding for successful broadband programs came from other agencies such as the Department of Education, the Department of Housing and Urban Development, and Medicaid programs through the Department of Health and Human Services.

All of the case studies supported applications that needed bandwidths higher than the FCC's official definition of broadband, which is 200 kilobits per second (as of December 2007). Furthermore, the impact of broadband was demonstrably significant in each of the case studies. For example:

- An IT skills training program in a fully wired mixed income housing project boosted the average income of graduates from \$9,800 to \$28,000.

- A sustained commitment to broadband infrastructure build out in Fort Wayne Indiana led to the creation of 3,000 technology related jobs.
- The school district in Hayward, California saved an estimated \$1.5 million in administrative costs using software and programs run over a broadband network.
- An Alaska telehealth program cut Medicaid reimbursed travel costs by 82%.
- Arkansas saved millions in Medicaid costs and decreased infant mortality through a rural telehealth program.
- A wireless broadband public safety network provides simultaneous interoperable data communication for up to 200 first responders in Washington, D.C.

Despite these successes, in all too many cases, the broadband applications and programs were all too limited in scale. Many of the case studies were conducted as pilot or test programs. Implementation often required a significant initial investment in infrastructure, thus creating a funding barrier for further expansion. Building on the success of these programs will require a sustained policy commitment by all levels of government to broadband infrastructure deployment to ensure that every American home and business has affordable access to the technology.

An Ongoing Effort

This document is the third in a series of APT publications designed to identify innovative broadband applications and raise awareness of their impact on communities. In 2002, APT published the first report, *Advanced Services, Enhanced Lives*, that documented eight examples of innovative broadband applications. The second report, entitled *A Broadband World: The Promise of Advanced Services* was published in 2003 and incorporated those earlier findings while adding six additional examples. Research is an ongoing process, and as new uses for the technology are conceived, APT will continue to document the successes and challenges for the valuable lessons to be gained.

What is Broadband?

Broadband is best described as high-speed, interactive, always-on, two-way data transmission capable of supporting video communication and other advanced applications. A range of transmission technologies is available, including cable modems, telephone lines, satellites, fixed and terrestrial wireless, and fiber optics. Broadband is also a connection platform, a gateway to information and services that can be accessed from a home computer, a laptop, or a wireless handheld device.

The Telecommunications Act of 1996, and Section 706 in particular, recognized the

evolving nature of the technology and did not limit the definition of broadband to any speed or technology. In implementing the Act, the Federal Communications Commission established its current definition of 200 kilobits per second (Kbps) upstream and downstream, which has outlived its usefulness because current broadband use requires far greater connection speeds. For example, downloading a 2 minute video on the popular website YouTube would take about 10 minutes with a 200 Kbps connection. Fiber to the home deployments are now offering connections many times faster than the FCC definition, upwards of 50 megabits per second (Mbps), and Internet2, a consortium of colleges and universities working with government and industry to develop the next generation of Internet services, is planning to build a network with a capacity of 100 gigabits (Gbps).

Current State of Broadband

The FCC is charged with implementing the provisions¹ of the Telecommunications Act of 1996 and managing the ever-changing telecommunications environment. The key element of the '96 Act is Section 706, which calls for “the deployment on a reasonable and timely basis of advanced telecommunications capability² to all Americans.” However, when the '96 Act was crafted, legislators could not begin to imagine the technological developments that were to follow, some of which are highlighted in this report. The FCC is now considering updates to the rules governing broadband, including the way deployment is measured, as well as changes to the definition of broadband. Issues such as accessibility requirements, appropriate investment incentives and reform of universal service are also being considered.

In addition, several pieces of legislation designed to encourage broadband investment have been introduced in Congress. Some seek to spur deployment through financial incentives, such as tax credits and grant and loan programs. While no comprehensive broadband legislation has yet been approved and signed into law, there is growing support for policy based on the public/private partnership model of ConnectKentucky. (www.connectkentucky.org)

Despite the clear benefits of broadband, the U.S. lacks a coherent national policy to ensure universal access and affordability. As a result, the U.S. – the country that invented the Internet – has fallen behind our economic competitors and many other smaller countries in broadband adoption and deployment.

The U.S. trails in almost every measure of broadband – subscribers, price, speed and investment. The U.S. is 16th in the world in the percentage of inhabitants with broadband subscriptions. The countries ahead of the U.S. include South Korea, Japan, Canada, Iceland, Hong Kong, Israel, and Iceland. Moreover, we are falling

¹ Associated Press, Anick Jesdanun, Researches Break Internet Speed Record, April 24, 2007.

² Advanced Telecommunications Capability is defined “without regard to any transmission media or technology, as high-speed, switched broadband telecommunications capability that enables users to originate and receive high quality voice, data, graphics and video telecommunications using any technology.”

³ Broadband access is expected to reach all Kentuckians by the end of 2007 through a statewide initiative know as ConnectKentucky. It has accelerated technology growth, particularly in the areas of broadband deployment and technology literacy and usage through public-private partnerships.

behind at an alarming pace: in 2002 the U.S. was ranked 11th according to the International Telecommunications Union. The U.S. also lags behind other countries in relation to the speed and price at which broadband is offered. We pay more for less speed than subscribers in other countries.

While we rightly applaud the success of programs such as the “E-Rate” in wiring classrooms and libraries throughout our nation, there is still a significant digital divide among our citizens based on income, geography and ethnicity; and high paid telecommunications jobs in the U.S. are disappearing. Four out of ten African Americans have broadband compared to five out of ten Caucasians. Three quarters of those with incomes above \$75,000 have broadband while only a third of those with incomes less than \$30,000 have access in their homes. College graduates are twice as likely to have broadband than individuals who only graduated from high school. And only one third of rural Americans have broadband, compared to half of their urban and suburban counterparts. These shortcomings reduce our quality of life and inhibit the ability of our citizens to participate in a global economy increasingly based on high-speed communications.

Policy Recommendations⁵

To further encourage policy developments and help craft a framework for a national broadband policy, APT gathered a broad array of policy experts and representatives from industry, consumer, labor and public interest groups, for careful analysis and thoughtful discussion. Based on this roundtable, APT published *Achieving Universal Broadband: Policies for Stimulating Deployment and Demand* in February 2007 with the following recommendations:

- Establish clear national goals for broadband deployment.
- Require accurate reporting of broadband deployment, speeds and prices.
- Continue to foster private investment and marketplace competition.
- Require Universal Service Fund recipients to offer broadband services.
- Provide tax incentives, low interest loans, and grants for broadband deployment.
- Create an Office of Broadband within the Federal Government.
- Utilize non-traditional, non-telecommunications programs more effectively.

⁴ International Telecommunications Union, World Telecommunications Indicators Database.

⁵ Data taken from John Horrigan and Aaron Smith, “Home Broadband Adoption 2007,” the Pew Internet and American Life Project, June 2007.

State and local governments are also important partners for developing innovative broadband programs and applications. In recent years states have undertaken a variety of initiatives, underwriting grants and loans for the construction of broadband infrastructure and facilitating public-private partnerships to spur deployment. Local governments are involved with rights of way issues and community organizing to determine how broadband providers can best construct their networks.

Connecting Each to All

Communication networks gain in value by having everyone connected. The case studies that are showcased on the following pages are powerful examples of how broadband enhances the lives of individuals and transforms communities. However, their effectiveness is inherently limited by the current state of broadband deployment. We, at APT, hope that this report provides a call to action that integrates the recommendations listed above. Through a comprehensive national broadband policy we can ensure future economic growth and a better society for everyone.

COMMUNITY DEVELOPMENT



Edgewood Terrace



Fort Wayne's Innovation Initiative

Edgewood Terrace: Wiring Mixed Income Housing

"The neighborhood was a mess, it was dangerous. But since the renovation my kids have gotten a lot of help here. I've seen a lot of improvement in their grades." - Linda Howard, Edgewood Terrace resident

Broadband can play an important role in providing resources to underserved communities. Many impoverished communities lack the telecommunications tools and technological skills to access the wealth of educational information and social services available online. Widely deployed to homes and supported by community programs, broadband can have a positive lasting impact on low-income communities.

One successful example is Edgewood Terrace, a mixed income housing complex located in north-east Washington, D.C. During the 1970s the community was an attractive place to live, drawing many older adults. However in the 1980s it became mired in gang activity, violence, and illegal drugs. A cycle of poverty became ingrained in the community and infrastructure was crumbling.

The Community Preservation and Development Corporation (CPDC), a non-profit real estate developer, confronted these issues and resolved to turn the community around. They developed a comprehensive strategy, which included broadband to each individual residence, in order to connect residents to social services, counseling, financial services and educational resources. Their goal was to create economic opportunity, educational advancement, and a stronger, more vibrant community.

Edgewood Terrace's broadband program is the result of a substantial collaborative effort. While CPDC took the lead on redeveloping and managing the property, significant support for broadband has come from other organizations as well. Long standing plans to integrate technology in mixed income housing were proposed and funded by the U.S. Department of Housing and Urban Development (HUD). The Department of Commerce's Technology Opportunities Program (TOP) provided grants for specific technology oriented training and application programs with matching support from Microsoft and Verizon. Catholic University and Montgomery College developed curriculum materials and supported training programs.

For the key first step in its community revitalization strategy, CPDC redesigned the entire complex to meet the health care, job training, and educational needs of Edgewood Terrace. Every one of the 792 residences is wired for broadband and over 2,400 users are now registered on the community network. Apartments are connected in a way similar to how modern office buildings are wired, with T-1 lines

providing connections of about 1.5 Mbps downstream and upstream.

In order to take advantage of their broadband connection residents have access to a range of technological tools. The network is accessed through subsidized personal computers or thin-client devices, which are less expensive alternatives but lack the full capabilities of a computer. A suite of office software, an intranet known as EdgeNet, and e-mail accounts are provided free of charge. EdgeNet gives residents an online forum to communicate, access resources, and form their own resident associations to legally represent themselves. Residents also work with community empowerment staff members to develop training classes on community issues, creating an environment where neighbors learn from, and rely upon, one another for support.

Broadband is not just confined to the apartments of Edgewood Terrace. A number of supporting programs and resources ensure that residents are able to maximize the technology throughout their community. Edgewood Terrace has six Learning Centers, similar to community technology centers, which are fully wired and equipped with computers. The Learning Centers are used for instructional classes and community development programs.

One of these instructional classes is the Career and Skill Enhancement program. Over 1,000 students have graduated from the program with acquired and upgraded skills in the IT field. Resources are also available for job searches. Other programs focus on youth and emphasize technology for school and career preparation. The e-Sharp program, designed for high school students, teaches computer programming and provides certificates in digital music that students can take to media companies. After school classes for younger students emphasize technology literacy.

Broadband also helps meet community health needs. Seniors have always been an important part of the Edgewood Terrace community. Outreach programs provide home monitoring for senior residents with chronic conditions like diabetes and hypertension. Video is used for regular check ups, to assist with nutrition and medication, and for consultations with health care providers. The seniors who participate in these home health care programs report a greater interest in healthier lifestyles, such as an increased willingness to take the stairs or watch their diet. They also benefit from the increased social interaction of regular check ups.

Edgewood Terrace has seen significant benefits from CPDC's efforts. Graduates of the IT skills program dramatically increase their incomes, on average jumping from \$9,800 to \$28,000. School attendance has improved as children take advantage of after school programs and online resources to improve their academic performance. Residents use broadband tools to work together for common goals, creating a safer, more involved community that has seen a decrease in criminal activity and is once again an attractive place to live.

Edgewood Terrace demonstrates the benefits of broadband technology in a community that would normally be the last in line for advanced telecommunications services. It has overcome its troubled past and there is now a waiting list for apartments. When

incorporated into a long-term, community oriented development strategy, broadband can be more than just high speed access to entertainment. Broadband has the transformative potential to provide new opportunities and open up doors to new resources for underserved communities.

More Information

The Community Preservation and Development Corporation

<http://www.cpdcc.org/>

Fort Wayne: A Wired and Inspired Community

“Getting the opportunity for people to learn and earn is so critical. The innovation information infrastructure of broadband is absolutely critical to rust belt cities.” - Mayor Graham Richard

Communities with extensive broadband access can leverage technology in exciting ways, especially when the technology is supported by local government and integrated into traditional civic activities. E-government services offer convenient, efficient, and cost-effective new ways for local governments to serve their citizens. Business development and educational programs can use broadband to build on existing community strengths while also adapting to the changing needs of the modern economy.

One of the best examples of large scale community oriented broadband deployments, is Fort Wayne, Indiana. The city of Fort Wayne historically relied upon industry and manufacturing for its economic base. As the economy shifted and businesses in these sectors closed or moved off-shore, the lack of jobs and declining annual wages threatened the city’s economic security. Political leaders felt that strong civic involvement in the deployment of advanced broadband infrastructure was critical to reversing this trend, as well as providing other community benefits.

The “Innovation Initiative” was created in 2000 as a long term strategic plan to develop Fort Wayne’s broadband connectivity. It now has one of the most widely deployed fiber to the premises networks in the country, and this has helped boost economic growth. Since the implementation of the Innovation Initiative over 3,000 new technology-related jobs have been created and hundreds of millions of dollars have been invested in Fort Wayne-area companies. A publicly supported high tech business incubator provides ideas and expertise on broadband use for business and other organizations.

This initiative is designed to boost both the supply and the demand of broadband. The city and regional governments work closely with broadband providers to increase the capacity and availability of high-speed networks. At the same time the government stimulates the demand for broadband by making an increasing number of services available through online applications and encouraging the use of broadband for existing government operations.

Fort Wayne relied on a strong partnership between city governments and private

business to build and improve its broadband infrastructure. Private investment accounts for most of the broadband infrastructure in the city. Fort Wayne's leaders began their efforts by leveraging resources, like rights of way and permits, to support deployment of a wireless broadband network for public safety use. Following the success of this network, which was expanded to include businesses and city offices, the city worked with providers to promote DSL and cable deployment. They soon realized, however, that in order to maximize Fort Wayne's economic competitiveness they needed the most advanced broadband infrastructure possible. Local leaders actively worked with a major telecommunications company to implement a massive fiber build-out that was finished in 2007.

More than 7.1 million feet of fiber now reaches over 110,000 homes and businesses in the greater Fort Wayne area. Fiber to the premises (FTTP) offers some of the most advanced consumer connection technology in the entire country. Speeds of 5 Mbps, 10 Mbps, and 50 Mbps are available, depending on the needs of the user. Each of the 87 schools in Fort Wayne and the surrounding county, encompassing 3,000 teachers and 54,000 students, has an even faster 1 Gbps fiber connection. Cable and DSL services also are available for residents, and the city operates wireless hotspots in certain areas with free access.

This high speed broadband infrastructure has made Fort Wayne stand out as a destination for high tech businesses. It is easier to attract and retain highly skilled workers with advanced broadband connections, which allows them to maintain a highly connected lifestyle and work from home. It is also easier to share resources and collaborate on projects with high speed technology. Many high tech companies view broadband as essential when considering where to locate their business.

Broadband's impacts are not just confined to the private sector. Fort Wayne is promoting broadband as a tool to meet community needs through Innovation Teams, better known as iTeams. Seen as the key to integrating broadband into the lives of Fort Wayne's residents, iTeams bring various community stakeholders together to address specific issues through the use of broadband. Broadband has also been heavily integrated into area schools. Through video links, distance is no longer a barrier to educational resources. Schools can offer specialized classes across multiple locations that could not be supported at an individual school, virtual field trips are easily accessible, and interactive instruction is possible.

Many Fort Wayne residents are benefiting from broadband through community oriented programs like the iTeams, which cover a range of areas and include:

- **Net Literacy.** Student volunteers work with seniors to improve computer literacy and basic Internet skills. The team also runs a computer drive to help gather used computers, recycle and refurbish them, and place them in community centers around the city.
- **Medical-Remote Diagnosis.** Real-time diagnosis in clinics through a "Virtual Medicine Eye" is provided for diabetic patients with possible retinal problems, including glaucoma. This extends the diagnostic reach of specialists, allowing for improved identification of those that need care.
- **Deaf and Hearing Impaired.** Working with local non-profit video relay service providers, the iTeam ensures that live sign language services are being fully

utilized, reducing communication barriers for residents who are deaf and hard of hearing.

- **21st Century Scholars.** Technology support is provided to an existing Indiana state program designed to help middle school students from underserved communities attend and graduate from college.
- **City Government.** To make civic government more accessible and interactive, the city provides streaming video of legislative sessions at the local, state, and national level. Administrative services are also increasingly offered over the Internet, moving on-line what had been done in-line.

Civic services have been improved by broadband. Data sharing and collaboration among different agencies has enhanced the value and delivery of services like traffic management and the payment of fines, which can now be done online. Public safety agencies are taking advantage of the city-wide municipal wireless network to increase their effectiveness. Police can instantly access databases, like fingerprint registries, that allow them to positively identify suspects and respond faster to incidents.

Broadband can boost a community's economy and provide improved tools for government services. Fort Wayne's large scale broadband strategy has been recognized by a number organizations and with the help of the iTeams, community leaders hope to continue expanding broadband technology in areas such as health care information systems, intelligent transportation tools, public safety, learning technology, advanced manufacturing, and library services. Fort Wayne has already seen the impact broadband can make in their economic and civic lives, and the future is even more promising.

More Information

City of Fort Wayne

<http://www.cityoffortwayne.org>

Further Examples

Corpus Christi Municipal Services

Corpus Christi, Texas, is one of the few cities to implement a truly city-wide municipal wireless network. While citizen access to the network has remained limited, to the point that the city sold control of the network to a private company, the uses for government services has been eye-opening. Corpus Christi uses wireless connections to keep building inspectors, code enforcers, police, firefighters and EMTs hooked into the office while out in the field. The network is used to automatically collect utility meter readings, providing detailed information that makes it much easier, for example, to find water thieves and manage water use. The city also uses more conventional broadband to broadcast public service announcements and city council meetings over the web

More Information:

<http://www.cctexas.com/egov/>

FAST-TRAC Traffic Management

Oakland County, Michigan, faces a growing traffic problem as a suburb of Detroit. They have managed this problem with FAST-TRAC, an advanced traffic management technology that uses video to respond in real time to traffic flow. Data collected from the video cameras is transmitted over broadband to a central computer for traffic signal adjustment. The data is accessible from the web, and live maps and images from the cameras are made available to citizens. This use of broadband minimizes traffic congestion and improves safety on the roads.

More Information:

<http://www.rcocweb.org/commuter/fasttrac.asp>

National Institute of Health and National Library of Medicine Online Resources

NIHseniorhealth.gov is a multimedia website operated by the National Institute of Health that offers the most up to date health information for seniors. The website has accessibility functions, like text size switching and contrast options, along with videos and a text reader. Medlineplus.gov offers more general multimedia health information. The resources include webcasts of surgical procedures for educational purposes and interactive maps of various systems of the body. All of the information, including the web cast videos, is also available in Spanish. Broadband is necessary to fully access these health resources.

More Information:

<http://nihseniorhealth.gov/listoftopics.html>

<http://medlineplus.gov/>

OneCommunity

Community leaders in Cleveland, Ohio, came together to build an ultra fiber network connecting educational and civic institutions. It now connects almost 1,500 sites in 18 counties, including schools; libraries; higher education institutions; hospitals; governments; and cultural organizations. It has not been used to connect individual homes and businesses. The network supports applications like virtual field trips to the zoo, a health information network that covers 80% of the area population, distance learning, and remote report filing for city workers. A program run over the network helping low income individuals file taxes resulted in the awarding of over \$2 million in tax credits.

More Information:

<http://www.onecleveland.org/index.aspx>

Overdrive Project

The state library of Kansas uses new web technology to enable online borrowing of multi-media materials. An increasing number of e-books, videos, movies, music clips, and audio books are available to download. A special media player ensures that the materials are only usable for a certain allotted period, and users are limited in the amount of content they can “borrow” at a time. Users can transfer the borrowed media to a portable device. Without broadband this resource is significantly limited. The service is especially beneficial to people who are blind because they can access a library of audio books from their home.

More Information:

<http://kansas.lib.overdrive.com>

Portable Electronic Enrollment Project

Community Partners, a health outreach partnership that works in close collaboration with the Massachusetts Department of Public Health, helps people enroll in publicly funded health coverage in rural western Massachusetts. Outreach workers use laptops, wireless connections and web-based enrollment program to increase the speed and accuracy of the process. A similar technological approach has been implemented to increase participation in the Food Stamps Program. Funding support has come from the Department of Commerce, through the TOP program, and the Department of Agriculture.

More Information:

<http://www.compartners.org/about/programs>

Technology for All

Technology for All is an organization that supports community technology centers in the Houston area. In the aftermath of Hurricane Katrina, when many refugees were housed in major public buildings in the Houston area, Technology for All deployed a wireless broadband network and computer terminals in major shelters to assist refugees in gathering information and contacting family.

More Information:

<http://www.techforall.org>

Virtual Possibilities Network

The Virtual Possibilities Network is a non-profit fiber network connecting key institutions in eastern Washington, centered on Eastern Washington University. It was founded through a consortium of area educational institutions on donated fiber. The network is open to proposed projects and is used for a wide variety of applications, including real time remote captioning services, back-up data storage for businesses in case of emergency, online interactive classrooms, and to provide low-income communities access to resources and information.

More Information:

<http://vpnet.ewu.edu/home.html>

weCare@school

The Fairfax County, Virginia, school system developed a student emergency information database that can be accessed quickly and easily by wireless handheld devices. Funding support came from the TOP Program. Parents, after verifying their identity in person, input emergency contacts, allergies, and other critical information through a web browser. Administrators add class schedule and enrollment information. The information travels over an encrypted communication channel to ensure confidentiality. In the event of an emergency incident first responders at schools, such as principals, nurses, and police officers, have secure access to emergency care and location information about students on their wireless handheld devices and cell phones.

More Information:

<http://www.fcps.k12.va.us/news/wecare.html>

DISABILITY ACCESS



Video Relay Service

Broadband Video: Equal Access for the Deaf and Hard of Hearing

"I was able to have many phone calls in sign language with the confidence that I was getting all of the important information needed to complete my adoption. If I had to communicate through text, it would have been a much longer and difficult process. My husband and I are all set to fly to Kyrgyzstan to pick up our deaf daughter. We are indebted to Video Relay Service." - Kelly Lange, Video Relay Service user

For the estimated 31 million Americans who are deaf or hard of hearing, full access to communication has been a challenge. During most of the 20th century a substantial portion of this population was unable to communicate effectively due to the limitations of the phone system and technology. From the 1970s through the turn of the century, some accommodations and solutions were made for people with hearing loss to communicate – like text telephones, also known as TTYs – but these were insufficient for the kind of live interactive communication that hearing Americans take for granted.

In order to place a phone call through voice-based devices, either to a hearing person or another deaf person, a slow and cumbersome text interface was required. Considering that most people can type words at only one third the rate at which they typically speak, the lack of live, interactive communication remains a huge barrier to work and social interaction. However, the ability to transmit clear reliable video over broadband can remove this barrier. A range of video telephony services over broadband now provides this historically underserved population with full, unfettered access to communication in their own language.

With true high speed broadband, people who are deaf and hard of hearing can benefit from a number of new communications options. A minimum bandwidth of 384 Kbps is required for video telephony to guarantee clarity and avoid time lags. Otherwise some aspects of sign language are lost and misunderstandings become more likely. For example, sign language requires eye contact and fast paced finger spellings of words that don't have their own signs, two characteristics that are put in jeopardy by a spotty connection.

According to some deaf and hard of hearing people, the removal of the phone barrier is unparalleled to any other technological advancement in recent years. Direct video telephony makes it much easier for people who sign to keep in touch with friends and

family across the country from their own homes and in their natural language, reducing their sense of isolation. Unlike text, video telephony users can show gestures and facial expressions, react to and interrupt one another, and communicate quickly. In addition, because it is conducted in real-time, users can participate in conference calls and make use of interactive voice phone menus, both of which were not possible with text-based relay services.

There are three main types of video telephony services over broadband. If the video is of sufficient quality, this visual connection makes the entire vocabulary and syntax of sign language readily accessible, an advantage simply impossible over text. The three principal types of video telephony services are discussed below.

- **Video Relay Service (VRS)** is a form of telecommunications relay service (TRS) that allows individuals who are sign language users to make phone calls to persons who are not sign language users. The user needs either a computer and a webcam, or a videophone and TV monitor, along with a high-speed broadband connection to reach the relay service center. Through the video link, the deaf person uses sign language to speak to an operator – often called a video interpreter – who is qualified in American Sign Language. The operator then dials the intended recipient of the call and facilitates communication by voicing for the deaf individual and signing for the hearing individual. A hearing individual can also initiate a call to a deaf individual through VRS.

Under the Americans with Disabilities Act (ADA), people with speech or hearing disabilities are entitled to telecommunications relay services that are functionally equivalent to voice telephone services. VRS is regulated by the FCC and provided as a free service funded by telephone companies through contributions to the Interstate TRS Fund. Relay service providers are required to operate 24/7 and must not limit the length of calls. Conversations must be kept strictly confidential. Because of this mandate and the advantages of live interactive video over broadband, VRS has become the most functionally equivalent telecommunication service for deaf people who use sign language.

- **Video Remote Interpreting (VRI)** is access to sign language interpreting services without an interpreter onsite. With a computer, a webcam or videophone and a high-speed broadband connection, deaf, hard of hearing and hearing individuals who are in the same room can communicate via a live, remote interpreter. Access to VRI must be set up before use at locations where it is likely to be used, like a workplace, a doctor's office, or at a business that serves deaf and hard of hearing customers. But once it is set up it can sometimes be used on very short notice. While VRI may not be able to substitute for in-person interpreting in complex situations that require in-depth discussion or communication, such as those that involve diagnoses/prognoses or patient/client consent, it can fill a void for more simple communications in these settings.

VRI is not a telecommunications service, in that it is not intended as a substitute for voice telephone services like VRS. As such, it is not regulated by the government. It is provided by a number of private companies, and consumers are expected to purchase the necessary videoconferencing equipment themselves. The potential improvement in access to interpreters is quite dramatic, especially with the emerging combination of broadband-capable mobile devices and advanced video camera technology.

- **Direct Video Telephony** - The third major use of video telephony enables individuals to communicate directly with each other in sign language just as easily as hearing individuals can speak to each other over phones, as long as they both have a computer, a webcam or videophone, and a high-speed broadband connection.

Broadband not only improves the communications options available to people who are deaf and hard of hearing. It also increases the availability and effectiveness of existing resources. There is a shortage of sign language interpreters across the country, particularly in rural areas. VRI expands the geographic reach of sign language interpreters to locations where interpreters are scarce and dramatically reduces travel time to reach distant sites. Interpreters can serve many more clients, and clients get convenient, affordable and flexible access. Business and organizations also benefit from VRI because in some situations, where no interpreters are located nearby, the technology may provide the only means of complying with ADA regulations for equal access.

Standard arrangements for an on-site interpreter require paying upfront for two hours of interpreting, even if that time will not be used, as well as travel costs for the interpreter. This can be a costly and burdensome arrangement, presenting a barrier to communication for deaf individuals who need to have live, real time communication with the hearing community. Compared to an on-site interpreter, VRI facilitates more immediate responses to emergency or unexpected situations, until such time as an interpreter can be found and brought to the desired location. Also, research from the Kentucky Deaf Access Consortium found that almost \$7,000 a year was saved in travel costs for each individual interpreter with the adoption of VRS.

Despite its popularity, video telephony over broadband is underused by the deaf community, largely because of a lack of broadband access or because of its high costs. This is yet another reason for universal access to broadband. But for those who do have access to broadband the impact of video telephony is truly life-changing. More accessible communication enhances educational, workplace and social opportunities, fostering greater independence and more productivity. For the deaf community, broadband fundamentally improves the quality of life.

More information

Clearview Innovations Video Telephony Information

<http://www.clearviewinnovations.com/VRS-VRILinks.htm>

6 Calculated from data provided by the Council of State Administrators of Vocational Rehabilitation, "Video Interpreting White Paper." May 9, 2007.

7 Greg Livadas, "Popular Video Relays for Deaf Raise Some Concerns," Rochester Democrat and Chronicle, June 6, 2006.

Further Examples

AccessIT

AccessIT is a program run by the University of Washington for those interested in accessible technology for people with disabilities. It has received significant funding support from the Department of Education and the National Science Foundation. The program uses online resources including instructional videos and courses on accessible web design, and a database of accessible technology issues. There is also an offline component that encourages students with disabilities to develop an interest in technology careers through summer programs and mentoring.

More Information:

<http://www.washington.edu/accessit>

American Foundation for the Blind Senior Site

The American Foundation for the Blind developed a website that has a wide range of resources for citizens coping with vision loss. The information is specially tailored for older Americans and is provided in multimedia formats, including video and compatibility with text reading technology, that allow access for people with vision problems. There are also user controlled options to change the text, color scheme, and contrast. Broadband is especially important for people who are blind so that they can access content in alternative, non-visual formats.

More Information:

<http://www.afb.org/seniorsitehome.asp>

Bay Cliff Health Camp

A summer camp for children with physical disabilities in northern Michigan's Upper Peninsula uses broadband to provide telehealth services from a regional hospital. The camp, which has an especially important need for expert timely medical care, is able to better serve campers through acute care and prevention. Additionally, there is a substantial savings in time and money that would be spent on medical related travel costs.

More Information:

http://www.mgh.org/telehealth/app_serv.html

Flatlands Disability Network

Run by Minot State University, the Flatlands Disability Network provides services for people with cognitive disabilities in rural North Dakota. Experts at Minot State connect to community centers and residential facilities over broadband. In addition to resource and information sharing, the network is also used to provide services like speech / language therapy, wellness training, nutrition counseling, real time captioning, and behavioral health monitoring. During the last presidential election the network was used for a voter education program as part of the Help America Vote Act.

More Information:

<http://www.ndcpd.org/proj/ODS/index.htm>

Overdrive Project

The state library of Kansas uses new web technology to enable online borrowing of multi-media materials. An increasing number of e-books, videos, movies, music clips, and audio books are available to download. A special media player ensures that the materials are only usable for a certain allotted period, and users are limited in the amount of content they can “borrow” at a time. Users can transfer the borrowed media to a portable device. Without broadband this resource is significantly limited. The service is especially beneficial to people who are blind because they can access a library of audio books from their home.

More Information:

<http://kansas.lib.overdrive.com>

EDUCATION



Hayward e-District



Megaconference, Jr.



PEBBLES Assistive Robot Technology



St. Lawrence School's Global Learning Program

Hayward e-District: Teaching Tools for Public Schools

“With this state of the art technology solution and the new Education Resource Center we're giving our students and teachers the tools they'll need to deliver improved student achievement.” - Patrick Simon, Chief Technology Officer for Hayward School District

Advanced technology has enormous potential for all levels of the education system, from the classroom to the administrator's office. When deployed on a large scale, such as a school district, broadband networks can provide affordable new tools to teachers while also streamlining administrative practices and reducing overhead costs. A recent effort to implement such a network has made a big impact in one school district in California.

The Hayward Unified School District is one of the largest school districts in the state with 24,000 students. Over half of the student population participates in the national school lunch program, a key indicator of economically struggling families, and almost one third of Hayward's students are in the process of learning English. Community leaders developed a plan to upgrade radically the technological capabilities of the school system as an innovative way to meet these challenges.

Called the Hayward “e-District,” their plan centers on a wireless broadband network that provides a widely distributed platform for teacher resources, educational applications, administrative support, and district-wide data management. While the e-District is only in its first full year, after a trial period, it is already proving to be successful. One of the major benefits for a cost-conscious school district is the variety of tasks that the e-District supports.

In the classroom the e-District helps enhance the learning experience. Teachers can create lessons with streaming video, other media, and an interactive white board. Students can conduct research, complete homework assignments and review lessons at the library, home or anywhere there is access to the network. Having all class materials available online also makes it easier to review and draw connections from past lessons. *An emphasis on technology means that Hayward students are learning how to learn, communicate, and interact in a variety of digital formats.*

Faculty and administrators use e-District tools to better assess, plan, and ultimately teach. Student answer devices called ACTIVotes generate immediate pop quiz results and feedback, allowing teachers to adjust their lesson plans to meet the learning needs of their class. Enhanced data management tools give the school system a clearer picture of what works and what is less successful in improving student achievement. Achievement gaps can be specifically identified and targeted. Professional teacher development is aided through a web portal, where educators

collaborate and reflect through shared best practices, actual classroom experiences, and discussion boards. With the knowledge gained from these online efforts teachers are able to make lessons more engaging and responsive to student interests.

School district operations also benefit from the e-District. Over 2,000 VoIP capable phones handle all voice communication for the district over the broadband network, saving significant amounts of money in telecommunications costs. The network is also used to manage all service requests, work orders and preventive maintenance for facilities, IT, and transportation operations. Currently a project is underway that would put all student records in an online format. *It is estimated that these behind the scene benefits save at least \$1.5 million in operating costs through reduced paper, postage and gas.*

Perhaps most importantly, the e-District helps the school system engage with the community. Parent Connect software notifies parents in emergencies and automatically reports student absences and school announcements. Parents will eventually have a unique user ID and a secure password to access their children's class schedules, discipline records, and grades on an ongoing basis. The Education Resource Center, a web-based portal, facilitates the exchange of resources like classroom supplies, equipment, furniture, and volunteers between businesses, community donors, and teachers and administrators.

The network uses standard Wi-Fi technology that is scalable for higher speeds and an Ethernet network for the backbone. Connection speeds for individual users vary significantly depending on the distance from a receiver and the number of other people online at the same time. For security reasons the network can only be used by registered students, teachers, and administrators. An identity management system allows secure access to applications based on a user's unique role and access rights, allowing teachers and students to use the same network without interference.

Access is free for all registered users of the network, which covers a three-mile radius around 25 elementary schools, five middle schools, three high schools, an alternative high school, an English language center, an adult education center and a child care center for pre-school children.

The local community was intimately involved with bringing the e-District to life. Assistance with both software and network deployment was obtained through the expertise located in nearby Silicon Valley and the work of Hayward Partners in Education, a group of community leaders dedicated to optimizing student achievement by connecting community resources with schools. Over half the costs of installation were donated by private companies.

While the e-District is having an enormous impact at every level of the school district's operations, it holds even greater promise for students and their families with Internet access at home. Greater digital opportunity means not only access to broadband, but access to computers. Community efforts are underway to increase the number of

computers in student households, an improvement that will allow the already successful e-District to go even further in enhancing the quality of education.

More Information

Hayward Unified School District

<http://husd.k12.ca.us>

Megaconference, Jr.: Accessible Global Learning

“I think Megaconference Jr. is a good way to interact with other schools around the world. It gives us insight on their learning styles as well as their personal views. Last year I got to perform for some kids in Australia, so I thought that was pretty cool.” - Lindsey, 10th grade, Moanalua High School.

With global understanding increasingly important in today’s world, finding affordable ways for students to interact with other cultures can add great value to the educational experience. In the past global learning opportunities at the K-12 level have usually been limited to the classroom and relied upon static and potentially outdated resources. Student exchange programs are a more meaningful alternative, but the cost of these programs limits the number of participants.

Live, interactive, cultural exchange programs are now available to connect students around the world through affordable high speed interactive video. One program in particular has taken advantage of video over broadband to build a widely inclusive and participatory global learning experience. The program, called Megaconference, Jr. is an annual day-long collaborative video conference for K-12 students from all over the world. A wide variety of educational content is featured every year and the most recent conference had 170 schools participating from 16 different countries.

Megaconference, Jr. is more than just a substitute for field trips. It is an entirely new way of learning. *For the relatively low cost of video conferencing equipment, students have a learning experience that would not otherwise be possible.* Schools from all over the world produce and present content in short segments, such as skits, reports, games and musical performances. Student video jockeys act as hosts, introducing each presenter, keeping the conference on schedule and making sure that transitions between presentations go smoothly.

Interactivity is a main goal of the conference. Each presentation is followed by a question and answer session, and participants are encouraged to include students from other schools in their presentations. Recent examples include students at Moanalua High School in Hawaii explaining their native culture to the Navajo Preparatory School in New Mexico; a high school in Indonesia taking questions after a performance of traditional dance from elementary school students in Oklahoma; and an American middle school class running a Jeopardy based geography quiz with live contestants from three different countries.

A small group of volunteers drawn from educational professionals and academics began Megaconference, Jr. in 2004. This core of volunteers collaborated to develop programming, identify and work with participating schools, and implement technical standards. Most importantly, Megaconference Jr. could not succeed without dedicated involvement from teachers and administrators at the local level. In the U.S., they represent 30 states and a broad demographic profile, including many rural and technology oriented schools.

Students are involved in every aspect of the project. In addition to running the presentations, committees composed of both students and adults approve presentation applications and work out technical problems. At many schools students also learn about and assist with the technical details of network connections. Through these responsibilities, students build and strengthen their organizational, communication, and leadership skills.

Connection technology in local schools varies, with a two-way connection of at least 528 Kbps needed to maintain an effective video link. The schools all manage their own broadband connections, ensuring that enough capacity is available the day of the conference.

Administrative and consulting support is provided by Megaconference, a similar program for professional adults. A consortium of educational institutions that support high speed network access, called Internet2, donates a substantial amount of network capacity to participating schools in⁸the U.S. In other countries, network access is provided through similar support from universities and other educational institutions.

The benefits of Megaconference Jr. last long beyond the day of the actual conference. Students that participate develop a deeply rooted global understanding of and appreciation for the value of collaboration across cultures. Many students maintain communication after the conference and even develop lasting friendships. Some schools have also been inspired to further integrate live broadband video into their curriculum, including additional video conference projects and virtual field trips.

Because of its success Megaconference, Jr. has been expanding every year. For the next conference a battle of the bands segment is being organized to showcase the different musical styles that are popular among participants. Live video has provided these students with a unique and enriching learning resource, limited only by their imagination. Indeed, having such a wide variety of students from so many different cultures interacting simultaneously would be practically impossible without broadband.

More Information

Megaconference, Jr.

<http://www.megaconferencejr.org>

⁸ The adult Megaconference began in 1999 and pioneered the technical procedures for simultaneous video conferencing with multiple users over broadband that Megaconference, Jr. is based upon.

PEBBLES: Keeping Sick Kids Connected to the Classroom

"When you're in the hospital you're isolated, you're stuck here. You don't have friends, you don't have anything except maybe a phone call from home. You fall behind at school. With this you have social interaction, which is a part of school." -Jim Desimone, traumatic brain injury coordinator at Blythedale Children's Hospital

Distance learning over broadband has become a new tool in learning, expanding the reach of education to homes, offices, and other places such as hospitals. Many children are forced to miss substantial time from school due to a serious medical condition, sometimes even having to withdraw. Anxiety and stress is an almost universal response from children facing a serious medical condition. The isolation of hospitalization or home care separates children from their friends and peers precisely when social interaction is needed most. It is also disruptive to their academic progress and can have significant long term effects. It is estimated that 50% of all children requiring long term care do not graduate from high school on schedule.⁹ Providing these young patients with as much stability as possible is important for both their physical and mental health.

Broadband offers a way to keep these children connected to their classrooms, so that their education is not interrupted and their lives retain a sense of normalcy. PEBBLES (Providing Education By Bringing Learning Environments to Students) is a broadband enabled solution for maintaining a link between medically fragile children and their regular school environment.

PEBBLES uses simple looking child-sized robot units in pairs, linked over broadband. For each case one unit is deployed with a patient in long term care and the other is deployed in that patient's regular classroom. The robots incorporate a variety of features to provide interactive communication, including a microphone and speakers, a swiveling touch screen monitor, a camera, and a combination scanner and printer. The unit is on wheels and can be moved into cafeterias or hallways so that social interactions can happen outside of the classroom and the presence of a teacher. The classroom unit even has a robotic hand so that the student can get the teacher's attention. Patients control the camera, which has a 330° range of motion, with a video game control pad. The project creates what's termed "telepresence," which expands upon teleconferencing to give users enhanced interactive tools. With this virtual classroom presence patients can ask questions of the teacher and talk with their

⁹ The E-Rate program is administered as part of the Universal Service Fund under the FCC. Through E-Rate over \$19 billion has been spent providing and maintaining Internet access for schools and libraries. To date almost 100% of schools and libraries have some form of Internet access.

classmates in real-time. Teachers and students can send worksheets, tests, and homework to each other.

Connecting a patient to their regular classroom with PEBBLES is relatively simple if broadband is available at the patient's location. Broadband connections for many elementary and secondary schools are made possible by the federal E-Rate program. Dedicated cable modems are used in both the patient's location and the school, in¹⁰ conjunction with virtual private network routers to maximize reliability and security. The school units are equipped with a long lasting battery and a WiFi antenna to increase mobility.

The PEBBLES technology would not work without the two-way video capacity of broadband. Although upload and download speeds of 768 Kbps are sufficient, higher bandwidths are best in order to maintain the clearest possible picture between the child and the classroom. The clarity of the image is important for maintaining a visually realistic connection between the patient and the classroom, especially when dealing with younger students who may not be used to the fuzzy or heavily pixilated video images available over low bandwidths.

PEBBLES is managed by the Learning Collaborative, a non-profit educational organization based in Connecticut, with 28 units in operation. The program has been operating in the U.S. since 2001. Most of the funding support has come through grants from the Department of Education's Fund for the Improvement of Education. Each robot costs \$70,000 and the units are provided free of charge to patients. Close collaboration with health care providers and schools is essential for the success of individual cases. Typically, patients are identified by hospitals or by parent requests for the service.

The Learning Collaborative is promoting PEBBLES as a solution for other medical issues by expanding on the benefits of telepresence. For example, the technology could assist the integration of autistic children into a regular classroom by giving them control over their social environment. The technology may also be used to help people with disabilities overcome access barriers.

The impact of PEBBLES is simple but profound. Students are able to maintain contact with their teacher and classmates while undergoing serious medical treatments, overcoming isolation. Academic continuity is maintained, as patients stay on their regular school schedule and keep up with their homework and tests, improving their chances of graduating on time. Doctors and educators also agree that PEBBLES can assist in recovery by keeping children connected to their normal social and school lives, significantly reducing stress and loneliness.

Through broadband technology, PEBBLES has made a big impact. Some of the more

¹⁰ The E-Rate program is funded by the Universal Service Fund and administered by the Schools and Libraries Division (SLD) of the Universal Service Administrative Company (USAC). It is designed to ensure that all eligible schools and libraries have affordable access to modern telecommunications and information services. Up to \$2.25 billion annually is available to provide eligible schools and libraries with discounts for authorized services.

notable experiences include a PEBBLES unit literally embraced by a patient's classmates sending a virtual hug, and one that was put on stage during a school show so that a patient could sing along with his class. The technology is helping children keep something easily lost when facing a serious medical condition: a life independent of hospitals and doctors.

More Information

PEBBLES Project

<http://www.pebblesproject.org>

St. Lawrence: Expanding School Resources

“We studied the language, culture, history and geography of Ukraine but nothing can compare to the actual live meeting and exchange of ideas when we finally met our friends from Ukraine.” - St. Lawrence 8th grade student

Sometimes strong local efforts are required to integrate broadband into a school’s curriculum. One school that gave the necessary effort is St. Lawrence Regional School (SLRS), a K-8 parochial school of limited resources located 10 miles outside of Philadelphia in Lindenwold, New Jersey. Over half of its 216 students come from single family homes and one out of every four students is considered low-income.

SLRS has overcome its many challenges to provide a significantly enriched curriculum through the use of broadband technology. For the past six years St. Lawrence’s Global Education Program has integrated video conferencing with classroom instruction. This technology is enabling students to interact with peers from other countries; learn from distant experts; and share their own experiments and papers in collaborative projects.

Every grade level has participated in video conference sessions, which generally last between one and two hours and involve an entire class. The structure of the conference is planned ahead of time and coordinated by teachers. Students learn about a topic in advance, engage in reactive exercises, and use e-mail accounts to remain in contact with the other participants. The Global Learning Program has helped teachers as well. The school’s Italian teacher, who is in Italy for one year, can continue teaching classes without interruption. Teachers also benefit by international networking with other teachers.

St. Lawrence classrooms use DSL services for an Internet connection. Available speeds are 1.5 Mbps downstream and 384 Kbps upstream, the low end of bandwidth necessary for high quality live video conferencing. Most of the video conferencing occurs in the school’s media center to simplify technical requirements. ISDN, which provides a very poor signal, is used as back-up connection technology. Unfortunately, it is the only technology available to some of their international partner schools.

Students have also used video conferencing to contact experts in various fields who would not otherwise be available to them. Participating in NASA educational programs over broadband, kindergarten students learned about monarch butterflies and were able to watch a live migration from New Mexico. A separate Biosphere

project explored the challenges of growing crops in space where students and teachers worked, ate, and slept for 20 hours in a simulated space station environment. The students then shared their experience over video conference with NASA officials.

Through international interactions with fellow students, children explore cultural differences and share information to increase student understanding of the world. Based on a previous student exchange program, the first use of video conferencing at St. Lawrence occurred between 7th and 8th graders and a school in the Ukraine. Students exchanged songs, artwork and questions about each other's country and culture, and the relationship between the schools is now permanent. Other subsequent exchanges included schools from Serbia, Greece, Pakistan, Australia, and Rome.

St. Lawrence students also participated in a UN sponsored day-long digital video conference on global water conservation. The conference involved six schools from the United States, British Columbia and Pakistan. Speakers included public water officials in Philadelphia and a senior UN food and agricultural water policy officer based in Rome. Through these programs students present their own experiments, programs, and papers to adults and their peers, gaining confidence, speaking skills, and a global perspective.

Integrating broadband into the curriculum has vastly expanded the instructional tools available to St. Lawrence teachers. Live experiences with foreign countries and advanced scientific research are now a regular part of the classroom. Those kinds of educational resources would not be available to this small parochial school without the high speed capacity of broadband.

More Information

St. Lawrence Regional School

<http://www.slrs.addr.com/>

Further Examples

After School Astronomy Project

A program developed for low-income technology centers in Boston, in conjunction with the Massachusetts Institute of Technology, uses broadband to bring advanced astronomical tools to students. A network of community technology centers in a low-income and predominantly minority neighborhood runs this after school program. Students engage in interactive projects where they can control telescopes, called the MicroObservatory, in real time over the Internet. 60 students have completed the program and 22 have gone on to paid internships with MIT.

More Information:

<http://ideas.mit.edu/~pscadmin/landing.php?id=75>

Distance Learning and Virtual Field Trips

The Regional Educational Media Center Association of Michigan has compiled a list of all the known distance learning programs offered over the web. Currently there are at least 225 providers of distance learning programming. Options include interactive science expeditions with Dr. Robert Ballard, the discoverer of the Titanic, field trips to many museums and zoos, and cultural programs like participatory theater. Classrooms must have broadband in order to support the interactive video necessary for these educational resources.

More Information:

<http://dl.remc11.k12.mi.us/curriculum>

English for All

English For All is a free web-based multimedia system for adults learning English as a second language. Based in California and funded by the Department of Education, the system provides online supplements to classroom instruction. It uses either online streaming video or DVDs, offering two options so that it can cover areas that do not have broadband access. There is also an interactive educational website that works with limited bandwidth. With better broadband access this program could be more fully developed to provide even greater resources for the important task of teaching English language skills.

More Information:

<http://www.myefa.org>

ImagiNations Project

Lehigh University developed an educational program. the ImagiNations Project, that introduces K-12 students to electron microscopy and nanotechnology. Scale and surface area animations are available for the students' interaction, along with interactive image magnifications. Most exciting is a project that provides real time remote access to an advanced electron microscope. Access software is provided for free. Teachers must undergo training at Lehigh, but once training is complete they can use the electron microscope remotely for research and lesson plans. A broadband connection is essential to view images.

More Information:

<http://www.lehigh.edu/~inimagin/>

Old Dominion Distance Learning

Utilizing video links, Old Dominion University runs one of the largest distance learning programs in the country. Students watch live webcasts of their classes and participate by asking questions through a instant messenger interface. The technology is especially useful for students in rural areas of western Virginia.

More Information:

<http://dl.odu.edu>

TVbyGIRLS

A Minnesota based non-profit organization helps girls challenge traditional portrayals of women in mainstream media. Adolescent girls are trained and given video equipment to pursue projects designed with guidance from mentors. Through broadband the Internet is used to collaborate on projects and post finished videos for viewing. Projects have included student interviews with their grandmothers about feminism, and a video on Muslim head coverings by Somali immigrants. Through videoconferencing girls from all over the county can participate in educational seminars.

More Information:

<http://tvbygirls.tv>

Vermont MIDI Project

The Vermont MIDI Project is a non-profit organization dedicated to encouraging music composition in Vermont schools. The Project makes use of MIDI digital music technology to facilitate online instruction and collaboration for high school music students. Over broadband students can share their work with each other and with professional composers. There is a live online concert every year.

More Information:

<http://www.vtmidi.org/>

HEALTH CARE



Alaska Federal Health Care Access Network



Antenatal and Neonatal Guidelines, Education and Learning System



Winona Health Online

AFHCAN: Serving The Remotest Communities

“Being one of those primary care providers who is on the frontier, in bush Alaska the technology was a vital part of providing appropriate care for that case. We were able to conduct an exploratory surgery that was a lifesaving procedure for that patient.” - Dr. Michael Orms, after performing remote surgery 26 miles north of the Arctic Circle using AFHCAN

Some communities have little hope of obtaining wireline broadband access, given virtually insurmountable geographic barriers. Alaska in particular is home to some of the most remote communities in the country. While Alaska occupies close to one fifth the land area of the entire U.S., the population—spread between many small, hard to reach communities—is five times less dense than any other state. The mountains, glaciers, and winter weather that give Alaska its breathtaking beauty also contribute to the vast dispersion of its people.

Providing effective basic health care to remote Alaskan communities is an enormous challenge. One out of every four Alaskans is without road access to a hospital. Most of these are Alaska Natives, and most live in communities of less than 1,000 people. Flights to the Alaska Native Medical Center in Anchorage, the primary advanced health care facility, cost about \$1,000 on average. These factors make Alaska’s small distant communities ideal for telemedicine applications, if broadband can be delivered.

The Alaska Federal Healthcare Access Network, or AFHCAN, is a statewide telehealth network designed for the many residents that depend upon federal support for health care. AFHCAN’s most valuable application is in the most remote Alaskan communities, where community health care providers use mobile telemedicine workstations to exchange video and data with centrally located medical experts. In the last three years over 700 providers participated in more than 19,000 clinical telemedicine cases using AFHCAN.

AFHCAN connects 248 sites across rural Alaska and is considered the largest telemedicine network in the world. In 1998, the Department of Defense, the Veterans Administration, the Coast Guard, the Bureau of Indian Affairs, and many local tribal organizations joined in a formal health care partnership to serve all the federal beneficiaries in rural remote Alaska, almost half of the state’s total population.

The organization now bearing primary responsibility for operating and developing AFHCAN is the Alaska Native Tribal Health Consortium. Chartered and operated by

tribal governments, this independent non-profit brings together resources at a scale that ensures self-governed health care for Alaska Natives. They provide telemedicine services and are partially compensated, depending on the user, by the Indian Health Service, Medicaid, or other federal agencies. Universal Service Funds and Department of Agriculture grants provide support to connect many of the Native communities to the Internet.

Sites vary in their connection technology, but most use some kind of satellite link to the Internet. Broadband connections are always preferred in order to utilize more advanced applications. Yet, because of a number of factors, including the varied capacities of the organizations involved and the occasional disruption of satellite transmissions due to weather, services are provided in both high and low bandwidths.

Equipment consists mainly of videoconferencing hardware and a standardized telemedicine cart. The cart is a mobile workstation that integrates diagnostic tools with computer software to document cases, which can then be forwarded to more specialized care providers. Data management software is also run over the network, helping to improve the efficiency of health care administration.

AFHCAN's telemedicine carts place advanced tools and software in the hands of community health aides in remote rural Alaska Native communities. These local providers, the first line of defense for health care, use telemedicine tools to maximize accuracy at the first stage of medical assessment. Tools on the cart include a stethoscope, microscopes, ultrasound, electrocardiogram, a digital camera, and a scanner for documents. Equipment is also available on a more limited scale for applications like teleradiology.

With these advanced diagnostic tools remote rural communities are able to communicate and consult with specialized experts located in Anchorage. Clinical specialties accessible over AFHCAN include primary care; ear, nose and throat; audiology; dermatology; pediatrics; cardiology; family practice; trauma registry; and emergency same-day surgery. Video conferencing is also helpful for some clinical applications, as well as training and continuing education.

AFHCAN ensures a more efficient and effective health care system for Alaska. By reducing distance barriers, travel costs are minimized. An estimated 37% of cases diagnosed with AFHCAN would otherwise have required travel to an advanced facility. A study on Medicaid reimbursement for AFHCAN services found that \$4.41 was saved on average for every \$1 spent on claims in travel costs alone.

Telemedicine also allows for a more efficient use of doctors. Given Alaska's harsh conditions, doctors are more willing to serve these communities with telemedicine because they have fewer field clinic appointments. Over AFHCAN more doctors can serve more patients without dramatically increasing the impact on their time. For example, the Ear, Nose, and Throat service at Alaska Native Medical Center was able to serve an additional 1,200 patients without increasing staff.

Prior to the introduction of AFHCAN, waiting lists for specialists at regional hospitals were typically around six months, and could be as long as 15 months. Now there is little

11 "Evolution and Summative Evaluation of the Alaska Federal Health Care Access Network Telemedicine Project." University of Alaska Statewide Health Programs and University of Alaska Anchorage Center for Human Development. November, 2004.

if any waiting time. Patients have been diagnosed, undergone surgery, and received a telemedicine post operative check in their home community in less time than it used to take to simply get an appointment.

The success of AFHCAN has been recognized by the American Telemedicine Association, which gave the program an award in 2004. The network provides an enormous benefit to a unique and underserved population. Quite simply, AFHCAN provides better health care at reduced cost. As more reliable broadband connections are deployed, services will be substantially improved and expanded. With a highly developed telemedicine program ready to grow, the only limit on better health care for rural Alaskans is bandwidth.

More Information

Alaska Federal Healthcare Access Network

<http://www.afhcan.org>

University of Alaska Report on AFHCAN

<http://www.alaska.edu/health/downloads/Telemed/AFHCAN.pdf>

ANGELS: Healthcare for Mothers and Infants

“Arkansas is a very rural state and many people have problems with access to health care. This clinic, and other telemedicine applications, is an economical way to take a doctor’s expertise and put it out in these rural areas.” - Dr. Martha Brewer, Department of Obstetrics and Gynecology

Generally, rural communities are severely limited in their access to physicians and other medical resources due to their low population density. Travel for consultations with distant specialists is frequently not an option because of lost wages and transportation costs, resulting in inadequate preventative care and an increased likelihood of costly acute care. For doctors, particularly sub-specialists who are usually located in urban areas, traveling to rural communities is time consuming and drastically reduces the number of patients they can treat.

In Arkansas the unequal distribution of advanced prenatal and neonatal care was a costly burden for the state. 43% of the population lives outside urban areas, 53% of all births are paid for by Medicaid, and the only maternal fetal specialists are located in Little Rock. Under these circumstances it is difficult to identify at-risk pregnancies, let alone provide them with the monitoring and clinical care they need, leading to more serious medical complications and increasing the likelihood of expensive care later on. Addressing this issue was an urgent need.

The Antenatal and Neonatal Guidelines, Education and Learning System, better known as ANGELS, is a statewide broadband network of telehealth applications that has greatly improved access to prenatal and neonatal care throughout Arkansas. The network connects rural health care providers, such as clinics and hospitals, with the University of Arkansas for Medical Sciences (UAMS) in Little Rock, the most advanced health care facility in the state. In 2006 ANGELS conducted almost 900 telehealth consultations throughout Arkansas.

Specialists at UAMS use video conferencing technology to communicate with doctors and patients in rural hospitals and health clinics. Live ultrasounds and other screening tests are transmitted over broadband, giving doctors in-depth visualizations of the brain, heart, and spinal column that can determine whether the fetus is at risk for certain medical conditions. Supplemental support services include medical transports for high risk and emergency cases that are arranged by ANGELS and a 24 hour ANGELS call center that provides a resource for questions about maternal and

neonatal care.

Another aspect of the continuum of care offered by ANGELS over broadband includes infant observation over webcams. Families can use this technology to stay connected to newborns in intensive care, which helps to overcome the stress of separation and assists in bonding during this crucial early period. There are also video conference counseling sessions in the event of a tragedy. After the loss of a child grieving families can come together online for mutual support with the aid of specially trained mental health professionals. This service is offered free of charge to anyone in need throughout Arkansas.

ANGELS has greatly improved prenatal screening throughout Arkansas. Identifying those most in need of expert care and ensuring their access to specialists throughout pregnancy and early childhood has reduced the rate of infant mortality within the first 60 days. Early identification of at-risk mothers has led to twenty percent more high risk births now occurring at advanced care hospitals, rather than rural clinics and community hospitals.

Medicaid provided most of the funding for ANGELS through a contract managed by the Arkansas Department of Human Services. The state government also contributes to Medicaid and the basic health care infrastructure that supports ANGELS. Teleconferencing equipment was provided to ANGELS through grants from the Department of Health and Human Services' Office for the Advancement of Telehealth. Additional help came from the Arkansas Medical Society, a group representing physicians.

Many of the rural clinics already had broadband connections provided through Rural Utilities Service grants. Connection technologies vary somewhat depending on the facilities, but most participating hospitals and clinics have at least a T-1 land line, which typically allows for 1.5 Mbps upload and download speeds. Some remote locations rely on the more limited bandwidth of DSL technology. The video conferencing equipment, which requires high speed connections, also varies and can include webcams and televisions or computers.

ANGELS was recognized as a model Medicaid program for patient care and outreach in 2006. It is estimated that ANGELS has saved millions in Medicaid costs through improved physician education, direct clinical services, reduced hospital stays, and improved long term outcomes. Improving access to medical experts has raised the quality of preventative care, reducing acute care visits and hospitalizations.

Due to its success, physicians in Arkansas and around the world look to ANGELS for telemedicine and obstetrical guidelines. Building upon the ANGELS concept, UAMS cardiologists, pediatricians, and many other medical specialties are providing telehealth care to Arkansas' underserved rural areas.

12

Rural communities deserve the same high level medical care available in urban and more densely populated areas. The powerful combination of broadband access and a

program like ANGELS ensures that in Arkansas an expectant mother will have the best chance of delivering and raising a healthy child regardless of where she happens to live.

More Information

ANGELS Program

<http://www.uams.edu/angels>

Winona Health: Electronic Medical Records

“The biggest benefit is immediate access to the record any place, any time. I have patients calling me at home and I look at their record; it’s right there. It’s hard to beat that. And electronic prescribing is a huge advantage. All their meds are there, the interactions are documented, and it avoids errors.” - Dr. Bill Davis, Chief Medical Information Officer

Conservative estimates find that almost one third of all medical spending in the U.S. goes towards administrative costs.¹³ Creating more efficient access to medical records and health information can lower these costs, plus reduce medical errors, improve patient safety, and empower patients in their own health care. In rural communities, strong health care systems can also provide an economic boost through jobs and an improved business environment. Broadband’s ability to improve access to information, and provide tools to manage that information effectively, is well suited to addressing both of these issues.

With an understanding of the power of broadband the small town of Winona, Minnesota implemented a network-based medical records system that stores health information and links medical records to a number of applications that improve quality of care. Called Winona Health Online, the system maintains complete medical histories with immunizations, test results, measurements, surgeries, allergies, and medication for every resident.

Compared to similarly sized hospitals, Winona has demonstrated improved performance outcomes. Mortality rates are lower and hospital stays are shorter because efficient access to medical information helps avoid gaps or overlaps in care.¹⁴ At the same time Winona Health Online has lowered costs. Care providers spend more time treating patients and less time on paperwork, particularly when managing billing with insurance companies.

Winona Health Online supplements rather than replaces a personal relationship with a doctor. Patients have improved access to medical information, meaning they can educate themselves and ask better, more informed questions. A regularly updated health resource database is linked with the records to provide information on conditions and medications. There’s even a special section devoted to children and teens that contains articles, interactive games and movies.

The technology has made it easier for medical professionals to do their jobs. “E-visits” use online software so that patients can interact with doctors for non-urgent

13 David Himmelstein, Steffie Woolhandler, and Sidney Wolfe, “Administrative Waste in the U.S. Health Care System,” International Journal of Health Services, Volume 34, Number 1. 2004.

14 Corrigan, Erickson, Grenier, eds. “Fostering Rapid Advances in Health Care.” Institute of Medicine of the National Academies, The National Academies Press. 2003.

conditions like colds or headaches. A diagnostic assessment and any questions the patient may have are referred to a doctor, who responds within an hour. Doctors can then prescribe medication and prescriptions can be renewed with a doctor's approval. Medical care providers also have handheld access to complete medical records. This is particularly important when treating unresponsive patients. If the individual's identity can be confirmed, emergency personnel can have instant access to pre-existing conditions, allergies, and other critical information.

Patients are empowered in their own health care through other software that compliments the medical records. Specially designed programs help patients manage chronic conditions like asthma, congestive heart failure, diabetes, and sleeping problems. Data from devices like diabetic glucose monitors can be entered directly into the system and then compiled into graphs and calendars to be reviewed by a care coordinator. Health diaries and risk calculators help patients track their own status and assess vulnerability to certain medical conditions.

First deployed in 2000, the system now includes every health provider and practitioner in Winona, with over 17,000 patients treated and documented in 2006. It is operated by Winona Health, a locally owned and operated non-profit organization that has provided health care to the town for 113 years. Run by a volunteer Board of Directors, Winona Health operates a hospital, nursing home, pharmacy, and other services. The organization is also an important economic base for the town, currently employing 50 doctors and a staff of over 1,000.

The medical records system was built upon an existing fiber optic network because of its ability to provide reliable, fast, and mobile access to large quantities of information. Started by a local corporate foundation in 1993, this network has evolved into a private company that now provides a combination of fiber and cable connections to the homes and business of Winona. Secure servers, an in-person registration procedure, and other security precautions ensure that records and correspondence with doctors is kept private, protected and compliant with the Health Insurance Portability and Accountability Act (HIPAA).

Having become more patient-centered, effective, and financially responsible, Winona Health is now looking for ways to expand its broadband services. A library of digital pictures is in development to further enrich the medical information database. Winona's ambulances, already connected to the health records system through a wireless system, will soon be able to connect doctors in real time to patient information like heart rate and blood pressure so that they can be better prepared for arrival at the emergency room. All of these innovations demonstrate the power of broadband to improve medical care while also controlling costs.

More Information

Winona Health

<http://www.winonahealth.org>

Further Examples

Center for Native American Telehealth and Tele-education

Based at the University of Colorado in Denver, this program works in collaboration with tribal organizations and federal agencies to provide a variety of psychiatric services to remote communities. It has been partially funded by the Technology Opportunity Program (TOP). The main program consists of weekly clinics focused on medication management, case management, and ongoing group/individual psychotherapy for veterans with post-traumatic stress disorder. The clinics are conducted via video conference to provide expert psychiatric care for five tribes on four different reservations across the northern plains. There is also a geriatric consultation service connected to a tribal nursing home in Alaska and a youth counseling service for an Indian Health Service hospital in South Dakota.

More Information:

<http://aianp.uchsc.edu/cnatt>

Remote Ophthalmology

Eye specialists from the University of Maryland set up remote glaucoma screening stations for higher risk African American communities. The stations would transmit diagnostic data and pictures over broadband to a specialist, who would provide diagnosis for glaucoma and diabetic retinopathy, two of the leading causes of blindness. By placing a broadband equipped telemedicine station in an urban shopping mall and rural health clinics, this screening program reached more African-Americans, who are also four to five times more likely than other groups to develop glaucoma. This program has been discontinued.

More Information:

http://www.umm.edu/news/releases/eye_telemedicine.htm

Remote Evaluation of Acute Ischemic Stroke

In treating strokes, timing is critical. A long-running program at the Medical College of Georgia uses broadband to connect rural clinics to experts for quick diagnosis of strokes. Called the REACH program it has nine participating hospitals in rural Georgia. Physicians can see patients via a secure video feed, review a CT scan, evaluate physical signs and symptoms, download information regarding medical history from the participating hospital and send back instructions. Providing this kind of expert diagnosis has been essential in reducing catastrophic stroke in rural Georgia.

More Information:

http://www.mcghealth.org/health_services/neuroscience_center/reach/index.html

Southern Arizona Teletrauma and Telepresence Program

A telehealth network developed by the University of Arizona in Tucson connects rural doctors with specialists for video conferencing, consultation, transmission of x-rays, and other clinical services. It has been most successful in providing expert “telepresence” in rural emergency rooms. The program is also used to provide health care for Native American communities, Arizona prisons, and other areas where access to medical expertise is traditionally restricted. There are plans to expand the program across the border into Mexico. They have recently added wireless broadband capable ambulances so that doctors can get a head start on treating patients before they arrive at a hospital.

More Information:

<http://www.telemedicine.arizona.edu>

St. Francis University’s Center of Excellence for Remote and Medically Underserved Areas

This experimental technology program has worked in close collaboration with the Department of Defense. They have developed important deployment technologies, such as a wireless equipped ambulance specially suited for mountainous terrain. Another project developed a vehicle that instantly creates a broadband wireless network supported by a satellite connection and has the capability to integrate on-site telecommunications services for the provision of telemedicine and disaster command and control activities. The Center also runs distance education and video conferencing applications for the University and the surrounding area in rural Pennsylvania.

More Information:

<http://www.cermusa.francis.edu>

Telepsychiatry for Remote Colleges

Many colleges and universities cannot cost effectively provide psychiatric services to their students. Even a university the size of Virginia Tech, prior to suffering last year’s shooting tragedy, did not have a full-time psychiatrist on staff. A pilot program conducted by the Medical College of Georgia, in conjunction with a rural college, provided expert psychiatric care to students over broadband through “tele-clinics.” Rather than intermittent travel of up to six hours, psychiatrists can provide services more reliably and effectively. Indicators are that better mental health can substantially improve college graduation rates.

More Information:

<http://www.mcq.edu/telehealth>

University of Tennessee Telehealth Outreach Center

The University of Tennessee at Memphis Health Center is the center of regional telehealth network. The Health Center runs a host of comprehensive telehealth services, providing specialists and expertise to rural communities in Tennessee and Mississippi. The program includes outreach centers in rural exchanges with a huge range of services, including a variety of pediatric services for underserved populations, AIDS/HIV counseling, and mental health services. Broadband is essential for these services, which rely on video and other diagnostic information transmitted between the Health Center and the outreach clinics.

More Information:

<http://www.utmem.edu/telemedicine>

Veterans Administration Care Coordination Home Telehealth

The Veterans Administration has long been a leader in telehealth technologies. Provided from a number of locations, the VA offers psychiatry services through teleconferencing, home health monitoring, and health education over the web. Scalability to broadband has brought enhanced levels of interactivity and more advanced health care services.

More Information:

<http://www.va.gov/occ/CCHT.asp>

LABOR & ECONOMIC GROWTH



Beyond Tobacco



CWANETT Academy

Beyond Tobacco: Spurring Rural Development

“We know we are just a fingertip away from the rest of the world. We just need to provide our people here with the tools to compete and develop a sustainable course.” - Mary Betty, former tobacco farmer and County Commissioner

Widely deployed broadband infrastructure can revitalize areas that have historically relied on agricultural industries and are now in decline. With a sustained and broad-based local effort, connections to resources all over the world can be established and economic transitions can be better managed.

Greene County, a small rural community in eastern North Carolina, has been ranked as the second most tobacco dependent county in the nation. With the steep decline in the tobacco industry between 1998 and 2002, almost 15% of the county's population lost their jobs. High school drop out rates hovered around 50% and there was negative business growth. Community leaders responded to this challenge with a bold plan for a new economic future based on global integration and a modern workforce.

Beyond Tobacco, a technology development program, began in 2003. It combines community supported broadband infrastructure with training and outreach programs. As a result *12 new businesses opened in Greene County last year.* Many local farmers are branching out into new ventures, such as organic farming and ranching, crafts, and hospitality services, like bed and breakfasts. Businesses are also using broadband to connect to the larger economy, advertising their services and finding new suppliers.

A number of organizations came together to ensure the success of the Beyond Tobacco project. Funding support came from the Department of Commerce's Technology Opportunities (TOP) Program. One Economy Corporation, a global nonprofit organization dedicated to delivering information technology to low-income people, provided crucial organizational backing and expertise, especially for the community website. Additionally a number of community institutions, such as Lenoir Community College and North Carolina State University, provided resources and programming support.

The key component of Beyond Tobacco is a county wide large-scale point-to-point

wireless broadband network. The county government worked with a local provider to deploy this network, which improved broadband access by a factor of nine. Greene County owns the equipment and contracts to the provider for service and management. Over 88% of the county is covered and typically a 512 Kbps connection is available. Residents subscribe to this network for a fee and can choose from different speed and connectivity options. Free access is offered from a number of hot spots around the county, including schools, fire stations, and churches.

The wireless network was only one piece of an overall strategy. In order to ensure that the network would be taken advantage of fully a computer access plan was implemented. The school board provided each of the 1,600 students in grades 6 to 12, as well as their teachers, with a laptop computer. Every evening, 85% of these computers travel to students' homes. The county also runs a refurbishing program for old computers and distributes them to households without computer access. In addition, a mobile training lab with 35 laptops offers computer access and technology classes that are very popular with students.

It was not enough, however, to simply provide the residents of Greene County with a broadband connection and a computer. A custom, locally oriented gateway website was built that addresses community concerns and improves information sharing. This website provides residents with local resources such as: an agricultural site for crop alternatives; an online marketplace for residents to post ads and offer services; a pest alert tool to provide up-to-date information about identifying and treating agricultural pests; and a health information center. Recently, the website hosted a political candidate forum and added a feature called the Greene County Marketplace to highlight local businesses.

Another effort to enrich the broadband experience involves outreach programs that improve digital literacy and work with local businesses to encourage Internet use. A program called Digital Connectors trains young people in technology so that they can serve as support staff for the community. More than 350 residents have been provided with free computer training, including assistance for farmers and business owners to create websites. The mobile lab offers regular computer classes and programs at easily accessible locations, such as community centers and firehouses. Weekly classes run in conjunction with the Department of Social Services, using both online and offline resources to address job training needs and provide GED instruction.

Beyond Tobacco has brought significant benefits to Greene County. Over 450 residents have received free technology training from the Digital Connector program and the mobile computer lab. Education has improved through the laptop program and advanced teacher resources available over broadband. Student test scores, graduation rates, and other measures of achievement have risen. *In 2006 more than 80% of graduating seniors applied to college, compared to just 28% in 2004.*

Greene County's vibrant rebound can be largely attributed to Beyond Tobacco's comprehensive approach to assessment of local technology needs and customized broadband solutions. Beyond Tobacco made sure their community was invested in

broadband and tied the benefits to people's lives. When broadband is deployed on a wide scale and integrated into a community-oriented plan, the potential for positive change is tremendous.

More Information

Greene County's Beyond Tobacco Program

<http://www.co.greene.nc.us/beyondtobacco.aspx>

One Economy's Greene County Beehive

<http://www.beehivegreene.org>

CWA/NETT Academy: Modern Working Training

“I knew that I wouldn’t be able to be an outside technician for the rest of my life. And if I wanted to be able to follow the new technologies into the new millennium, I would have to prepare myself. CWA/NETT academy is good training at a good price, and it prepares you for the future.” – Ronald Munfor, Systems Technician, St. Louis

Workers must be lifelong learners to keep up with changing technology and to advance in their careers. But time, cost, and distance serve as powerful constraints on continuing education. Thus, the Internet provides an exciting opportunity to overcome these barriers, while building on proven models for worker education and training.

The Communications Workers of America (CWA) is a labor organization that represents more than 700,000 employees, most of whom work in high-tech industries. CWA has long recognized that education and training is key to job security and career advancement for its members. Starting more than two decades ago, CWA negotiated path breaking education programs and financial support for these programs with its major telecommunications employers, including AT&T, Qwest, and Verizon.

With the advent of the Internet, CWA saw yet another opportunity to reach members and unaffiliated workers with education and training. CWA now sponsors two on-line worker education and training programs. The first, known as the National Coalition for Telecommunications Education and Learning (NACTEL) Online Telecommunications Degree Program, is a unique industry-wide collaborative between leading telecommunications unions that allows workers to take online courses leading to a four-year Bachelors of Science and a two-year Associate degree in Telecommunications. The second program, known as CWA/NETT Academy, provides online networking certification training, including the only national online Cisco certification training program.

NACTEL is an innovative industry partnership designed to develop and deliver online education and training to meet critical employment needs in the telecommunications industry. Members of NACTEL include CWA, the International Brotherhood of Electrical Workers (IBEW), Qwest Communications, AT&T, Verizon

Communications, and Frontier/Citizens Communications. The partnership was formed in 1997.

NACTEL offers an online Bachelors of Science (BS) degree in Telecommunications and an Associate (AS) degree in Applied Information Technology. The degrees are designed to prepare students for a wide range of technical positions in the telecommunications industry. In addition to the BS and AS degrees the program offers certificates in telecommunications, broadband, and wireless essentials. As of April 2007, more than 2,500 students participated in the NACTEL program, with a 95 percent course completion rate.

The program has partnered with Pace University in New York to develop the curriculum and provide certification. A joint curriculum committee comprised of members of the companies, the unions, and the university develops and revises the content for each course, ensuring that the training is relevant to contemporary industry needs.

NACTEL runs entirely online, including application, assessment, ordering books, coursework, and communication with fellow students and faculty. The program is structured around the concept of asynchronous learning: students can go online anytime to do the work, but must meet specific assignment deadlines. There are online threaded discussion groups among students and interaction with faculty.

The Communications Workers of America founded the CWA/NETT Academy in 2000 to provide its members with technical competence in the most current technology. There are courses in telecommunications policy and criminal justice, as well as technical classes in fiber optics and digital media that make extensive use of video and flash animations. There are also courses designed for working families to better understand the changing telecommunications industry.

Students can take classes working towards an associate's degree, an academy certificate, or one course at a time to target specific skills. It is possible to graduate with a degree and up to six industry certifications without setting foot in a classroom. Training is available for certification in Cisco networks, Unix and Sun Microsystems, A+ computer technician status, Microsoft Office User Specialist, and telecommunications cabling for Building Industry Consulting Service International certification.

Workers can access their coursework over the Internet with the flexibility to read and absorb the information at their own pace, and schedule study time to fit into their day. As the curriculum currently stands students interact with instructors through virtual classroom websites that include e-mail postings, chat areas, whiteboards, community postings, and links to student web sites. NET-Labs is an online system that provides users with remote access to switches and routers to conduct virtual labs, which record every step for review by an instructor.

The CWA/NETT Academy operates with several partners, including Cisco and Stanly Community College in Albemarle, N.C. Instructors, counseling, and program accreditation are provided by Stanly. All coursework is developed, administered, and evaluated by the community college as well. As of September 2007 the CWA/NETT Academy has provided training for over 5,000 union members to advance their careers with major telecommunications employers.

Both NACTEL and the CWA/NETT Academy accept union negotiated education benefits to pay for tuition and course materials. The CWA/NETT Academy is available to all union members and their families, as well as active duty military personnel and veterans. CWA members, and IBEW members in the case of NACTEL, whose employers do not have tuition assistance programs receive tuition discounts because they are union members.

Both training programs are accessible from union facilities or from the home, provided that students have an Internet connection. Currently the minimum recommended technical requirements are a computer with sufficient memory, a printer, and dial-up Internet access. Much of the online coursework is conducted through basic educational software, due to the broadband access limitations among students. The material is mostly text based, but high bandwidth applications are being increasingly integrated into the curriculum.

According to program administrators, broadband would allow them to do many things they cannot do now, such as streaming audio-visual material or conducting real-time two-way conversations among students and faculty. More multi-media content and interactive learning is planned as access improves. Currently video must be distributed in a variety of formats to accommodate those without broadband. Demonstrations for courses that would be hands-on in a classroom are provided on video either online or as a mailed DVD, depending upon the duration of the presentations and the bandwidth requirements.

Online learning is affordable and efficient. It saves workers time and money compared to traditional classes, while also providing a more meaningful education compared to correspondence courses. NACTEL and the CWA/NETT Academy provide an industry wide training standard that is directly linked to the employment needs of modern telecommunications. However, as successful as these programs have been, they hold even greater promise. With broadband access to the home workers can take full advantage of interactive educational resources and stay competitive in a changing economy.

More Information

NACTEL

<http://www.nactel.org/>

CWA/NETT Academy

<http://www.cwanett.org>

Further Examples

Cattle USA Video Auctions

A private company uses online video to conduct cattle auctions. Video of available cattle is available over the Internet and the sale process is run by an on-site auctioneer. Buyers are required to register to ensure financial security. Multiple auctions occur every week and include dozens of livestock companies from 17 different states. Broadband is essential to ensure image quality and a reliable connection.

More Information

<http://www.cattleusa.com/>

College On Demand

Washtenaw Community College in Ann Arbor Michigan offers a multimedia distance learning program called College On Demand. The program is affiliated with the United Association of Journeyman and Apprentices of the Plumbing and Pipefitting Industry union training program and offers both degree and certification programs. Technology used includes DVDs, text based distance learning software, interactive chat sessions with professors, and limited video. Broadband is not required but it is recommended.

More Information:

http://www.uauniversity.org/degree_programs/wcc.php

Microfinance for Underserved Communities

ACCION is a non-profit dedicated to providing financing to underserved communities, particularly Hispanic and African-American communities in New York. As part of their microfinance project, designed to provide financial support to people who have little access to institutional financial support, the organization uses loan agents equipped with wireless computers to process loans and information on the street.

More Information:

<http://www.accionnewyork.org>

PUBLIC SAFETY



Washington Area Responder Network



Winston-Salem Fire Department

WARN: Wireless Public Safety in D.C.

“WARN has had a tremendous impact on our ability to access and transfer critical information to and from our mobile command center. It has provided our mobile units with a fast, simple, and reliable means through which to send and receive digital information. We look forward to the day when WARN has expanded throughout the National Capital Region.” – An Officer from the DC Homeland Security and Emergency Management Agency

Inter-agency resource sharing and interoperable communication have become essential for first responders in the wake of September 11th and Hurricane Katrina. Police, fire and other emergency personnel need the most advanced possible realtime, anytime, anywhere access to mission-critical data to effectively manage prevention, protection, response and recovery activities. These needs are particularly acute in Washington, D.C., where there is an unusually complex combination of organizations, agencies, and jurisdictions.

The Washington Area Responder Network (WARN) is the first interagency, interoperable, city wide public safety data network to use wireless broadband. Launched in 2004, WARN provides access to streaming video, large files and images, and specialized emergency response databases, as well as standard desktop applications, such as e-mail and instant messaging. A wide range of federal, state, and local public safety agencies have access to the network, marking the first time many of these agencies have shared a common communications platform.

WARN began as a pilot project to explore the feasibility of wireless spectrum communication for public safety applications with sponsorship from the Department of Commerce’s National Telecommunications and Information Administration (NTIA). The District’s Office of the Chief of Technology took the lead in implementing the project, but the cooperation of many other organizations was essential to its success. The Federal Communications Commission provided spectrum licensing support. Equipment funding grants came from the Department of Homeland Security and networking companies, specializing in wireless communications, were contracted to provide technical support.

WARN uses an experimental license in the 700 mhz spectrum, which has special characteristics that make it well suited for wireless public safety use. The signal can penetrate building walls and carry more data over greater distances, improving the redundancy and reliability of public safety communications. WARN operates with 12 radio transceiver sites and can accommodate up to 200 users at a time averaging 900 Kbps download and 300 Kbps upload speeds. Devices for accessing the network use commercial network standards, enabling the transfer of public safety applications

to a commercial network in the event of a breakdown.

The shared and redundant structure of WARN makes it much easier to access information from the 19 jurisdictions comprising the National Capital Region. Through their work on WARN, authorities now have a framework for future inter-agency cooperation on other issues as well.

In its first major use, WARN provided streaming video from federal and District vehicles for the 2005 presidential inauguration. The system was also used during the national Fourth of July celebration and the International Monetary Fund (IMF) meeting. In addition, the District's Emergency Management Agency relied on the network's video overview and Internet access for Hurricane Katrina evacuees at the DC Armory.

Beyond the cooperation that WARN enables, *public safety personnel have unprecedented access to resources in the field*. With a laptop they can stream remote video surveillance footage from traffic cameras. Video transmissions also link cameras on vehicles, including helicopters, allowing for remote suspect identification, bomb squad support, and tracking. Emergency patients can be screened on the way to the hospital with video feeds in ambulances and chemical and biological weapon sensors can be accessed remotely. WARN can be used to access information on fingerprints, criminal records, vehicle registration, and other databases. WARN also enables better command, control, and coordination. Senior leadership at central offices can direct and support incident responses much more effectively with live video and high value data transmitted over the network.

WARN's success is now being channeled into an even more advanced network – the Regional Wireless Broadband Network (RWBN). It will have a higher data transmission capacity, allowing for more applications and more users over a wider area. The RWBN will have the capacity for 3.1 Mbps download data rates and 1.8 Mbps upload, comparable to landline speeds. It will consist of 106 transceiver sites and support a minimum of 35,000 local first responders, with the capacity for further growth. While WARN covers over 95% of the District, the RWBN will expand coverage into surrounding communities, providing seamless roaming for users between jurisdictions without the need to switch channels.

Officials in San Diego, Phoenix, and the Silicon Valley are looking at the technology and Structure of RWBN for their own public-safety networks. These would potentially be compatible networks that could lay the foundation for a nationwide public safety network. Their interest is a testament to the significant benefits broadband provides for first responders. With its rapid, mobile access to video, databases, and other resources that can be shared across agencies, WARN has significantly improved the effectiveness of Washington's public safety personnel, and it may prove to be the first of many successful public safety wireless networks.

More Information

DC Office of the Chief Technology Officer

<http://octo.dc.gov>

Winston Salem Fire: Information in the Hands of Firefighters

“With this system firefighters are better prepared before arriving at an incident location.” - Chief Steve Williams

Fighting fires is a dangerous business. It requires discipline, hard work, training, and quick reactions. Firefighters depend on knowledge of the situation they are facing when they enter burning buildings, so that they may make important decisions about combating the fire. The likelihood that a firefighter will save a life or avoid a catastrophe is determined by response time, which is measured in seconds. The more critical information firefighters have access to while responding to an incident, the better chance they have to control a fire with no casualties and minimal damage.

Tasked with the safety of 202,000 citizens, the 312 firefighters of Winston-Salem, North Carolina’s fire department are always looking for ways to improve the effectiveness and safety of their service. In the beginning of 2006 the first high-speed wireless cards were used with new mobile data computers and installed in department vehicles. These computers serve as a conduit for communication and information exchange between the crews of emergency vehicles and the dispatch center. Data that used to be kept in bulky binders is now available at the touch of a button. Complicated information from the dispatcher, rather than spoken over radio and scribbled on a notepad, now shows up on a touch screen.

Four of the department’s 25 response vehicles are currently equipped with broadband, but by the end of the year the entire fleet is expected to be covered. Funding support for Winston Salem’s technology upgrades has come from a variety of sources. When they first began equipping vehicles with advanced data applications in 1996, support was available from the Department of Commerce’s Technologies Opportunities Program (TOP). More recently homeland security grants and regular civic budgets have provided support.

Each vehicle’s wireless card relies on a commercial network that has 100% coverage of the city with usual transmission rates of around 1 Mbps upload and download. Compared to the old wireless system the network allows for more vehicles and more advanced applications. The department also uses an 800 mhz radio channel for some basic data transmission.

These technology improvements enable firefighters to spend less time worrying about the information they do not have, and more time taking the critical steps needed to contain fires and save lives. Critical dispatch information is uploaded to mobile data computers, including notes about the number of people trapped, special conditions of

the emergency, and other information that would be difficult and time consuming for a dispatcher to relay over radio.

Up to date routing and mapping information is also displayed. With this feature firefighters can quickly find the best route to a fire. Turn by turn instructions are provided that include speed limits, construction and road closure information, and the location of possible delays like school crossings. The mapping function also alerts fire fighters to the locations of nearby fire hydrants and expedites effective response time by improving speed and safety, especially at intersections.

The combination of mobile data computers and a wireless broadband network is especially valuable for tactical planning. Firefighters have the maximum available amount of relevant information at their disposal before entering a structure, reducing dangerous guesswork. Commanders gain a head start in planning a response because of mobile access to dispatch information, maps, and pre-fire plans, which are based on information collected from fire inspections for over 2,000 major buildings in Winston-Salem. They include building diagrams, water infrastructure (e.g. hoses and sprinklers), expected numbers and locations of occupants, and details on hazardous materials.

The department has long recognized, and invested in, the resource maximizing benefits of communications technology. When the first data computers were placed in fire vehicles ten years ago information could only be delivered by CD-ROMs. This meant that updates were periodic and there was no way to transmit live data from a dispatcher. Later a low-bandwidth wireless network was used for basic data applications, like vehicle location. This early commitment to vehicle-based data transmission made the transition to a broadband system relatively simple, a transition that is helping Winston Salem stay on the cutting edge of broadband's public safety applications.

More Information

Winston-Salem Fire Department

<http://www.cityofws.org/Home/Departments/Fire>

Further Examples

Corpus Christi Wireless

Corpus Christi, Texas, implemented a citywide wireless network for general use and civic functions, including public safety assistance. Wireless is used to connect streaming video to a small unmanned helicopter for aerial surveillance; track the vehicle location of all first responder vehicles; and support mobile data computers. In the event of an emergency, mobile wireless antennas can be set up to provide public safety agencies with communications and data transfer.

More Information:

<http://www.cctexas.com/egov/>

Hazardous Material Incident Response

Morrow and Umatilla counties, in rural northeast Oregon, are close to a U.S. Army facility for the disposal of chemical weapons. The county governments built a wireless network to assist in emergency response. Capabilities include live video footage on laptops, mobile access to traffic information, and broadband equipped ambulances. Public access to the network is available for a small fee.

More Information:

<http://www.csepp.net/>

New Orleans Wifi Police Surveillance

New Orleans instituted a wireless camera system to monitor high crime areas in 2004. Direct footage from Hurricane Katrina came from this system until power was lost. The system uses IP based cameras that can be remotely controlled from police headquarters and transmits over open spectrum. Areas covered by the video network reported fewer violent crimes and car thefts. After the devastation of Katrina many of the network providers for the camera network donated free Wifi to the city.

More Information:

<http://www.cityofno.com/portal.aspx?portal=98&tabid=18>

Pratt, Kansas Public Safety Wireless

The small rural town of Pratt, Kansas has a mobile broadband wireless network that can be accessed by police officers in their patrol cars. Officers can access databases remotely and file reports from the field. The network uses unlicensed spectrum and covers the entire city. Speeds can be comparable to a T-1 landline connection.

More Information:

<http://www.prattlec.org/>

Real-time Environmental Monitoring and Observation Technology

San Diego State University's Field Station Program has developed real time environmental monitoring technology for research and monitoring of natural areas. It is used for tracking environmental information and has been deployed to help fight wildfires. Specifically, the technology was deployed for a fire in 2003, allowing real time data transfer for weather, communications, and progress on feedback.

More Information:

<http://fs.sdsu.edu/kf/index.php>



Alliance for Public Technology

919 18th Street, NW
Suite 900
Washington, DC 20006
Phone: (202) 263-2960
www.apt.org



Communications Workers of America

501 3rd Street, NW
Washington, DC 20001
Phone: (202) 434-1194
www.cwa-union.org
www.speedmatters.org