# Advanced Services, Enhanced Lives


## *An Examination of Broadband Application Case Studies and Policy Recommendations to Accelerate Deployment*

## INTRODUCTION

Broadband. It is a word with many connotations. To some, it simply means faster Internet service. To others, it is a political term, an issue that has caused much debate. Whatever the perspective, broadband is an important, yet complicated and often misunderstood, telecommunications technology.

To members of the Alliance for Public Technology (APT), broadband is a tool that can benefit everyone. Broadband is about improving quality of life. It means bringing services to people that can enhance the way they live, work, and learn.

APT is a coalition of individuals and public interest organizations that has been advancing the need for universal deployment of broadband and advanced telecommunications services for over a decade.

This document follows in the spirit of such previous APT publications as *Connecting Each to All* and takes that vision of advanced universal service and brings it to a new level where the benefits of broadband are clear. Within this document are stories of broadband success; individuals and communities who have utilized this technology to provide services that fundamentally change how we all live our lives. Broadband has allowed these communities to have better and more affordable health care, expand educational opportunities for lifelong learning, create jobs and economic advancement, enable independent living for people with disabilities, and live in safer neighborhoods.

These stories come at a crucial time in the evolution of broadband. Congress, the Federal Communications Commission and the Administration are all investigating the many policy options that could speed the deployment of broadband to all Americans. But unfortunately, these debates about broadband are often mired in rhetorical battles between industries. The value of broadband is relegated to a secondary place behind the question of who will provide the services.

APT seeks to change this. By bringing these stories to the forefront, we illustrate the importance of broadband. The programs here, and countless more like them, need broadband capabilities to reach their potential. Without widespread deployment and access, the ultimate value of these services is reduced. The broadband debate should not be about which industry is providing services or has regulatory advantages. It should rather focus on how can we best bring affordable, accessible, and universal broadband services to all Americans.

APT's vision is predicated on a commitment to universal broadband access. People need the tools in their hands. Through this document, we hope to demonstrate that the social benefits of broadband translate into a critical need for its rapid deployment to all Americans. APT believes that broadband and other advanced telecommunications services are crucial elements of community building in the 21st century. With these tools, citizens and communities will have great opportunities to grow together, share information, and enrich their lives. But we must seize the opportunity, bring broadband to all Americans and develop the connected communities of the future.

## SECTION I

### The Problem

Broadband possesses the power to connect people and deliver new and exciting services. Full utilization of the technology demands access to the networks be as widespread as possible. But is broadband being deployed to all Americans in a reasonable and timely fashion? There are certainly differing answers to this question. Federal law, as stated in Section 706 of the 1996 Telecommunications Act, encourages the goal of such universal deployment. But are we there yet? Are we even approaching this goal of advanced universal service?

The fact is that deployment of broadband is a slow and uneven process. Millions of Americans have no access to high-speed services. Others may have the services available in their communities, but are unable to access them because of high costs and interoperability issues.

The problem remains that broadband is neither universally affordable nor accessible.

*The Statistics*

Many sources have estimated how many Americans have broadband services today. The Federal Communications Commission reported that in December 2000, there were 7.1 million broadband connections. 75% of the nation's zip codes had at least one subscriber to broadband services which they classify as a minimum of 200 kbps upstream and downstream (about 4 times the speed of standard dial up modems today). The National Telecommunications and Information Administration reported that in September 2001, only 10.8% of Americans had broadband access. A Cahners In-Stat Group market study from November 2000 found that only 9% of households with Internet access used a broadband connection. While these numbers increased from the previous year, they still show a that only a small percentage of Americans are actually utilizing broadband services.

### Why Is Broadband Deployment Limited?

These statistics illustrate that many Americans do not have access to broadband. Why? Two main impediments, market failures and problems with the current policy framework, combine to hamper the widespread deployment of broadband.

*Market Failures*

A competitive broadband market is a desirable goal and will facilitate deployment of advanced services to most Americans. However, with any market, there will be communities that will not be served, either because these communities cannot muster the economic demand needed to entice investment or because the services are inaccessible to them. Some areas of the country will not be reached because the infrastructure is too costly. Others may have deployment but a sizable number of the population will be

unable to utilize the services. The subscription costs for the services may be too high for many consumers. All point to problems within the marketplace.

Rural and remote communities and Native American populations are examples of these marginalized areas the market will not completely serve. As with traditional phone service, these Americans are the last to receive broadband. According to FCC data, only 45% of the zip codes with the lowest population densities have at least one subscriber to broadband services. According to the Rural Utilities Service, only 5% of towns with populations below 10,000 had either cable modem or DSL service.[1]

The market can also fail to reach certain communities, not because of their economic status, but because of other circumstances. People with disabilities will benefit from many life-enhancing opportunities with broadband services, but often will be unable to access them. Broadband may be available in their communities, but it may not have the technological capabilities they need to interact with it. For example, a person who is blind may be able to subscribe to a broadband service, but if the service requires the use of equipment or software that cannot be operated without sight, then it is useless.

The market, by its nature, does not serve all customers equally. With this reality, many consumers are unfairly left behind. Deployment only occurs where it is economically feasible. People underserved by market forces are left to wait, sometimes for decades, before services reach them.

*Current Policy Problems*

Broadband deployment is hampered by policies and regulations unsuited to the new world of telecommunications. Broadband services do not conform to the properties of the voice and video worlds, but they are constrained by regulatory frameworks born in the last era.

Three major policy hurdles confront broadband. Regulatory disparity, lack of investment incentives, and regulatory barriers to deployment all slow the pace. Each hurdle has unique characteristics that place it in the path of speedy deployment. These policy problems call for intervention from government that will allow broadband to flourish free of regulations that were not designed for it.

Regulatory disparity among the various broadband platforms has lead to an uneven playing field and a lack of true competition. Cable modems, DSL, satellite and wireless are all regulated under different schemes. There are disparate local and national policies and structures. It hurts consumers when only one provider has the opportunity to compete in a market because the regulatory burdens on the other potential entrants dissuade them from investing. Full competition between and among broadband providers will not happen with regulations that treat like services in different ways. In the past, when different industries offered different services, disparate regulations worked. Now, with the convergence of technology, independent industries compete with each other for

[1] "Advanced Telecommunications in Rural America" Rural Utilities Service and National Telecommunications and Information Administration Report, April 2000, pg. iii.

the same ground. But they are competing under different regulatory structures. This hurts consumer choice and reduces opportunities for open broadband competition.

Broadband deployment is a high cost endeavor. The industries that have begun to rollout services have committed huge sums of money to develop and upgrade the telecommunications infrastructure so that broadband services can be provided. But most of this investment flows to areas with high rates of return. Consumers in regions where deployment is extremely expensive are underserved. Yet there are no policies in place that provide incentives for investment in these areas. In high-cost areas, such as rural America, where there are fewer customers and greater distances to cover, the market often fails and there are few corrective measures available to overcome this problem.

Old regulatory barriers, designed for an era before broadband existed, cause major problems for deployment. Broadband services transport data across the country, yet there are restrictions from the telephone regulatory framework which curtail transmission across artificial LATA boundaries, even though they were designed for a voice-only environment. These LATA boundaries, created after the divestiture of AT&T, are irrelevant in the data world. Data travels end-to-end, creating economies of scope and scale that will reduce the cost of deployment by increasing network use. The LATA boundaries contribute to lower use rates because the data cannot travel efficiently from point to point.

Other regulatory impediments that slow deployment include unbundling requirements and below-cost pricing. As stated earlier, broadband networks are very costly to deploy. If they must be resold and dismantled for the sake of competition at below cost, companies will not commit the capital because there is no chance of recouping the investment. Similarly, spectrum allocation requirements impede the development of satellite and wireless broadband carriers. These providers could be the solution for bringing advanced services to rural and remote areas, but they cannot always obtain enough spectrum capacity to provide the highest level of service.

**Why Is This A Problem?**

Lack of broadband access stifles innovation and deprives millions of Americans of the ability to use new technological services that would benefit them on a daily basis. Broadband is both a social and economic tool, brining unparalleled opportunities to Americans for services and growth.

The potential for broadband is great. Applications are evolving that utilize the high-speed capacity of broadband and transform existing services and capabilities into new and dynamic opportunities. Lack of broadband is a problem because it prevents us from fully employing these applications and enjoying the life-enhancing benefits they can provide.

## SECTION II

Broadband is a tool that can empower people in all aspects of their lives. It is **not** merely a faster means to download email and surf the Internet. Advanced services allow high-quality, two-way interactive voice, video and data transmissions. Broadband today (cable, DSL, satellite, wireless) combines technology with many of the services we already know and augments their capabilities, by delivering them faster and expanding their reach. Broadband of tomorrow, including fiber to the home and 3G wireless, will enable functions to grow even further and lead to applications that can improve quality of life.

The following case studies are broadband applications already in place that demonstrate the various uses of broadband in all communities. With high-speed connections, these projects can deliver services that would otherwise be impossible. These stories are about potential. They have broadband capacity, but still need greater deployment and more bandwidth to fully achieve their goals.

Telemedicine, real time sign language translation, rural community development, public and fire safety, and mobile broadband in low-income areas, education and online worker training are the types of programs discussed. They use broadband services from different platforms and at different speeds. They target different audiences. But all share a common need for high-speed capacity and all strive to improve quality of life for their constituencies. Without broadband, these applications would be far less useful.

These are the stories of how advanced services enhance lives.

CASE STUDY # 1
TELEMEDICINE

Telemedicine, as defined by the American Telemedicine Association, is "the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or healthcare provider and for the purpose of improving patient care."[2] As communications technology developed in the 1990's, telemedicine enjoyed a rapid growth. In 1991, the Association of Telehealth Service Providers (ATSP) identified three telemedicine programs operating in North America. In 2001, the number of programs identified had risen to 206. In 1999, ATSP estimated 74,828 telemedicine consults, excluding radiology work, occurred. This number increased from the 1997 figure of 41,740 telemedicine consults.[3] As more Americans are able to utilize advanced telecommunications technology, telemedicine will continue to grow as a medical tool.

Dr. Max Stachura is an endocrinologist in Augusta, Georgia. He treats chronic diseases such as diabetes. Broadband and high-speed data transmissions have not been tools he carried in his doctor's bag. In the mid 1990's, Dr. Stachura assumed responsibility for the Telemedicine Center at the Medical College of Georgia (MCG) where a statewide telemedicine program, supported by MCG and the State of Georgia had been underway for several years. A fledgling program to address home health care, supported by federal research dollars through the Department of the Army, state money from MCG and from the Georgia Research Alliance, also was being discussed. A steering committee comprised of representatives from the three collaborating institutions - the Fort Gordon/Eisenhower Army Medical Center (EAMC), Georgia Institute of Technology (GIT), and MCG – was assembled and tasked to put together a plan for a telemedicine program in home care of chronic disease that would yield tangible results. Funding requirements stipulated that the work be based on existing technologies, and not research into new systems.

Telemedicine today makes use of a variety of both home health monitoring devices/systems and health care facilities-based systems that connect rural primary care facilities to specialty consultation services. It augments current medical services by using technology to make care more accessible to the patient, more cost effective, and by giving the health care system more flexibility. Both provider and patient are empowered to manage conditions in the best possible manner.

Traditional healthcare has always been face-to-face between doctor and patient. The doctor uses traditional diagnostic instruments, such as stethoscopes and blood pressure cuffs to assess and treat whatever ailments the patient has. But in some settings this system encounters obstacles, distance and time restraints being two of the most pressing. The patient has to travel to reach the doctor and receives care by appointment except for more serious conditions where required treatment occurs in an emergency facility.

[2] "Toward A Rapidly Evolving Definition of Telemedicine"
http://www.americantelemed.org/news/newres.htm
[3] Association of Telehealth Service Providers, 1999 and 2001 ATSP Reports on U.S. Telemedicine Activity, www.atsp.org

The team with whom Dr. Stachura was working was one of several groups trying to bring these two concepts together. They had to envision how doctor and patient might interact through a technology interface. They had to address the rate of data transmission. At that time transmission over regular phone lines was too slow and unacceptable. ISDN connections were costly and not available to every home. Finally, they reached an agreement with the local cable operator, who offered them dedicated bi-directional transmission. In 1996, they deployed a feasibility test of the system they had created into 25 homes in Augusta, Georgia, the "Electronic HouseCall System" (EHC).

EHC was a two-way system with one unit in the patient's home and the other located at MCG or EAMC. The patient unit required no computer sophistication (no mouse or keyboard) and used a touch screen instead. From the home unit, the patient could check his or her pulse, blood pressure, blood oxygenation, temperature, glucose levels and heart function with a modified lead 2 electrocardiogram without connecting to medical staff. This information was then sent to the medical staff. The patient and provider could also interact on-line through a videoconference activated by touching the appropriate icon. Once connected, the clinician could use a stethophone to expand examination of the patient. Even though the system was originally conceived as a tool to help monitor and manage known chronic diseases, rather than a tool for diagnostic assessment of a new patient, the utility of the system was in many ways tied to available bandwidth. For example, less than full motion video is not acceptable in certain medical situations. With broadband capability, the EHC system could incorporate a wider array of monitoring tools such as spirometers, fetal heart monitors and uterine activity monitors

There were stories of success during the feasibility deployment. One patient who previously was admitted to the hospital every three or four months, was able to avoid hospitalizations during nine months on the EHC system because problems were detected early and resolved during a doctor's office visit scheduled as a result. Not long after the completion of the funded feasibility study, MCG and GIT licensed the patented EHC technology to industry (CyberCare, Inc.).

Now the MCG Telemedicine Center is exploring the breadth and depth of health service applications that can be enhanced through the use of a variety of telemedicine technologies. The EHC is just a single example of how telemedicine technologies can be used to enhance access to health care services and potentially reduce their over-all cost. EHC addresses chronic disease management, where both patient and care provider know the condition being managed. It requires broadband capability for optimal video and data transmission. However, ubiquitous access and development of advanced health care services are unlikely without dedicated high-speed connections. Current incarnations such as DSL and cable modems are acceptable, but still limit the scope of potential applications. With general bandwidth availability, telemedicine technologies can be used to expand access to medical services and explore the delivery of more sophisticated medical services.

There are significant unresolved questions raised by the possibilities created by telemedicine. For example, medical licensing: Health care providers currently are licensed by the state in which they practice. How should we address the potential for

caring for people across state and even national boundaries? There are funding issues: How shall we pay for the infrastructure required by telemedicine? These questions will be answered as the capability, utility, and potential of telemedicine evolves, and as familiarity and comfort make telemedicine more commonplace in medical care and treatment. Telemedicine does not replace in-person face-to-face health care; it is a multi-faceted tool to be employed when, and as appropriate, to enhance the delivery of health care services.

Regardless of these questions, the potential benefits of telemedicine are many. At its most fundamental level, telemedicine frees both the patient and the provider from brick and mortar limitations. The patient can address medical needs as necessary. The doctor is not limited to his office. In providing flexibility, telemedicine holds the potential to greatly increase cost effectiveness. Health care costs have skyrocketed in recent years; telemedicine offers a way to lower costs for both the patient and the provider. Its judicious use and application holds the promise of reducing the frequency and/or duration of hospital stays, reducing the frequency of physical office and home health care visits, expanding service availability to a greater number of patients at a lesser unit cost through more efficient use of provider time and facilities, and by generally supporting community wellness.

Dr. Stachura sums up the goal of telemedicine best – "Services to those who need them, where and when they need them."

Resources:

Medical College of Georgia Telemedicine Center http://www.mcg.edu/Telemedicine/Index.html

American Telemedicine Association http://www.americantelemed.org

Association of Telehealth Service Providers http://www.atsp.org

U.S. Department of Health and Human Services, Health Resources and Services Administration, Office of the Advancement of Telehealth http://telehealth.hrsa.gov/

CASE STUDY #2
REAL TIME SIGN LANGUAGE INTERPRETATION

Sign language interpreters have become commonplace in society. They are often seen on television and at meetings and conventions. But where they are not seen, and often are in the most use, is in the everyday activities of people who are deaf. These individuals need interpreters for routine tasks, such as going to the doctor or even just having a conversation with a friend. This process requires scheduling an appointment with an interpreting agency, coordinating this with the doctor's appointment or the schedules of other people involved in the activity, waiting for the interpreter to arrive and then perhaps still being unable to finish a conversation if the interpreter has to leave for another client.

These problems are still great for those who are deaf, compounded in most areas of the country where the number of interpreters is relatively small, but there is an alternative.

Sign Language Associates (SLA) of Silver Spring, Maryland is a full service interpreting agency. It was founded in 1982 and today has a staff of 48 full time interpreters. They provide interpreters for meetings, conferences, performing arts shows, emergency situations, hospices and individual needs. The cost for these in-person interpreters is $150 for the first hour and $40 for each additional hour. Clients must pay for the full hour and travel costs for the interpreters.

In the early 1990's, SLA began investigating video conferencing as a medium for remote translation. However, the equipment was prohibitively expensive and the video technology was not suitable for sign language. By 1996, several pilot programs were being tested as the technology had developed to the point where transmission was clear enough and fast enough to accommodate the translation. In 1997, SLA began offering the Video Interpreting Program (VIP).

VIP is an ISDN video conferencing system, which transmits data and images at 384 kbps. This speed is necessary to avoid drag images and to ensure that both the interpreter and the client can view the intricate hand movements of sign language. The interpreter works from SLA's offices and the client can be anywhere, so long as their location has the video conferencing devices and a high speed connection. The ISDN connection requires two pieces of equipment, a Coder/Decoder and an NT-1 box, both of which come standard with video conferencing packages. Since 1997, SLA has upgraded the system to include an IP connection, but again the client must have a high-speed service to access VIP over the Internet.

The price for the VIP service is a $50 reservation fee and then $2.50 per minute. The benefits of the system are two fold. First, the client only pays for the time needed. If they only need interpreting for a fifteen minute conversation, with VIP they do not have to pay for a full hour. Clients can utilize the system when and how they need, without being tied to the schedule of the interpreter. The interpreters can serve more clients by not losing time in travel between sites.

As technology develops, SLA is researching home based systems that would be inexpensive and highly efficient for many clients. Currently, most video interpreting is done with business and government clients because they have the necessary video conferencing equipment and the broadband connection.

The possibilities for video sign language interpretation are immense. Primarily, it allows for complete independence for people who are deaf. With increasing wireless options, people who are deaf could take handheld devices with them and at any time connect to an interpreter for whatever time needed. They can have conversations in private using sign language with other deaf individuals, a far more effective and appropriate means of communication than impersonal and difficult written communication over TTYs or message services. On an institutional level, hospitals would not need to have emergency arrangements for interpreters, they could use a video connection in the emergency room. Schools could have all classes interpreted. And the list goes on.

Broadband is a tool that enables communications. As the advent of communications technologies such as cellular phones and email have brought us into greater communication with each other, the rise of broadband and advanced services provides opportunities to live and work efficiently and independently.

Resources:

Sign Language Associates www.signlanguage.com

Telecommunications for the Deaf www.tdi-online.org

Polycom View Station (provider of the video conferencing equipment) www.polycom.com

CASE STUDY #3
RURAL COMMUNITY DEVELOPMENT

Broadband has many uses. But its uses are limited if the number of people connected is low. Beyond the particular applications, broadband connections can unite communities and allow them to flourish. Expanded telecommunications capabilities allow citizens to interact with their government, businesses to reach potential customers and create new jobs, students to access information resources all over the world and other daily uses that improve quality of life. But the connection must first be made.

LaGrange, Georgia has taken the initiative and made the connection. LaGrange is a city of approximately 27,000 residents, sixty miles southwest of Atlanta. The county seat of rural Troup County, LaGrange sits on Interstate 85, which is commonly called the growth corridor of the South. In the early 1990's, the leaders of LaGrange viewed the shifts in the economy and understood the vital role technology would play in the new economic model.

A decade of technology infrastructure planning ensued. The city believed that economic development would be fostered with the development of an advanced telecommunications system that is rarely found in rural communities. LaGrange was already a provider of utility services such as electricity and natural gas and saw an opportunity for growth in providing telecommunications. After becoming a local and long distance service provider, with offerings including T1 lines, the city sought to acquire the local cable system. In 1998, through a $9.6 million bond, LaGrange entered into a unique public/private partnership with local cable operator Charter Communications. LaGrange bought the local transmission lines and the equipment and agreed to lease channel capacity back to Charter to provide video entertainment. LaGrange then began an upgrade of the cable system to provide more advanced services.

"We could have overbuilt Charter," said Joe Maltese, the city's director of community and economic development. "We would have been competitors. What we wanted was to be in the telecom business in order to complement our other enterprises, and to be able to offer our citizens and businesses access to state of the art broadband networks."[4]

The upgrade of the cable system entailed the deployment of a hybrid fiber-coax (HFC) network that enabled LaGrange to offer residents 500 kbps broadband Internet service via cable modem, free e-mail and 5 megabytes of space for a website for $39.95 per month. Broadband connections of up to 2 mbps are available to commercial and residential consumers. The broadband network today encompasses more than 150 miles. All 21 area public schools, LaGrange College and the West Georgia Technical Institute are connected via broadband.

But LaGrange wasn't finished. On March 22, 2000, LaGrange Mayor Jeff Lukken announced that the city would begin offering free broadband Internet service over television via the cable system. LaGrange Internet TV (LITV) is available to all cable subscribers within the system (of the 10,500 TV households in LaGrange, 9,100 are cable

[4] Joanne Donner. "LaGrange Hoists Internet Flag" Georgia Trend June 2000. Pg. 45.

subscribers). Customers are given a wireless keyboard, set-top box, five email addresses and a parental control feature. The broadband connection offers service at about 150 kbps. Approximately 4500 households requested that the LITV service be installed in their home. Many others opted to connect through the City's and Charter's high speed cable modem service or via a dialup connection.

This connection is having a discernable impact on life in LaGrange. One of the first beneficiaries of the Internet TV initiative was the senior citizen population. The Troup County Senior Center reported that seniors are using the Internet connection to research insurance policies, gather information about medical conditions and interact with other seniors who may have similar conditions, email grandchildren and trace family histories. Local banks have made presentations to the senior groups about online banking.

Local businesses reach more customers with the spread of Internet connections. A local business-to-consumer e-commerce initiative is under way, with plans to create a virtual mall in the works. This mall would have free listing to every business in LaGrange and visitors to the site would be able to perform all their e-commerce functions with a variety of businesses in one place.

Mayor Lukken described his vision for the Internet TV initiative as "a community wide communications network that will allow citizens to communicate on a variety of topics including school assignments and activities; postings for civic meetings and job openings; and other community events, sports, entertainment and the arts; as well as local e-commerce. Additionally, plans are underway to develop a community-wide email and local content directory to facilitate increased communications within the community."[5]

In August 2000, the World Teleport Association named LaGrange "Intelligent City" for 2000, the first American city to ever receive the honor. LaGrange illustrates how a connected community can flourish, both socially and economically. Through the city's initiative, there is strong use of the telecommunications technology that is so vital today.

LaGrange is an example of "Connecting Each to All." The value of the network grows as more people are connected to it. Sharing information builds strong community bonds. Community building in the 21st century is no longer solely about traditional infrastructure like roads and houses. Now, the new infrastructure that unites the community via broadband and communications technology is equally critical. LaGrange and its citizens will experience rapid growth because they can communicate with each and with the world.

RESOURCES:

City of LaGrange www.la-grange-ga.org

World Teleport Association http://www.worldteleport.org/

[5] City of LaGrange, Georgia. Intelligent City Application, May 2000, pg. 11.

CASE STUDY #4
PUBLIC SAFETY

Fighting fires is a dangerous business. It requires discipline, hard work 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. It can take only an instant for a fire to rage out of control and become deadly.

But what if firefighters could be equipped with the information they need before they get to the fire? If they could get to the fire faster, be informed of the layout and structure of the building and have rapid communications with the other emergency vehicles involved? Such innovations would give firefighters an advantage that would allow them to address the situation more efficiently and have better opportunities to control the situation with no casualties and minimal damage.

The Fire Department in Winston-Salem, North Carolina took the steps to give their firefighters these tools. In October 1996, the Winston Salem Fire Department received a TIIAP grant (the precursor to the Technology Opportunities Program grants) from the U.S. Department of Commerce. This money funded the Integrated Network Fire Operations (INFO) project, whose goal was to provide critical information in graphical form to the firefighters in the emergency vehicles.

The city's emergency vehicles were equipped with laptop computers that could display maps, building layouts, hydrant locations and the status of other emergency vehicles. The laptops in each truck are connected via mobile wireless technology at 19.2 kbps. Current mobile wireless broadband has average transmission speeds of 14.4 kbps, with the anticipated 3G technology expected to take this speed up to 2 mbps. The laptops serve as direct communications links between the emergency vehicles and the dispatch center, as well as between vehicles. The firefighters interface with the system via touch screen icons and this transmission of data frees up communication over the traditional radio system.

Data is transmitted to the emergency vehicle from Winston-Salem's E911 Computer-Aided Dispatch (CAD) mainframe system. The CAD identifies the nearest fire vehicles for the incident type and location. The address of the emergency, details on the incident, status of other responding units, prefire survey data, information on possible hazardous materials involved, existence of gas and water lines, condition of occupants at the location, and other data transmits from the CAD to the on-board computer.

When a fire alarm is initiated, the firefighters are immediately able to view the optimal route to the location. The city utilized global positioning satellite (GPS) technology to create a street centerline coverage that the computers then use to determine the fastest route to the emergency. The laptops in the emergency vehicles use the Geographical Information System (GIS) applications, which determines the route based on speed limits, one-way streets, turning movements allowed, etc. The GIS software also can alert

the firefighters to any impediments on the route, such as downed power lines, and then create an alternate route.

Each fire station is connected to a citywide ISDN network and the firefighters constantly update information on their areas of responsibility. Data collected from building inspections, new construction and other information that is routinely changing are added to the system.

Before the INFO project, all the information was compiled in binders that were kept in each emergency vehicle and the binders held information for that vehicle's home territory. If the vehicle had to respond to a large-scale emergency in another section of the city, the firefighters would have no advance knowledge of that location. The INFO project allows the fire department to respond to an emergency with a strong knowledge about the situation. Firefighters can be equally prepared for action even when they are working at a station that is not their usual assignment, as is often the case in large departments.

Communications technology has allowed the Winston-Salem Fire Department to revolutionize its services. With enhanced information, firefighters are able to control emergency situations and protect communities better than ever. As transmission speeds increase, along with other technological advances, firefighters will have even more tools. Imagine if each firefighter was equipped with a wireless device that could transmit his or her exact location in a building, as well as vital signs, water pressure on the hose and oxygen remaining in the airpack. If that firefighter needed assistance or was injured, other firefighters could immediately respond, based on information displayed on the computer in the emergency vehicle or on another handheld device. The key to fighting fires is reacting quickly to changing situations. Information transmitted at high speeds gives firefighters the ability to respond as quickly as possible.

RESOURCES:

City of Winston Salem Fire Department www.cityofws.org/fire

Technology Opportunities Program (TOP) www.ntia.doc.gov/top

CASE STUDY #5
BROADBAND ON WHEELS

A growing problem in the provision of broadband Internet connections is the widening gap between information rich and information poor. It is costly to subscribe to many broadband services and many low-income Americans are unable to obtain access in their homes. Yet these Americans have great opportunities available through broadband, including medical information, job training and continuing education. Sometimes there is an Internet connection in the local library, but often there is little time available to travel to the library for at best thirty minutes of computer use.

In Grand Rapids, Michigan, people in low-income neighborhoods have broadband rolling up to their doors. In October 2001, the Grand Rapids Community Media Center (CMC) unveiled MOLLIE, the Mobile Learning Lab for Information Education. This "broadband on wheels" will travel to low-income neighborhoods and schools to provide computer training and access. MOLLIE was made possible by funding from SBC/Ameritech, a $234,000 grant from the U.S. Department of Education and matching funds raised by CMC. In addition to MOLLIE, CMC provides training in radio, television, and information technology; as well as access to all the equipment necessary to implement the training. Multi-media transmission possibilities available through the CMC include cable TV, broadcast radio, and the Internet.

MOLLIE contains 20 iBook computers and transmits and receives over a wireless network based on the new 802.11b protocol. The transmission rates are at 2.4 Ghz. CMC is in the process of developing a wireless LAN using 802.11a, which will transmit at 5.4 Ghz. This network should be able to accommodate 10 mbps of data transport. Beyond the wireless capability, there are plans to incorporate Ku Band satellite broadband in MOLLIE once the signal is installed at CMC.

The goal of the MOLLIE project is to bring computer and video technology to underserved areas where it is not available. In addition to the computers, MOLLIE contains Sony hand held video cameras, and the CMC staff train users in video and content production. Audio, video and computer data are routed back to the CMC for possible transmission on the local FM radio station, public access cable station and streaming on the Internet.

MOLLIE is reaching out to many different communities in Grand Rapids. A migrant workers group with ties to Mexico City is using MOLLIE to communicate with family and friends in Mexico. Inner city middle school students are using MOLLIE to build web sites. High school students in Kentwood are working with MOLLIE to bring access and training to a senior citizens center. Community organizing groups, utilizing MOLLIE's laptops, are bringing people to together for discussions on issues. The laptops are at different locations and send the data from each user to one main screen at a meeting and to all the people participating online.

MOLLIE is an excellent example of community-based solutions to some of the problems in broadband deployment. With uneven deployment and high costs, it often falls to

community institutions to find ways to bring broadband to underserved citizens. Community groups, such as CMC, can partner with companies to develop programs like MOLLIE that address the specific needs of local neighborhoods. CMC saw that the low-income areas needed access to technology and found a solution that worked. Communities across America are finding ways to bring broadband and other technologies to their areas, even if the competitive market is failing to serve them.

RESOURCES

Grand Rapids Community Media Center www.grcmc.org

MOLLIE project www.grandnet.org/wip/mollie

Alliance for Community Media www.alliancecm.org

CASE STUDY #6
DISTANCE LEARNING

Education has traditionally been limited to students and teachers in a classroom setting. The need for direct interaction has always demanded physical proximity. However, communications technology expands the reach of education to homes, offices and other non-education environments. Distance learning has become a new tool in education, bringing the teachers and curriculum to students regardless of location, and increasing opportunities for lifelong learning.

Distance learning programs are now utilized at all grade levels from Pre-K through college. Educational materials are available either online or through video transmissions. Students who are unable to attend school, either because of distance, medical conditions or other impediments are now empowered to continue their educational pursuits. Adults who desire to obtain further education but who do not have the time to return to school are able to learn from work or home.

Old Dominion University (ODU), located in Norfolk, Virginia, operates TELETECHNET, one of the largest university distance learning programs in the country. It began as a satellite based program, transmitting interactive images of classes to over fifty sites in Virginia, Indiana, Georgia, Washington DC, Arizona, North Carolina and Washington state. In Spring 2000, ODU decided to offer interactive degree programs via videostreaming. Live courses would be available over the Internet to students not served by the satellite locations.

The program was tested using 56 kbps modems, and during the Spring and Summer 2000 semesters, several hundred students participated. However, it was soon discovered that the low bandwidth transmission was not sufficient. The program now requires students to have broadband connections, such as DSL, cable modem or LAN. The students must also have computers capable of displaying full motion video.

Online students have direct interaction with the professor and the other students, using Lotus Sametime software, which enables chat features. The online students can type in their questions or comments, which are then read aloud in the class by an instruction assistant.

The videostreaming project offers undergraduate degrees in Computer Science, Professional Communication, Mechanical Engineering, Nursing, and Business Administration and a graduate degree in Special Education. Students who wish to participate in the videostreaming program take introductory level courses at either ODU, community colleges throughout Virginia, or other accredited colleges or universities. These students then enroll in the videostreaming program and take their advanced level courses online.

Online courses for Spring 2002 are transmitted live and each session is three hours in length. If the distance learning students are unable to attend the class at its regular time, the transmission is archived and available two days after the session.

Online education provides amazing opportunities for current students and those who wish to become students again. Technology has opened these possibilities. But distance learning via video streaming and the Internet requires bandwidth. A student cannot reap the full benefits of attending a class online if the video transmission is slow and fragmented or if he or she cannot ask a question in real time. For distance learning to be truly successful, the students outside the classroom must engage themselves in the same fashion as those students physically present. Broadband connections provide distance students full access to the classroom.

Distance learning can fundamentally change education. Incorporating more students into learning environments can lead to a better-trained workforce and more informed citizenry. When given the opportunity, many people will return to school via distance learning programs, because they are convenient and allow flexibility for the student who is also a parent, employee, etc. It allows for greater access to resources, as students with particular interests and abilities can learn from experts anywhere in the world. Together, technology and education can help build strong communities and enable Americans to learn everyday.

RESOURCES:

Old Dominion University TELETECHNET Distance Learning Program
www.odu.edu/home/distance.html

United States Distance Learning Association www.usdla.org

Distance Learning Resource Network www.dlrn.org

CASE STUDY #7
WORKER TRAINING

*"For many years I have wanted to go back to school and obtain a degree. My work schedule and family responsibilities have not provided the extra time necessary to fit in classes at a local university. The online AS in Telecommunications program has given me the opportunity to obtain a higher education, and having a degree within reach is a dream come true." - Gladys McGinnis, SBC employee*

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. 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, SBC, Qwest, Verizon, and BellSouth.

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) On-Line Telecommunications Associates Degree Program, is a unique industry-wide collaborative between leading telecommunications employers and telecommunications unions that allows workers to take on-line courses leading to a two-year Associate college degree in Telecommunications. The second program, known as CWA/nett Academy, provides on-line networking certification training, including the only on-line Cisco certification training program, in combination with hands-on activities directed by trained CWA proctors located in CWA union halls.

The National Coalition for Telecommunications and Learning (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 and the International Brotherhood of Electrical Workers (IBEW), Qwest Communications, SBC, Verizon Communications, and Citizens Communications. The partnership was formed in 1997.

NACTEL works in partnership with Pace University in New York to offer an online Associate Degree (AS) in Telecommunications. The program is administered by the Council for Adult and Experiential Learning (CAEL), the nation's leading adult education organization. Initial funding for curriculum development came from a $500,000 grant from the Alfred P. Sloan Foundation.

The AS in Telecommunications degree is designed to prepare students for a wide range of technical positions in the telecommunications industry. A joint curriculum committee

comprised of members of the companies, the unions, and the university develops and revises the curriculum for each course. In addition to the AS Degree, the program offers two certificates, Introduction to Telecommunications, and Telecommunications Essentials, as stand-alone options.

The entire program runs online, including application, assessment, ordering books, coursework, and communication with fellow students and faculty. An initial orientation course walks students through the necessary technical specifications. Currently, the minimum recommended technical requirements are a computer with sufficient memory, a printer, and dial-up Internet access.

Because most students do not have broadband connections at home, distribution of materials and on-line communications are designed for dial-up narrowband users. For example, video demonstrations for courses that would be hands-on in a classroom are provided online or are mailed, depending upon the duration of the presentations and the bandwidth requirements (long presentations are mailed, short presentations may be streamed on the Internet). 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.

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. In fact, faculty report that e-mail allows them to interact more with their online students than they often do with students in the classroom environments

Students who are CWA or IBEW members take advantage of negotiated tuition assistance programs with their major telecommunications employers that cover the costs of tuition and books. Qwest allows students to use computers at work, if necessary. CWA or IBEW members whose employers do not have tuition assistance programs receive tuition discounts because they are union members.

As of January 2002, the AS Degree completed its third year with over 2,000 individual students having participated in the NACTEL program. Eight students graduated in 2001, and many more graduates are expected in May 2002. Completion rates in courses average almost 90%. Students range in age from 21-55, with the mean being in their late 30s. More than 40% of those participating are women.

Three factors lead to the success of this program. First, it is industry-wide. Second, it is accessible, with Internet delivery allowing students from anywhere to learn at any time of the day or night. Third, it is directly linked to the employment needs in the industry. In sum, the program combines best practices in worker education with the advantages of on-line delivery.

CWA has also initiated a unique on-line education program to improve members' and military personnel skills in computer networking. The program is designed to deliver on-line networking certification training, with supplemental hands-on activities in labs located in CWA union halls and proctored by trained CWA technicians. The CWA/nett

Academy is the only on-line Cisco certification training program. The program operates in partnership with Stanly Community College of Albemarle, N.C. Stanly provides instructors, counseling, and program accreditation.

The CWA/nett Academy offers courses a verity of training and certification courses. The A+ Certification covers repairing, servicing and upgrading computers and peripherals. The CCNA (Cisco certified network associate) training consists of two courses that prepare students for the CCNA exam. In addition, there are courses in UNIX leading toward Sun Microsystems certification; basic computer literacy; and a Microsoft Office User Specialist (MOUS) certification. A new course in telecommunications cabling leading to a Building Industry Consulting Service International (BICSI) certification will be offered by mid-year 2002.

One unique feature of the CWA/nett Academy is that the online coursework is supplemented by hands-on assistance in one of 11 proctored labs located in CWA local union halls around the country. CWA technicians, trained by Stanly Community College, serve as lab proctors, assisting students with hands-on activities such as building a computer or cable router troubleshooting. The A+ certification class and the CCNA classes include 16 hours of proctored lab time. The equipment in the labs was provided by Cisco and CWA.

Students enrolled in CWA/nett Academy classes have the opportunity to interact on-line with faculty and students through a virtual classroom website that includes e-mail postings, chat areas, whiteboards, community postings, and links to students' web sites. Stanly's instructors have used the web site to set up flexible chat rooms allowing discussion among students and teachers. This web-based communication vehicle differentiates the course from a traditional correspondence course.

Most enrolled students have narrowband Internet access; on-line activities assume this level of connectivity. In a broadband environment, the program could expand to include more multi-media interaction and distribution.

The CWA/nett Academy has enrolled 450 students in its first 18 months. CWA members working for major telecommunications employers can use their negotiated education benefits to pay for tuition and course materials. In a few sites, full scholarships are available through the federal government's H-1B worker training funds.

On-line delivery has allowed the CWA/nett Academy to reach many more students at a fraction of the cost of more traditional classroom programs. The CWA/nett Academy program continues to grow and to evolve to meet the needs of today's high-tech workforce.

RESOURCES:

On asynchronous distance learning: http://www.aln.org/

On CWA's online education and training programs and partnerships: http://www.cwa-union.org/jobs/training.asp or http://www.cwanett.org

## SECTION III

### Policy Solutions

Broadband has the capacity to change peoples' lives in numerous ways, as evidenced from the preceding case studies. From health care to job training, public safety to services for people with disabilities, the possibilities are boundless. But the key to all of these services is deployment of broadband technologies. Without sufficient bandwidth and universal deployment to all Americans, the value of these services is reduced.

Problems in broadband deployment cited earlier include regulatory disparity between broadband platforms, lack of investment incentives and the existence of regulatory barriers to deployment. All contribute to the slow pace of deployment and the high cost of broadband services.

Now is the time for action. Government must create an environment suitable to rapid deployment to all Americans. The Federal Communications Commission, the Administration, and Congress must work together to create a national broadband policy that accelerates deployment.

Foremost, broadband services must be affordable and accessible. This should be the foundation of any broadband policy. All Americans, regardless of race, color, national origin, income, location of residence, or disability, must be able to access broadband services. This goal is embodied in Section 706 of the Telecommunications Act of 1996. Fulfillment of this goal must be paramount.

The following policy principles can contribute to the goal of advanced universal service:

**1. Universal Access to Broadband**

Section 706 of the Telecommunications Act first codified the goal of broadband deployment to all. This standard must be incorporated in any new broadband policies. Access for all is a critical component of a connected society. Networks reach their full potential only when we are all connected.

But beyond just deployment to all, universal access must also incorporate usability. Broadband systems must be designed with all potential users in mind. The technology must be accessible by all Americans, regardless of location of residence, economic status or physical disabilities.

**2. A Fair and Open Regulatory Environment**

A fair regulatory environment reflecting a technology-neutral philosophy is crucial to deployment. Policies should foster investment in high capacity network services on terms of equality among all providers in the broadband market and respond quickly to the changes in technology and the organization of the industry. Broadband services must be allowed to flourish regardless of the platform. Cable, DSL, satellite, wireless and whatever other platforms may emerge must all be treated equally so that they can serve all Americans. True competition in broadband cannot occur until the regulatory policies are neutral.

Within this technology neutral framework, the existing principles of common carriage and interconnection must be maintained. Regardless of the platform, the systems must be open and able to interface with each other. The goal is a network of networks, with different technologies, service and content providers able to interconnect. This framework protects consumers by ensuring their access to the network and content providers by guaranteeing they are not blocked by the service providers. Consumer choice increases and costs decrease because all the systems will have to compete with each other on equal ground.

**3. Creation of Investment Incentives**

Deployment of broadband is costly. It will require hundreds of billions of dollars to create new networks and facilities and to upgrade old ones. Broadband deployment will gravitate towards areas with high return rates on investment, but it is the marginalized communities, where investment returns are less, that must be assisted. Incentives for investment in these areas must be created.

Tax credits are an option for helping broadband providers make the decision to invest. Several tax credit proposals have been introduced in Congress, particularly the Rockefeller-English version, that would provide a 10% tax credit on investment in current broadband technologies and a 20% tax credit for investment in next generation technology.

Incentives make economic sense. Stimulating investment can lead to greater economic activity, both in providing the services and the end users of the services increasing output. Additionally, as more users subscribe, prices for the services will be lower for consumers

**4. Removal of Regulatory Barriers**

Another impediment to deployment is regulatory barriers from a previous era. Video and voice regulations are still ruling the broadband world, even though broadband service does not conform to the properties of the video and voice worlds.

LATA boundaries constrain broadband transport. These arbitrary lines were drawn to foster long-distance competition as part of the breakup of the AT&T monopoly. They were not designed to regulate end-to-end data transmission. In the broadband world, where data travels around the world, LATA lines should not constrain transport in local areas. Removal of such barriers allows for capitalization of economies of scope and scale. More traffic on the network creates more opportunities for investment and lower prices for consumers.

Second, unbundling and below-cost pricing regulations only serve as disincentives. As stated previously, broadband networks are expensive to build. If a provider has to dismantle this network and sell it to competitors at below cost, there is little reason for the company to devote the enormous capital up front. And there are other examples of regulatory barriers in broadband, such as spectrum allocation and overlapping local provisions.

Section 706 of the 1996 Telecommunications Act empowers the FCC to use "price cap regulation, regulatory forebearance, measures that promote competition in the local telecommunications market, and other regulating methods that remove barriers to infrastructure investment." Market incentives will drive network investment,

supplemented by public policy interventions to provide an infrastructure that that creates a competitive market, with safeguards built in for market failures and protection for consumer interests.

**5. Facilities Based Competition**

True broadband competition must be facilities-based. Without strong competition among and within the different platforms, innovation will be lacking. Different technologies can push each other, developing more advanced and comprehensive services. From this innovation we can gain expertise on the many potential uses of fiber technology and how best to deploy it to the home. Beyond innovation, facilities-based competition offers more opportunities for consumers. Reselling services and dismantling networks neither automatically decreases prices for consumers nor provides more choices. True competition comes from companies with full service operations that can offer various service packages that address individual needs and desires. Facilities-based competition will bring advanced services to more Americans as competitors seek venues where they can build facilities that will succeed. Finally, facilities-based competition provides for network reliability. After the events of September 11$^{th}$, it is necessary to have overlapping facilities to maintain service in the event of disaster.

**6. Aggregation of Demand**

Often in underserved communities, the lack of broadband deployment stems from economic factors that deter companies from entering the local market. There is an insufficient subscriber base and the company will likely not return profits on their investment. Communities can overcome this problem by aggregating demand. Bringing together neighborhood institutions such as colleges, libraries, hospitals, school districts, community centers and local government, a community can offer itself as an attractive partner for corporate investment.

By joining together, these institutions increase their economic power. If one of the institutions sought access to broadband, it might not reach the necessary level of economic demand. But multiple institutions united, through which future demand can be created, offer economic incentives for companies to enter the market.

Policies can encourage aggregation of demand as a solution to slow deployment. Governments can act as facilitator, uniting the various community institutions in stronger networks and facilitating dealings with the service providers and giving them more economic incentives to invest. It has already been shown as an effective alternative. The E-rate program for wiring schools and libraries serves as an example of demand aggregation. Many school districts and public libraries would be unable to afford Internet access. With government help and the fostering of relationships with the private sector, thousands of schools and libraries are now online.

Demand aggregation stands as one of the few viable policy options that can bring deployment to underserved areas. Marginalized communities will continue to experience delays until they are able to create the economic environment needed to attract deployment and investment.

**7. Support for Federal Demonstration Projects**

The federal government must continue to support grants and other programs that assist community projects engaged in bringing technology to local areas. Federal initiatives such as the Technology Opportunities Program (TOP) grants, the Community Technology Centers (CTC) and the E-rate all devote federal funds to local communities. This is necessary for both the deployment of the technology and the development of lasting interest. Many of the programs profiled in this document were dependent on federal grants. TOP grantees, CTC's and wired schools and libraries encourage members of their communities to become involved with the technology and learn how they can benefit from it. Once people are exposed to the possibilities, they desire greater access. This will spur demand, particularly in currently underserved areas.

**8. Deployment Timelines**

Timelines for deployment of advanced services to all Americans should be established. Congress is considering a proposal that would ensure deployment of DSL to all central offices or equivalents within five years. The state of Iowa has set the goal of bringing advanced services to all Iowa residents by 2005 through a combination of public and private endeavors that will increase demand for the services. One national goal should be set, with rules that would ensure every consumer will have access to some form of broadband service (cable, phone, satellite, wireless or other technology), at 200 kbps (the speed the Federal Communications Commission cites as "broadband'), within a fixed time frame. Such a goal will require close scrutiny of the market and public policies to determine if deployment is making progress. Policymakers, industries and consumers will then be better able to ascertain if the market is working or if policies need review and revision. But we should be even more ambitious, setting a national goal for next generation advanced services to follow within another set time frame.

Utilizing these principles in the formation of broadband policy will take more than incremental changes in the existing framework. It will take firm commitment to advanced universal service and a dedication to fastest possible broadband deployment. Congress, the Federal Communications Commission and the Administration must all engage in constructive policy building endeavors. The time for inquiries and questions has passed. The time for action and resolve is now.

## CONCLUSION

### A Promise To Keep

The Alliance for Public technology is committed to universal deployment of broadband services and the widespread use of this technology to improve quality of life for all Americans. Section 706 sets universal deployment to all Americans as a goal. Now is the time to keep that promise.

The potential for broadband use is enormous. The case studies in this document demonstrate how this technology has a tremendous and growing impact on people on a daily basis. It is not just speculation anymore. Advanced services *can* deliver better health care, expanded educational opportunities, enhance community and economic development and provide the other services discussed. There are many practitioners who are developing more programs like these. But they need broadband capacity and so do the communities they seek to serve.

Policy intervention is needed. Without assistance, broadband deployment will continue to stagnate, costs for services will remain high and millions of Americans will be deprived of the opportunity to use advanced services. The rhetoric about the importance of broadband is loud. But the necessary action is not following this call.

APT has presented the case for broadband. It is about bandwidth and getting the tools in peoples' hands, so that they can access the many applications. It will help people live healthy and safe lives, it will empower marginalized communities, and it will enable lifelong learning. We offer this vision as the rationale for dedicated action to bring broadband to every single American.

Advanced services can enhance lives. If we do not keep the promise of Section 706 and advanced universal service, then we will all be left behind.

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