Broadband Revolution

By: Harold Peterson, P.E.

Thanks to the Internet, the word "connection" has taken on an entirely new definition. People and communities everywhere are demanding fast, easy access to information, shopping, and even long-lost friends. Broadband is essential today to staying connected and up to date with the latest information. To keep up with demand, the electronics and telecommunications industry has made giant leaps in data handling and processing speed and is providing them at more affordable costs, thereby fueling new applications for everyday business and personal use and new ways to communicate.

But why is broadband so important? Applications such as streaming video and new computer input/output technologies that operate 20 times faster than current USB systems require increasingly more bandwidth. Social media influences everything in our lives, from how we live to political revolutions. News travels worldwide instantaneously, 24/7. Videoconferencing with high-definition video and surround sound is standard at most Fortune 500 companies. Medical test results, patient records, and research are sent around the world to make lifesaving decisions. The world today requires us to be connected and capable of electronically sending and receiving massive amounts of data, so we all must have fast, reliable Internet service.

Until recently, high-speed data connections were available only in urban areas, where the cost of high-speed broadband could be spread across large numbers of subscribers. People in sparsely populated areas were left with the limitations of Digital Subscriber Line (DSL) technology (if available), old dial-up systems, or satellite technology (if they could afford it). Wireless carriers now provide wireless Internet access, but it is expensive and has limited coverage.

The American Recovery and Reinvestment Act (ARRA) provided the Department of Commerce's National Telecommunications and Information Administration (NTIA) and the US Department of Agriculture's Rural Utilities Service (RUS) with $7.2 billion dollars to expand access to broadband services in the United States. Grants for extending service to the population of rural areas with failing economies are the highest priority. These areas have limited Internet access and if provided, are typically substandard and unreliable. Organizations in Washington State alone received almost $300 million in grant money. Washington will use much of this money to develop high-speed, fiber optic–based broadband for health clinics, libraries, and other public and institutional facilities, and to establish a backbone broadband system for rural areas — an effort that contributes to President Obama's commitment to ensure that 98% of the U.S. population can connect to high-speed Internet within the next five years.

PACE's experience in telecommunication infrastructure development, underground utilities, and cutting-edge Geographical Information System (GIS) mapping has entrenched us in this communication revolution. PACE has been selected to assist with three grant-funded projects to construct approximately 2,000 miles of fiber optic cable throughout Washington. Two of the projects connect dozens of small and underserved cities in Washington, collectively known as the "middle mile," to the larger nationwide network. The third project is a fiber-to-the-premises project that will bring high-speed, low-cost broadband service to approximately 5,000 homes and businesses in northeast Washington.

PACE's involvement in the projects began with environmental assessment in compliance with the National Environmental Policy Act (NEPA) and the State Environmental Policy Act (SEPA). The GIS and mapping element included critical integration of data

from more than twenty Federal/State agencies. Field survey and construction staking, led to permitting and design drawings for the entire 2,000 miles.

Survey, staking, permitting, design, utility franchise documents, construction management and mapping for these projects involved more than 20 counties, 50 cities, and almost 1,000 stream and river crossings. These three grant-funded projects are among the largest permitting undertakings in state history. The work involves close coordination with federal and state agencies, tribes, counties, cities, special purpose districts, railroads, utility companies, and private land owners. These projects are the first to be coordinated with the Governor's Office of Regulatory Assistance under the newly developed Statewide Multi-Agency Permitting process aimed at streamlining permitting and coordination by inviting multiple agencies to work together and share information.

Many people know it is important to be connected but don't understand how it works. The following paragraphs provide a brief overview of what broadband is and why we all need it.

What is broadband?

"Broadband" refers to broadband Internet access, which the FCC defined in 2010 as a high-speed data connection system providing a transmission rate of at least a 4 megabits per second (4,000,000 bps). The higher the data connection rate, the more information can be transmitted over a fixed period of time. The fiber optic cable being installed as part of these federal grants is capable of transmission rates of more than 100 megabits per second, and some areas of the country are looking into 1-gigabit broadband systems. For comparison's sake, consider that a typical dial-up system provides a transmission rate of 56 kilobits per second (56,000 bps), and a high-quality DSL service or cable Internet service provides a transmission rate of 12 to 20 megabits per second.

What is fiber optic cable?

Fiber optic cable is a thin, transparent cable that acts as a pipeline to transmit light waves. It provides a significant advantage over other transmission media because it carries more data over longer distances and with less signal loss. Fiber optic cable generally is made of silica or fluoride glass compounds, which provide the low indices of refraction crucial to achieving high-speed transmission rates. The fiber core's thin, glass-type coating allows it to trap light waves. Individual coated cables usually receive an additional resin coating and are then bundled together and sheathed to protect the fibers and permit ease of handling.

Data from computers, telephones, video, and other sources are converted from digital electronic signals to light waves that can be transmitted over the cable. Because different light wavelengths and frequencies can be used, the cable carries multiple signals in both directions (sender to receiver and receiver to sender) simultaneously. At the receiving end, the light waves are converted back to digital signals for transmission to the user.

What does this mean to me?

Whether you are a municipality, a developer, or an owner of a business or industrial complex, a fiber optic cable system can produce significant benefits. Because the data transmission rates for fiber optic cable are primarily a function of the electronic equipment at each end of the cable, the system can grow to meet your or your customers' needs without having to replace most or all of your previous investment. The fiber optic backbone system will be scalable as you add new facilities (for example, wells, fire stations, manufacturing equipment, new phone systems, and videoconferencing), allowing you to handle the increased load.

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