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PROPOSAL

For

FEASIBILITY STUDY FOR A COMMUNITY NETWORK

TOWN OF JAMESTOWN, RHODE ISLAND

Presented by

Sertex Broadband Solutions
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Plainfield, CT 06374

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1. Executive Summary

Sertex is pleased to provide our proposal to determine the feasibility of implementing a Community owned Broadband Network for the town of Jamestown that will serve all Municipal residents, businesses, government, and emergency service providers.

We offer a wide range of services developed specifically to assist municipalities with the complex task of deploying a community wide fiber optic broadband network. We can help your community by starting with our ***Sertex Connect Survey Tool*** that enables municipal leaders get the information they need from residents to make informed decisions about taking the next step in FTTX deployment.

Our broadband and feasibility analysis provide a high-level design complete with a bill of materials and estimated network costs. The design includes all network cabling, aerial and underground construction costs, electronics, transport and operational costs. This information is then used for price modeling to demonstrate the viability of the project, perform a take rate analysis, and determine the best financing options to fund the project.

When the project is approved, Sertex planning and design services will now create your final FTTX design, complete with construction prints and a final bill of materials. Sertex construction crews will then complete the installation and certify the network. Our network operations group will then take over when it's time to start connecting subscribers to the network.

We appreciate the opportunity to provide our qualifications for your project. We look forward to working with the Town on a solution to deliver broadband services to all residents. Our team is prepared to discuss the solutions presented and what will best serve the needs of your Town.

In the last four years alone, we have constructed over 1,500 miles of last mile FTTX network and connected over 20,000 customers in 17 communities. Let us help make your community next on our list!

Respectfully,

Michael A. Solitro
President,
Sertex Broadband Solutions

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Our Vision for Broadband

Cable TV and phone companies alike realize that their current product model is rapidly changing. "Triple play" and other bundled services are giving way to pay as you go services delivered via the Internet. These trends will continue to drive the demand for high-speed broadband across our country.

Cities and towns are also experiencing this growing need for increased broadband speeds as demands in education and government are increasingly dependent on its ability to access the power of the Internet. Our educational institutions are adopting instruction via iPads, Laptops and other connected technologies. Municipalities are adopting new technologies to better serve their citizens. These advances will only continue to drive the demand for bandwidth in the coming years.

The construction of Middle Mile Networks across the country, funded by the Broadband Technology Opportunity Program Grant (BTOP) has essentially moved the access point closer than ever to the municipal user. Many communities now have an Internet access point within their borders. They no longer need to rely on the conventional telecommunications providers to bring the connection to them. Instead, municipalities have the unique opportunity to bring their community to the service providers and competitively purchase the services that will be the most beneficial to them. By creating a Last Mile Broadband Network communities can take control of access to their market.

Sertex has developed a program to assist municipalities with the planning and implementation of a state-of-the-art last mile fiber network within your community. We will meet with your staff and help you develop a conceptual plan for your network, then provide full design and engineering services to properly locate and license your facilities within the Right of Way. The network is then constructed with top quality Corning components, and factory warrantied for the next 25 years.

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Mission Statement

Sertex is committed to continually employing the latest technology and striving for customer satisfaction with every project. We consistently complete work on time and to exacting specifications, exceeding customer expectations for performance and service.

Sertex team members are trained to provide value to our customers and strictly adhere to design and installation requirements. We are committed to supporting a skilled, competent work force, focused on safety, efficiency, and productivity.

Sertex is committed to delivering the highest quality work in the safest and most efficient manner.

- FCC Registration #0025008160
- SPIN / Form 498 ID #143048464

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2. Scope of Services

Sertex Municipal Fiber Optics Solution

With our involvement in the Open Cape Middle Mile project, and the opportunities these BTOP funded projects created, we realized there was a growing need for more municipalities to have alternatives to incumbent provided Internet services. BTOP essentially made network ownership and delivery more financially viable for communities that would never have been able to afford this option before. That guided us to develop a specific program for municipal broadband network deployment. We offer a full turnkey solution, from concept to completion, that can simplify the process and is a viable alternative to services provided by commercial, for profit companies. With over 33 years of experience in the telecommunications and fiber optics industry, we share our expertise to help our municipal customers meet their growing bandwidth demands today and for the future.

SertexConnect Community Interest Survey

Public support of a municipal fiber network is essential. SertexConnect is a tool for communities to begin registering interest and engaging grassroots champions. This online survey tool can help municipalities gather data take-rates, in support of funding and grant opportunities. Sertex's marketing team provides communications support from prelaunch to completion.

Feasibility Analysis

Combining custom design tools and GIS data, Sertex can provide a high-level design and budgetary analysis of a broadband network servicing all town residents, businesses, government and emergency service providers. Analysis will include bill of materials, construction pricing, operational expenses as well as a financial proforma that considers take rate levels. This information will assist towns in determining funding options and assessing grant opportunities.

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Planning and Design

Sertex planning and design services combine information from feasibility analysis, current and future growth plans, and budgetary goals. High level designs are refined incorporating actual aerial and underground pathways, architecture, spare capacity, and future needs like Smart City and public Wifi applications. Sertex supplies construction drawings, splice diagrams and bill of materials to begin the procurement process.

Permitting/Make Ready

Sertex handles the submittal and tracking of all pole licensing and Right-of-Way acquisition applications for the client. We ensure that the process moves as efficiently as possible to keep the project on schedule. Our engineers will assist the client with utility negotiations interaction with State, Federal and other licensing entities.

Public Relations and Communications

Building a fiber-to-the-home network is exciting and groundbreaking for communities. It also is a complex process that requires careful planning and coordination over many months. Timely and effective communication with residents and businesses is essential for a successful project.

Sertex's public relations and marketing team develops custom public relations and outreach programs that will represent the interest and objectives of the client and effectively communicate with residents throughout network construction process and into network operations. Our professional marketing and communications team will develop and deliver resources for public relations, graphic design, media planning, digital marketing, and website development.

We develop a custom website for the municipalities that serves as the customer portal for the Town/City-Wide Broadband project. Community members can get facts and updates about the project, download information about fiber drops, and find answers to frequently asked questions.

Our team provides community outreach communications that will encourage residents to visit the website and learn more about the project. Construction updates are published regularly to keep residents apprised about the latest activities, project status, and progress. Information about subscribing for broadband Internet and phone service, streaming resources, and other information will be added to the website as the network goes live.

- Custom website development, content, maintenance

- Social media oversight, content, and response
- Media relations
- Developing relationships with local officials, broadband advocates, and influencers
- Outreach and promotion
- Events publicity to celebrate milestone achievements (materials arrive, construction groundbreaking, first house lit, 1,000th customer, etc.)
- Crisis communications planning
- Weekly construction planning meetings to construction updates.

Construction

The best design is only as good as the quality of the construction that turns it into a "built to last", functioning network. We ensure the quality of our work by having our own crews perform and supervise all construction activities. Our personnel have extensive training and industry certifications that provide the level of expertise needed to ensure your network is built to the design we created.

Sertex crews are experts in both aerial and underground installations. Aerial placement includes strand with cable lash and All Dielectric Self Support (ADSS) cable methods of installation. Underground construction environments include rural, suburban, and inner city, with methods ranging from open trench, plowing, boring, and micro trenching.

Corning Network Preferred Installer **(NPI)**

Sertex is a *Corning Network Preferred Installer,* adding value to our customers by assuring that our technicians are knowledgeable and among the most qualified in the industry. Unlike traditional installer programs, the LANscape® Network of Preferred Installers (NPI) enables installers to tap into an extended ecosystem of beneficial connections. Our ground-breaking network-style program offers a complete tip-to-tip solution by offering Corning's innovative product lines, leveraging valuable relationships throughout the fiber optic industry, and presenting a ***25-year LANscape Solutions extended warranty*** to our municipal customers.

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Testing

Sertex provides all testing and certifications of the optical network and will perform all fiber testing if ensure network performance requirements. Customers are provided with a complete set of test results as well as all warranty information at the completion of the project.

Network Operations

As your network operator, Sertex and our ISP partner manage the day-to-day network operations. This includes new customer drop installations and connections, regular maintenance, upgrades, troubleshooting, and all residential billing and collections. We are available 24/7/365 for emergency response and repairs.

Sertex has built a backend work order system that specifically addresses the needs of our *Municipal FTTX customers*. The system is fully integrated with all levels of the Sertex operational structure, including scheduling, delivery, tracking, and documentation. When coupled with the custom-built website that we provide on the front end of your project, you now have a powerful tool to manage construction through to operational needs.

Using the custom website that we developed for the municipality residents are able to get facts and updates about the project, download information about fiber drops, and find answers to frequently asked questions. It also includes details about subscribing for broadband Internet and phone service, streaming resources and other information as the network goes live.

The website is also fully integrated with our customer relationship and work order system that provides real time access to information on all work orders completed, customer information, and all performance criteria for completed installations. Our technicians document all test data, terminal and equipment IDs, drawings and pictures of completed customer installations complete with customer approval signatures, customer premise equipment serial numbers and IP addressing information. Easy access to this information ensures that Sertex is able to efficiently operate and maintain the network. You can view a sample of one of our live custom websites at www.broadbandbi.com

In addition, our customer service and technician departments are there for ongoing support of your residents, efficiently managing signup and installation needs.

- Technicians are fully trained and certified on FTTH installations.
- Background and criminal offender record information (CORI) check on all technicians
- State of the art devices for complete electronic data entry in the field
- Technician receives work orders daily from our customer service department.
- Installation is documented directly from the field into the Mobile System.

- Includes all documentation. Pictures, Speed Test, PON Level Readings, customer signatures
- Real Time Information enables us to react quickly to schedule changes.
- More efficient use of cancellations and rescheduling
- Additional work requested by the homeowner can be documented and verified.

3. Project Team

Sertex was formed in 1999 at the height of the telecommunications expansion of the 1990's, realizing that the need for both energy and telecommunications infrastructure would be critical to the U.S. economy in the future. The name Sertex itself was derived from the latin word sertus, meaning bound together, as we have seen these two industries are interwoven by the same new technologies.

Since our formation the company has assisted our clients with a diverse array of projects, not only in telecommunications, but also including wind, solar, and wireless facilities. We now see our one of our greatest challenges as the need to leverage our experience and expertise to assist municipalities. To help them position their community for growth and also manage their energy resources more efficiently in the future. We see Broadband as the way to accomplish this. Not only through providing access to broadband for all citizens but enabling the community itself to manage its energy through smart grid initiatives that can be accomplished through a carefully designed broadband network.

We are committed to providing high quality services that effectively support the installation of high bandwidth systems today and in the future. Sertex has remained on the leading edge of technology while continuously developing and maintaining a highly skilled work force that continues to grow with an industry that has changed dramatically over the last two decades.

Since 2016, Sertex has been working with multiple service providers and towns in Western Massachusetts to construct, maintain, and provide customer installations for municipally owned fiber to the home (FTTH) networks. To date we have built over 1,500 miles of fiber optic cable plant and connected over 20,000 customers in 17 communities. Our installation technicians have worked with a variety of manufacturers including Adtran, Calix, and Nokia when connecting them to the service provider.

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Pike Telcom

Sertex has worked with Pike over the last 20 years on past projects such as the Open Cape BTOP Middle Mile Network and the American Tower NE Distributed Antenna System (DAS) in Rhode Island and Southeastern Massachusetts. Because of the success we have had on these projects we have formed a strategic alliance with them to address the unique needs of municipalities. Their extensive experience with Right of Way acquisition and licensing with major utilities across the United States makes them the ideal partner to ensure that network deployment is fast and efficient.

Pike has extensive experience providing a wide array of engineering, planning, construction, mapping, and project management services. They have been in business since 1969 helping customers build and maintain critical communications infrastructure to meet the industry's growing demand for bandwidth and network reliability.

Over the years, they have supported numerous communications, cable, and cellular providers such as AT&T, Verizon, CenturyLink (Qwest), Windstream, American Tower, Crown Castle, Comcast, DukeNet, Fibertech, Extenet Systems, Lightower Networks, CapeNet, and Fairpoint Communications, among others.

They have been supporting Verizon's FIOS program since its inception in 2004 and have successfully engineered and designed thousands of miles of fiber optic cable directly past 3+ million homes in the Mid-Atlantic and Northeast regions. In addition to the FIOS contract, they hold several other Verizon "business-as-usual" engineering and records maintenance contracts, authorizing them to provide a host of engineering services on behalf of Verizon including pole survey, make-ready analysis, and make-ready negotiation.

In 2011 Pike earned the opportunity to provide engineering, planning, & design services to the Open Cape network, a BTOP funded middle mile project. This project encompassed over 400 miles of ADSS fiber-optic infrastructure, bringing reliable, redundant broadband capacity to a vastly underserved region of Cape Cod, MA. This $41 million project will support Cape Cod's economic development by helping local businesses increase revenue, manage costs, attract skillful employees, and enhance their competitive edge both regionally and on a national level.

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4. References

Block Island Broadband

In July of 2020 Sertex was awarded the contract to design, build, and operate a Fiber to the Home Broadband network for the town of New Shoreham, Rhode Island. Internet and phone services will be provided by our ISP partner, Greenfield, Massachusetts based, Crocker Communications.

The network is being constructed to serve 1,800 homes on the island. It consists of 41 miles of backbone construction and 62 miles of new underground service drops. The project officially started in October of 2020 with design on track to be complete late 2022. All pole license applications have been submitted to the Block Island Power Company and Verizon for make ready assessments. Construction crews are currently working on underground service conduit drops to residences as we wait for pole line make ready to be completed.

Sertex developed a custom website for the town that serves as the customer portal for Block Island Broadband. Residents can get facts and updates about the project, download information about fiber drops, and find answers to frequently asked questions. Outreach communications encouraged residents to visit the website to register their properties and learn about the project. Construction updates are published regularly to keep island residents apprised about the latest activities, project status, and progress. Information about subscribing for broadband Internet and phone service, streaming resources, and other information will be added to the website as the network goes live.

The website is fully integrated with Sertex's work order system and CRM. Our work order system provides real-time access to all work orders completed, customer information, and all performance criteria for completed installations, including speed test data, PON level reading, terminal and equipment IDs, drawings and pictures of completed customer installations with customer approval signatures, ONT Serial Number, ONU MAC Number, FSAN numbers and VOIP information. Easy access to this information ensures that Sertex will be able to efficiently operate and maintain the network.

Learn more at www.broadbandbi.com

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Shutesbury MLP Installation Contract for FTTP Services

Sertex was awarded the contract to install all fiber optic drops to the premises in Shutesbury, MA. The work was performed in partnership with the ISP provider, Crocker Communications.

Sertex utilized its customized Service Work Order system on this project that interfaced with the ISP customer database and provided the Town with information on every installation.

Our system captured all the required information requested by Shutesbury MLP and Crocker Communications. Shutesbury MLP had the ability to access real-time information about work orders completed, important customer information, track how many installs are being performed, and review all performance criteria after each install.

Crocker Communications also had access all the ISP data required, installation date, technician, ONT Serial Number, ONU MAC Number, and FSAN # necessary to provision the equipment. VOIP information is also provided for porting phone numbers, along with interior wiring information.

- Sertex Customer Service scheduled over 850 Residential Installs. Included multiple calls emails to customers from ISP database, collecting credit card deposits, scheduling the installation dates/times to coincide with technician and customer availability.

- Installation and provisioning of the ONT & Router, customer education, speed test performance was all documented on Sertex Work Order System.

- Over 100 new underground conduit installations from the MST to the customer NID. Work included customer consultation to determine the best route for installation, approvals, utility locating, red-line drawings/as-builts.

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Otis Municipal Light Plant – Telecommunications Cable Installation – FTTH Drop Installs

Sertex was awarded the contract for cable installation and FTTH drops. This $1.6M project included approximately 80 miles of FTTH network across the entire town:

- furnishing and installing all pole hardware and steel messenger
- installation of all fiber optic distribution cable, MST's
- completion of all fiber splicing and EXFO certification of the fiber plant.

This project was divided into 10 separate Fiber Service Areas (FSA) and constructed over a 24-month period as utility pole make ready was completed and attachment licenses received. Sertex preformed all drop installations to approximately 1,500 residences and businesses across the town.

Under separate contract with the community of Otis Woodlands within the town of Otis and Sandisfield, Sertex designed and constructed a 6.2-mile underground fiber network, complete with underground drops, to serve the 248 residences in this private community. Construction was completed during September through November of 2020. Residence installations were completed between March and December 2021.

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Peter Geller (978) 621-3249
Otis Woodlands Club Inc.
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Alford Municipal Light Plant - FTTH Drop Install Project

Sertex was awarded a contract in 2018 with Alford Link for custom installation of all residential drops in the Town of Alford, MA. This contract included over 20 miles of aerial install/lashing of the Fiber Drop Cable to steel strand/distribution network, and over 10 miles of FTTH Drops in customer owned existing conduits, both with/without existing telecom lines.

This project also included over 3 miles of new underground micro duct installed using vibratory plow, trenching, and boring on customer property.

There were over 280 residences that our technicians connected to the town network. Work included installation of the NID on residence, penetration into the basement/1st floor, wall-fishing of all cables inside the premises, installing wall plates, provisioning of ONT and Wi-Fi routers, customer education on use of new equipment, and full documentation of before/after speeds through work order system. We also provide optional installations of VOIP's if required.

Jim Hall (413)717-1406
jhall@townofalford.org

Westfield Whip City FTTH Project

Sertex was awarded a 3-year contract with Whip City Fiber for custom installation of all residential drops in the City of Westfield, MA. We installed over 4,000 aerial and underground residential and commercial FTTH installations, with over 15 miles of new underground conduit.

Our technicians are fully trained and certified in FTTH installations, we also perform full background and CORI checks on all of our residential installers. Our technicians provided a full-service install, including aerial/underground fiber from MST to the residence, installation of the NID on residence, hole penetration into the basement/1st floor, wall-fishing of all cables inside the premises, installing wall plates, provisioning of ONT and Wi-Fi routers, customer education on use of new equipment, and full documentation of before/after speeds through our work order system. We provide optional installations of Antennas and VOIP's if required. Sertex provided customer service and dispatching through the work order platform.

Sertex FTTH installation technicians receive over 95% in customer satisfaction Westfield's third-party survey outreach program.

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In addition, Sertex was also contracts for this project for installation of over 20 miles of new underground construction, installing Duraline Microduct and air-blown installation of Microfiber Cable.

Sertex was also awarded the Fiber Ring Backbone multi-year contract, installing approximately 50 miles of Aerial and Underground high count ribbon fiber cables, and performed all fiber splicing and EXFO fiber certifications. The value of work performed was over $ 5,000,000.

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Broadband Technologies Opportunities Program – Open Cape Project

Sertex was contracted as the Construction manager for this $41 million, 400-mile ADSS fiber optic network project, connecting 76 municipal and cell tower sites in Southeastern Massachusetts. The project also included a Microwave Radio overlay providing additional capabilities and a connection to Martha's Vineyard.

This project included negotiations for a 20-year IRU contract with AT&T on behalf of Open Cape to provide backhaul services and connect 59 Cell Towers to the Middle-Mile Backbone. In 2016 Sertex constructed 30 miles of lateral cable plant, connecting the Cell Site locations for the AT&T Eastern Massachusetts Backhaul Project.

In 2020, Sertex engineered and constructed an FTTX pilot project in downtown Falmouth to serve business and residential customers. We are currently working with Open Cape to on expansion of that pilot within the town of Falmouth and other communities on Cape Cod.

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Capital Region Council of Governments – Master Service Contract

Sertex has been providing fiber optic network design and installation services under this contract since 2014. We have helped dozens of Connecticut communities construct their own private fiber optic networks to connect schools, libraries, public safety and other communities anchor institutions to the Connecticut Educational Network (CEN). We have also worked directly with CEN to provide other connections throughout the State.

We are currently completing a 12-mile Community Anchor Institution network in Plainville and working with the City of Hartford on their City-Wide Public WiFi project.

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Town of Sharon – Broadband Infrastructure Feasibility Analysis

The town of Sharon, Connecticut contracted with Sertex to develop a feasibility analysis for an open-access Fiber-to-the-Premise (FTTP) broadband network servicing all town residents, businesses, government and emergency service providers. The town is a sparely populated rural area with approximately 1,700 homes over 116 miles of road.

Sertex is providing a high-level FTTP design including electronics, a Bill of Materials, and construction pricing. Other deliverables on the project include projected monthly operational expenses, development of a financial proforma that considers take rate levels, and to assist and support the town funding presentations.

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5. Project Pricing

5.1 High Level FTTH Design and Financial Analysis:

Provide a high level design using city/town provided GIS and road data to include:

- Desk top feasibility study of aerial and underground OSP fiber pathway for proposed FTTH
- Determine High Level F1 feeder routes with boundaries / size proposed fiber counts
- Determine FSA Boundaries
- Create KMZ file with feeder route boundaries, FSA boundaries, estimated BOM
- Bill of Material with cost estimates
- Network and Electronics design with product specifications and costs
- Recommended Product Specifications
- Identify Aerial vs Underground Mileage
- Construction Cost Estimates both Aerial and Underground
- Provide estimated Make Ready Cost - Licensing and Construction
- Estimated Engineering and Permitting Cost
- Estimated Cost to Connect Homes
- Estimated Operating and Maintenance Cost
- Financial Pro-Forma and Take Rate Analysis
- Assist in preparing presentations for Town of Sharon Connect Task Force
- Develop recommendations for operations and infrastructure maintenance
- Assist with and support town grant applications

Total Cost: $ 14,000

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5.2 Sertex Connect Survey Tool

City / Town Home Count	Setup Charge	Monthly Fee
Less than 5,000 homes	$1,400	$ 400

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APPENDICES

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Preparing for the Broadband Future:
Understanding the Need for Speed

The passage of the historic infrastructure bill means a tidal wave of new funding that will transform the digital landscape. Crucial deployment decisions to bring broadband to unserved and underserved areas will be left to local governments. Municipal leaders can seize the opportunity to build for tomorrow's needs by recognizing the technology limitations behind current ISP service delivery and anticipating future bandwidth demands.

By Michael A. Solitro
msolitro@sertexllc.com

Broadband access allows us to survive in an increasingly connected world. Today's average user needs 100/50Mbps for adequate home monitoring, video conferencing, surfing, streaming, and gaming on multiple devices. The federal government recently redefined the minimum standard for broadband, dropping the 25/3Mbps standard for the latest 100/20Mbps threshold. But this new standard still doesn't come close to meeting even moderate real-world needs anticipated within the decade.

We're quickly moving from a past defined in megabits to a future of gigabit-plus connectivity. A recent report by the Fiber Broadband Association pushes for minimum symmetrical 100Mbps bandwidth to meet the requirements of emerging applications. Network speeds need to increase faster than demand to ensure that the U.S. remains a global internet leader in the real world and the centralized virtual worlds called Metaverse and Omniverse.

As demands evolve, bandwidth, latency, and reliability of network infrastructure become most critical. Of all available broadband technologies, wireline fiber optic networks offer the highest reliability, low latency, and greatest bandwidth potential measured in petabits.

Wireline fiber optic networks offer the highest reliability, low latency, and greatest bandwidth potential measured in petabits.

Industry analysts project the need for 2G symmetrical download and upload speeds by 2030, with 10G in the not-so-distant future, thresholds only fiber can deliver today. Durable fiber is the technology of the backbone and Middle Mile and offers a seamless Last Mile transition. The only limitation for fiber's bandwidth is the electronic equipment on either end, a variable that is easy and inexpensive to upgrade as technology advances.

Understanding Bandwidth Limitations

Often divided into asymmetrical download and upload speeds, bandwidth represents the maximum current capacity of an internet connection, measured as the volume of information transferred over time. Higher bandwidths deliver reliable online experiences without buffering, unstable audio or video, slow website loading, or timed-out connections.

Internet data flows through many tiers of network connections, from the fiber-based high-speed trunk lines of the backbone and Middle Mile to the Last Mile – controlled by ISPs with various technologies from DSL and cable to satellite and fiber. By design, the backbone and Middle Mile offer the highest bandwidth, with Last Mile connections offering the lowest bandwidth and the highest potential for organic bottlenecks. These bottlenecks, which are commonplace on cable and DSL networks where electrical limitations slow the signal, are unlikely on fiber networks.

Several factors can limit bandwidth on a broadband network. The first consideration is the medium delivering the signal, including fiber optic cable, satellite, wireless, DSL, and coaxial cable *(see Fixed Broadband Technologies sidebar)*. Poor service also can be linked to organic causes like dated, sluggish transmission technologies, network bottlenecks, or intentional activities by ISP providers. For-profit telecom companies are known to intentionally slow traffic and constrict bandwidth through throttling and unethical oversubscription.

- **Throttling** happens when an ISP intentionally limits connection speed, slowing data transfer dramatically. ISPs often throttle to regulate network traffic, control bandwidth congestion, and enforce data limits. Throttling gets questionable when ISPs use it to influence users' internet habits or increase their own profitability. Internet connections that involve shared bandwidth among local users – like cable internet, for example – are especially susceptible to congestion-related throttling. Cable internet providers sometimes throttle a specific area during times of heavy use. Throttling balances all connections so that specific customers don't use more network bandwidth.

> For-profit cable companies are notorius for pushing the limits of *reasonableness* to increase profits.

- **Oversubscription** is how all ISPs share bandwidth and only becomes a concern when end-user service is negatively affected. Problematic oversubscription manifests as slow connections and service that's disrupted or unreliable with buffering, unstable audio/video, slow website loading, and timed-out connections. Every ISP dedicates a percentage of total bandwidth demand to each node or PON in its network, delivering "best-effort" service to customers. The ISP understands that all customers don't use their entire subscribed bandwidth concurrently, so reasonable, well-managed oversubscription is an excellent way of delivering the bandwidth needed for all users.

  However, for-profit cable companies are notorious for pushing the limits of reasonableness to increase profits. These ISPs connect too many customers to service on a single node or PON, knowing – and not truly caring – that service will suffer. At low usage times, customers typically won't notice oversubscription; however, during peak usage times – or in a pandemic when everyone is home all the time – oversubscription becomes painfully apparent.

  On an ethically-managed fiber network, even when several users demand 1G each in short bursts, this congestion goes virtually undetected due to the extremely brief time it takes to complete the transaction at high speeds. An ethical ISP running a well-managed network will monitor the performance of each subscriber and PON and adjust service to ensure the bandwidth users are buying is reasonably achieved. Think of bandwidth

and oversubscription as traffic flow on an Interstate highway. If the road is adequately designed, traffic moves along with no issues at the speed limit or even above. When too many cars enter the limited road space – or too many users are included in the same node or PON – traffic slows because too many vehicles (subscribers) are using the same section of highway.

Today, oversubscription is particularly challenging related to upload bandwidth. Demand from people working, learning, and accessing entertainment (particularly augmented and virtual reality) at home can easily overwhelm available bandwidth. The symmetrical download/upload speeds provided by fiber and its potential bandwidth solve this problem and keep up with future demand as metaverse and omniverse applications grow.

Ensuring a Gig Speed Future

We're now in a national battle – spurred by colossal government investment – to deliver universal, equitable, high speed broadband access to every household and business. New networks need to be built to ensure digital equity in unserved and underserved communities and neighborhoods.

The challenge in delivering reliable broadband, especially in rural and remote areas, is the build-out costs. When small populations are spread across large geographic areas, hundreds of miles of network infrastructure must be built to serve smaller numbers of users. Profit-driven private telecoms have historically neglected rural/remote and low-income areas, even when these areas are in close proximity to a Middle Mile fiber backbone.

The lure of new government funding has prompted incumbent providers to renew promises to expand networks in underserved areas. However, their commitment to shareholders outweighs their public interest. If a project runs out of money halfway through, construction/improvement will end before access is universal and equitable, leaving communities on the wrong side of the digital divide.

Broadband access will remain inequitable as long as private telecom providers have control and choose densely populated/high-income areas for network build-outs while neglecting low density, low income, or remote areas.

So how can communities get better quality, lower rates, and universal access?

A recent study showed that open access municipally-owned networks routinely provide faster, cheaper, higher quality service than for-profit, monopoly ISPs. Pricing for municipal broadband service is also more transparent, more consistent, and less confusing. Revenues generated by local networks stay in the local community, and local ownership grants control over the network to the people who live and work there.

In addition to significant ROI benefits for communities, new scoring considerations under the USDA ReConnect broadband grant program actually call out local governments, non-profits, and cooperatives as preferred grantees.

> Publicly owned municipal fiber networks are investments that give local governments control of broadband infrastructure.

Becoming Shovel-Ready

For communities interested in exploring municipally-owned broadband, the clock is ticking to access federal funding. The first installment of ARP funds has already been paid out to communities, with a **December 2024** deadline to obligate the money to specific projects. Meanwhile, Federal infrastructure funding is waiting in the wings to be awarded to those state and local governments with broadband deployment plans in place.

For those committed to using government resources to make long-term, high-impact investments in broadband infrastructure, here are the steps towns can take to light up with fiber broadband.

1. Survey your community's current broadband landscape
2. Research the pros & cons of municipal broadband ownership
3. Perform a broadband infrastructure cost analysis
4. Determine the take rate required to run a break-even or profitable network
5. Gather subscription interest

As an expert in planning, designing, building, and operating municipally-owned fiber networks, Sertex can help you gather the information you need to be shovel-ready. And once you're ready to move forward, Sertex is ready to be your partner. We're a regional expert and have decades of experience building open-access fiber broadband networks to deliver reliable, affordable high-speed internet service to every home and business in communities throughout the Northeast.

Fixed Broadband Technologies: What's Future Proof?

A **high speed broadband** Internet connection is always on and transmits data, voice, and video across long distances at high speeds using various possible technologies. With ever-increasing bandwidth needs expected to hit 2G by 2030 and anticipated continued exponential growth, which technologies can handle America's long-term needs? **Here's a breakdown:**

Wireless: Wireless broadband provides internet connectivity over a wide area using a network of towers to transmit data, and antennas at regular intervals to access signals. A modem connects the user to the network. 4G is significantly slower than most wired connections. 5G offers high bandwidth outdoors in urban areas but can't yet effectively penetrate buildings and trees.

Coaxial Cable: Coaxial cable delivers download speeds up to 500Mbps, but upload speeds are much lower, maxing out at about 30Mbps. Cable connections are shared with multiple customers in the same area, which means throttling occurs during peak hours, and bandwidth is insufficient for future high speed demands.

Satellite: Relying on radio waves to communicate with satellites orbiting the Earth, a satellite connection isn't reliable for fast-paced communications but is sufficient for emailing, browsing, and other low-data activities. Starlink, the 100Mb satellite Internet delivery system launched by SpaceX, is a cost-effective solution for truly rural areas of the world but will never deliver the gigabit service that land-based fiber provides.

Digital Subscriber Line (DSL): A DSL modem connects a standard phone jack to the internet, and speeds usually cap out around 25 to 100 Mbps. Upload speeds are much lower.

Fiber Optic: Fiber is future-proof and scalable. The capacity of a single strand of fiber is thousands of times the capacity of any other wired medium. Without amplification, signals carry for miles with minimal signal loss, and fiber will not corrode on exposure to weather and other environmental conditions. This means lower maintenance costs and a useful lifetime of decades, a huge economic advantage.

We're Here to Help

Trust Sertex Broadband as a partner to help your town connect, serve, educate, and grow.

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Municipal Light and Power Manager, Town of Blanford, MA

"Sertex built our town's municipal fiber to the home network, involving approximately 80 miles of fiber with installations to more than 1,000 subscribers. I cannot imagine a project of this magnitude running more smoothly."

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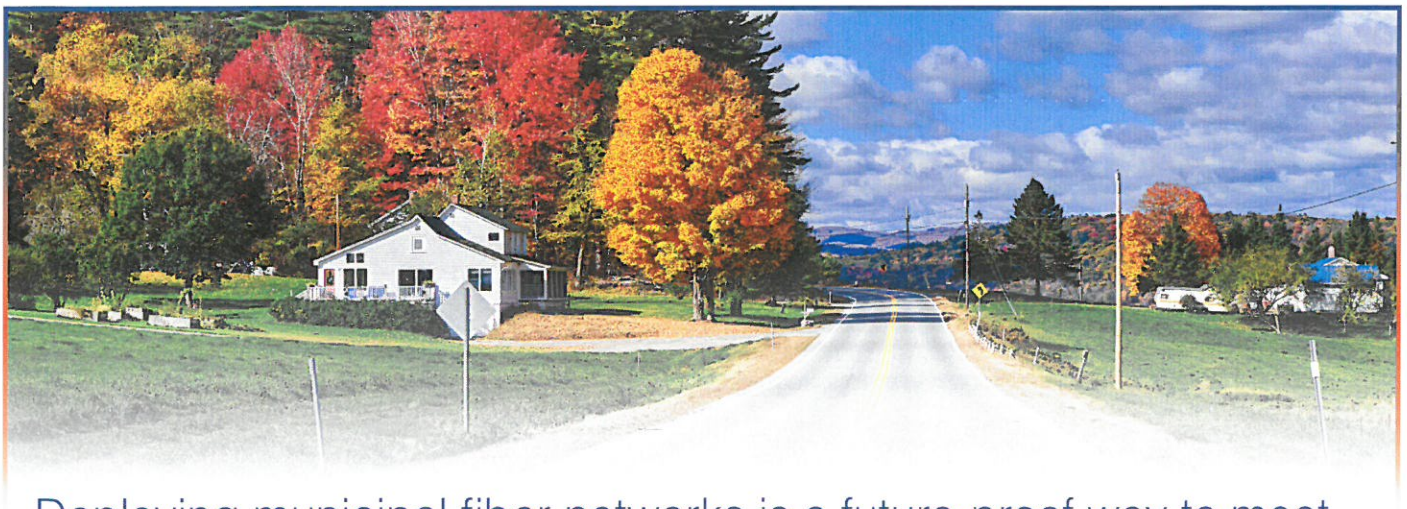
Publicly Owned Fiber Networks:

Communities Take Control of Infrastructure and Boost Economies

Tired of waiting for telecom giants to deliver promised high-speed internet services, small towns and cities in the Northeast are building last-mile fiber networks to deliver affordable, reliable, broadband access to all.

Michael A. Solitro
msolitro@sertexllc.com

This article first appeared in *Broadband Communities*, March/April 2021.



Deploying municipal fiber networks is a future-proof way to meet the long-term communication needs of homes, businesses, anchor institutions, and government agencies. Investing in publicly-owned fiber networks opens the door for growth.

High-speed internet is now the heart of our economy. According to the U.S. Bureau of Economic Analysis, the digital economy is growing nearly three times as fast as the overall economy, at about 10 percent per year.

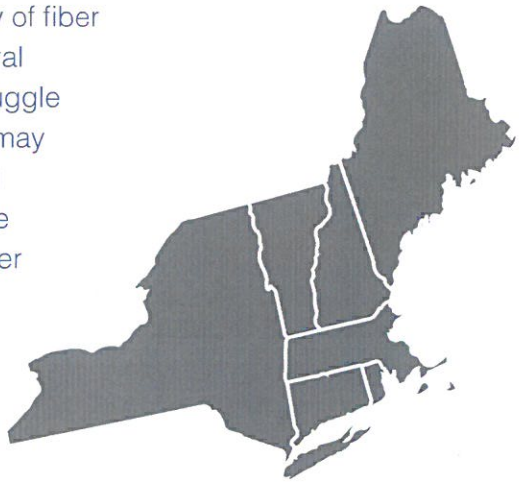
Today, a 100/50 Mbps connection will adequately allow videoconferencing, surfing, streaming and gaming with multiple devices. Projections anticipate two gigabit upload and download speed requirements by 2030. Yet most of non-metropolitan America still limps along without a wired connection capable of meeting the FCC's minimum 25 Mbps suggested speed. Without adequate broadband services, rural areas can't participate in one of the fastest growing sectors of the economy.

Fiber is a future-proof technology that can easily meet the communications needs of homes, businesses, community anchor institutions and government agencies for decades.

Cable companies claim to offer rates up to a gigabit per second, but these connections can be shared by hundreds of users. When many users access their connection at the same time, the true rate per home can be as low as 4 Mbps. Cable was designed for asymmetric data speeds with higher downstream and lower upstream rates. With 45 million people working from home in the pandemic, this often-oversubscribed data transmission system has proven to be weak and inadequate.

Enter fiber broadband. Fiber is a future-proof technology that can easily meet the communications needs of homes, businesses, community anchor institutions and government agencies for decades. The capacity of a single strand of fiber optic cable is thousands of times the capacity of any other wired medium. Without amplification, signals carry for miles with minimal signal loss, and fiber will not corrode on exposure to weather and other environmental conditions. This means lower maintenance costs and a useful lifetime of decades – a huge economic advantage.

But only a third of U.S. homes have access to the speed and reliability of fiber optic networks. Even in the densely populated Northeast, where several states are nearly 100 percent connected, many in small towns still struggle with DSL and underperforming, expensive cable connections. Cable may soon get even more costly in areas where true high-speed broadband is available. This year, Comcast is planning to begin charging its home internet customers in the Northeast and other areas for data usage over 1.2TB per month. And their competitors can't be far behind.



Recognizing broadband as an essential utility like roads and electricity, and tired of waiting for telecommunications giants to deliver promised high-speed internet services, a growing number of rural towns in the Northeast are taking back control by building publicly owned last-mile fiber broadband networks in their communities.

With gigabit fiber networks, these remote communities can compete digitally with big cities and affluent suburbs. By building affordable, publicly owned FTTX networks, municipalities can take control of their telecommunications infrastructure and open the doors for growth.

Public-Private Collaborations Give Communities Control

The challenge in bringing reliable broadband to rural areas is the buildout costs. When small populations are spread across large geographic areas, hundreds of miles of network infrastructure must be built, often through remote and rugged terrain. Infrastructure installation is expensive, and telecommunications giants are unwilling to invest in sparsely populated areas with limited opportunity for profit.

> A public-private partnership between a local government and private providers can leverage a municipality's ability to finance capital projects at low long-term interest rates.

To ensure affordability, a public-private partnership between a local government and private providers can leverage a municipality's ability to finance capital projects at low long-term interest rates. For taxpayers, access to public bonding means the cost for a publicly owned fiber network can be extremely affordable. By owning the networks, communities manage expensive – and often uncontrolled – ISP relationships and create infrastructure that pays for itself. Additionally, using the network to deliver advanced services can even generate revenue.

In a public/private scenario, towns have a low-risk way to chart their broadband future. Municipalities finance the fiber infrastructure and manage rights of way – things governments are familiar with doing. The community's financial investment is limited to network buildout and excludes the service side.

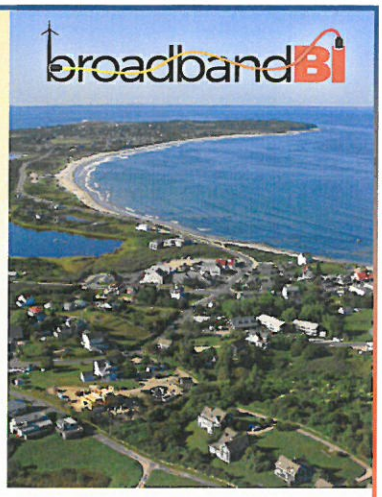
The private entity builds the infrastructure, maintains the fiber and equipment, and runs the business and operational end of the network. It handles sales and marketing, customer service, technology updates, and customer demands – functions private entities do well. For their investment, private network operators and ISP partners benefit by quickly accessing new markets without building infrastructure at their own expense.

Just as a municipality would fund any infrastructure investment, local governments can access capital markets and use grants or low-cost public financing methods, including municipal or revenue bonds to fund network development. No private entity has access to funding with similar rates and terms.

In **New Shoreham, Rhode Island**, located 12 miles offshore on isolated Block Island, residents and businesses have been struggling for years with underperforming satellite and DSL service. A tourist community with just 1,000 year-round residents and a seasonal population of up to 20,000, New Shoreham recently committed to building an $8 million FTTX network that will provide gigabit high-speed internet along with phone service to every home and business on the island.

The town is creating this network in partnership with Sertex Broadband Solutions, a provider of fiber optic infrastructure deployment services to unserved and underserved areas. The municipality will own all passive and active electronic elements of the island network including conduit, underground and aerial fiber cabling, and drops to about 1,700 properties. Sertex will engineer, furnish and install all conduit, cabling, drops and the necessary electronics to deliver the service. Once the network is operating, Sertex and the network's ISP will handle operations, maintenance, and customer service.

The public/private model gives local governments choice and influence over broadband decision-making. More reliable, more responsive, more affordable networks replace existing, achingly slow, monopoly-controlled services.



The backbone network and drops are the largest capital cost for the project. The town has committed to installing all the drops while crews are on-site during the construction process. This commitment is financially efficient and will help promote market penetration. Once a network is operational, the typical cost to run an aerial service drop to a suburban home is approximately $700 with an added $370 for electronics, which totals $1,070 for an installation just 250 feet from the right of way. (Drops in remote areas and underground installations come at a much higher price.)

By running drops to every premises during network construction, New Shoreham is picking up the installation costs for individual customers, an investment that should incentivize any hesitant property owners to join the network. The town is financing the island-wide buildout using 2 percent municipal bonds with 40-year terms. The town will recover many of the network's costs for construction, maintenance and operations through subscriber fees, which, combined, are less than the price residents are currently paying for poor internet and phone service.

By financing only fiber cabling and conduit, the town can secure loans with 40-year terms. If it tried to finance cabling and electronics, terms would be far shorter because of the limited lifespan of the equipment.

The public/private model gives local governments choice and influence over broadband decision-making. More reliable, more responsive, more affordable networks replace existing, achingly slow, monopoly-controlled services.

Empowering Rural Economies

Reliable, high-speed internet access delivered by municipally owned fiber networks improves the productivity of existing businesses, allows telecommuting, creates new jobs, and attracts new businesses to remote communities. It incentivizes younger people to stay in a community, draws new residents, encourages tourism, and strengthens real estate markets.

High-speed communications networks can also promote social good and human services by simplifying access to health care, enhancing public safety services, improving schools, enhancing the offerings of libraries, and allowing remote enrollment in higher education and participation in the arts. Because these networks are locally owned and operated, the millions of dollars in savings they generate can be reinvested in the local economy.

Over the past four years, as many as 23 small towns in the Berkshire region of western Massachusetts have chosen to construct more than 1,600 miles of FTTX networks that to date have connected some 17,000 rural customers to gigabit-speed internet service. These communities and many others throughout the country are experiencing:

- **Improved real estate values:** When people look for communities to move into, the presence and speed of internet connectivity is an important factor. Research by the FTTH Council Americas found that having a fiber broadband connection increased property values by 3.1 percent, and that private properties with 1 Gbps connections are selling for an average of 7 percent more than those with 25 Mbps or lower.
- **Residential growth:** FTTX availability attracts people looking to move from urban areas and keeps existing residents in town, increasing the community's tax base. Often newcomers are young families who use local schools and support local businesses and institutions. The presence of a gigabit fiber network can be the reason people choose one community over another.
- **Business growth:** High-speed internet access allows local businesses to expand, invest and seek new opportunities by connecting them regionally, nationally and globally. Some connected towns are even recruiting corporations to relocate or add facilities in their communities.
- **Job creation:** As existing businesses grow and new businesses are created thanks to FTTX access, new jobs are created. Many fields are now knowledge-based rather than location-based, and employees can choose to live anywhere that has a reliable high-speed connection for videoconferencing and accessing information.
- **Health care benefits:** FTTX networks provide greater access to health care without traveling long distances. Telemedicine can improve health outcomes for people inclined to delay medical visits if they must travel to see a doctor. Communities with healthier populations enjoy stronger local economies because the economic burden of health care costs is reduced. And communities with younger populations naturally have lower health care demands.
- **New income sources:** There are a few ways FTTX networks can generate revenue. For example, in a tourist location such as Block Island, the town could set up a commercial Wi-Fi network that all visitors can access for free. Local businesses can advertise on the network, and the town can collect some or all the advertising revenues. Private, subscription-based Wi-Fi networks in hotels, marinas and other closed communities could also be a source of new income.

> FTTX networks can literally transform both the character and the economic status of stagnant rural communities. With public-private models, the cost of entry is no longer a barrier, and doing nothing is no longer an option.

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Plainville officials have hired Sertex to install fiber-optic cabling in all four corners of the town, to connect municipal buildings: town departments, library, schools, public safety services and wastewater treatment facilities.

Plainfield's Sertex sees future in high-speed, fiber-optic Internet

By JAN TORMAY
Special to the Times

Since the beginning of the pandemic last year when adults and children were working and learning from home, Sertex Broadband Solutions of Plainfield has been inundated with requests from town and city officials requesting high-level designs and cost analysis studies for high-speed, fiber-optic cable installations.

"They're all evaluating whether they should build their own network and then hire us to operate that network," Sertex President and Chief Executive Officer Michael A. Solitro said during a telephone interview.

That's because families were all trying to use the Internet at the same time and were having trouble connecting to email, Zoom and other video-teleconferencing software programs, as well as streaming movies and online video-gaming sites.

Because entertainment was connected to people's perception of the Internet, it was considered a luxury, said Solitro, whose facility is located in the Plainfield Industrial Park. "Now it is a necessity. And last year really drove that point home."

"We're kind of moving towards a new era in business, communication and entertainment," Plainville Town Manager Robert Lee said during a telephone interview.

Plainville officials have hired Sertex to install fiber-optic cabling on utility poles in all four corners of the town, to connect municipal buildings: town departments, library, schools, public safety services and wastewater treatment facilities.

"Basically, it's going to provide a backbone for the possibility of expanding it to all of the homes in town," Lee said.

Sertex has already installed CAIs in more than 40 other Connecticut communities, including Pomfret, Glastonbury, Tolland, South Windsor, Bristol and Ansonia, Solitro said.

Even though Comcast is already using fiber-optic cable, GoNetspeed is installing it and Frontier plans to establish it, Lee said "they don't provide service to 100 percent of the people in Plainville."

If residents vote to have a municipally owned system, he said the town would control pricing, the operation and upgrades, "rather than rely on a private company to do that. And we think that would provide some better operation from our standpoint."

After conversations with Sertex staff, Lee said, "We also think that it's an economic development tool. Our businesses could buy it from these other entities, but we think that we

SEE PAGE 11

PHOTO COURTESY OF LAUREL PEPIN

Since the pandemic began, Plainfield-based Sertex Broadband Solutions Chief Executive Officer Michael A. Solitro has been inundated with requests from town and city officials throughout the Northeast requesting high-level designs and cost analysis studies for high-speed, fiber-optic cable installations. Internet speed has never been more important as multiple family members use the technology.

Sertex sees business zooming

FROM PAGE 1

can do it at higher speeds and lower costs."

Currently, he said they're doing a survey to see if it's worth pursuing. "Sertex has given us a cost of somewhere around $13 to $14 million to service the entire town. They've estimated that if 40 percent of the people connected to this at $90 a month — that would make the numbers work. The survey is intended to see if we can reach anywhere near that 40-percent-or-higher threshold."

Lee said the town council is expected to hear a presentation from Sertex in December about how a municipally owned system would operate, be funded and paid for. If there is enough interest in the future, he said the project would require a bond and residents would vote on it.

Solitro emphasizes the many benefits of a high-speed, fiber-optic network, which can be installed in the ground or on telephone poles: symmetrical upload and download speeds, unlimited streaming, gaming, conferencing, Internet surfing, consistent signal strength for more devices, lower cost service and operation, as well as ease of working and learning from home and no data caps.

Late last year, Comcast announced in Massachusetts that it's implementing data caps in certain markets, Solitro said. He predicts that trend will spread to all markets and that the other commercial service providers will follow.

These days, high-speed internet connection is as important as "running water and electricity," said Dr. Peter Geller, president of the board of directors for Otis Wood Lands Club with 220 homes in Otis and Sandisfield in the Berkshire mountains in western Massachusetts.

After years of research by former past board presidents Steven Grossman and Doug MacMillan and a five-member broadband committee that began in 2017, Geller gave a two-plus-hour Zoom presentation on funding fiber connection with Sertex in March 2020 to the community.

"At that time (because of the pandemic), people understood it because they couldn't come here reliably and work and have homeschooling for their kids, because of the tenuous Internet connection problems here."

Prior to installation, Internet connectivity was "spotty," said Geller during a telephone conversation. Some people could access the Internet via Verizon DSL, satellite company, or by using cell phones as "hotspots."

Because Otis Wood Lands Club is a private community, it contracted with Sertex in 2020 to construct a fiber broadband network, which would connect them to the Otis network for service. It was completed this summer and already 90 percent of the homes have opted to sign up for service.

Installing broadband was "a wonderful investment," Geller said. He added the board was told by Realtors two years prior to COVID that the 30-plus houses would not have sold if they did not have high-speed Internet in their community, "because everywhere else around here either has it or is in the process of getting it."

"Sertex was wonderful to work with," and saved them money, he said, adding they made "a very difficult process" easy for them. Geller said they took time to go through the plans and educated them about the equipment and what they were doing.

Education makes up about 75 to 80 percent of most community budgets, Solitro said. "That's a big number, but yet they're willing to spend $80 million to $100 million to build a physical school that nobody went to last year, nobody was allowed into. And the Internet became the replacement for that, and remote learning, and Zoom. So that's why I say there's a shift here. And so now you've got to start thinking of this differently. You need to go and be able to look out of the box."

Solitro said the high-speed, broadband network Sertex installs is "really never going to be dated." People could start out with one gigabit and change to 10, 40 or 100 gigabits in the future.

"So that's why there's no real bandwidth limitations on this fiber cable. It only represents a few one-hundred-thousand dollars' worth of replacement money. So you can run on what you're going to put in today for we figure seven to 10 years before what they call a technology refresh." When an equipment change is needed, he said, "I don't have to change any of the cable plant or anything outside. I have to change nothing but a few electronic boxes in the head end and at the house."

Sertex Broadband Solutions (a subsidiary of Sertex) is located in the Plainfield Industrial Park at 22 Center Parkway. For more information, go to www.sertexllc.com or call (860) 317-1006.

WHO WILL BE HELPED WHEN INFRASTRUCTURE DOLLARS ARE IN HAND?

Sertex will assist communities with information they will need to apply for much-anticipated federal infrastructure grants to establish, improve or expand fiber-optic broadband service, President and Chief Executive Officer Michael A. Solitro said.

"But you've got to meet a certain threshold. You have to be a rural community and either not have Internet, or have a speed of Internet that's less than the acceptable federal standard, which is a relatively low bar. Your bigger communities typically don't have that unless they have a demographic as such that it's considered not necessarily under-served, but doesn't have the ability to pay for the service. So they might be able to get some federal dollars, but it might be from a different pot than for the rural broadband."

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NOTE: Pricing shown is for communities with less than 5,000 homes. Pricing for communities with more than 5,000 homes is provided in section 5.2 of this proposal.