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High-speed internet is as vital as electricity and water. In 2000, just 1 percent of urban and suburban Americans had broadband internet at home, according to the Pew Research Center. Today, it's in the homes of more than 70 percent of people living in urban, suburban, and rural communities. Despite the significant increase, about 24 million people lack home access, and even more can't afford it, limiting job and educational opportunities and making it more difficult to maintain connections to family and friends. The reality is that broadband internet has become essential to quality of life.

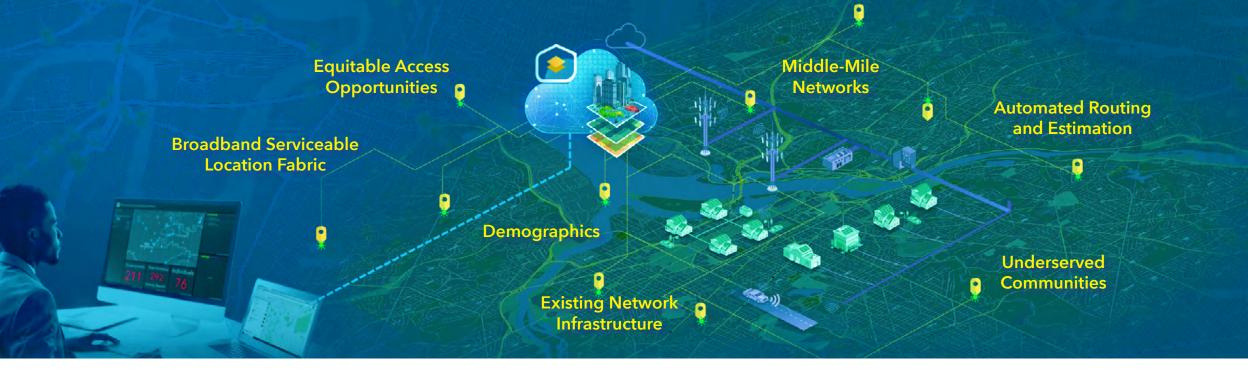
**Executive Summary** 

The Infrastructure Investment and Jobs Act (IIJA), signed into law in 2021, earmarks \$65 billion for broadband that's reliable, affordable, and equitable. Communication service providers and communities now have the chance to bridge the digital divide by building modern networks that support communication, education, telehealth, remote access to work, and entertainment—especially for underserved and disadvantaged communities.

This remarkable legislative push to modernize America will start with a map: one that shows leaders where current coverage exists and where it must be extended to fill gaps in unserved and underserved communities. And that's just the beginning.

Building and managing a broadband network requires a tremendous amount of location data and an acute awareness of physical terrain to situate infrastructure where it reaches furthest, with the least amount of material and digging. A geographic information system (GIS) excels at providing that location intelligence as well as incorporating demographic and socioeconomic characteristics and tracking workflows.

The technology is uniquely suited to help all stakeholders work together at closing the digital divide.



### **How GIS Bridges the Digital Divide**

State and local governments have long used GIS to analyze all types of data in the context of geography. That location-based analysis, using smart maps to layer information about natural and human-made systems, steers decision-making about infrastructure expansion. Maps reveal patterns and relationships, showing what is happening *where*. The GIS work includes creating virtual simulations known as digital twins to provide near real-time awareness of operations, monitor project progress, and detect changing conditions.

As is the case when upgrading any critical infrastructure, the information essential to equitable and efficient broadband expansion revolves around *where*. For example, where is service lacking relative to where people are living, where is existing fiber, and where should new fiber go. All the essential considerations are spatial in nature, making GIS ideal for filling in gaps. The technology also provides a common operating picture to organize and manage the work while providing transparency on progress.

In each phase of broadband expansion, spatial analysis plays a role.

- Governments and internet service providers (ISPs) work together to analyze demographics and broadband needs in a community, determining where an expansion needs to occur.
- Unifying real-time maps of existing network assets with data on potential customers and markets can also help in profitability analysis and risk assessments.
- ISPs analyze the terrain, drive times, labor availability, and other variables. Having geographic context guides planning for network routes that avoid hazards from adjacent utilities.
- Project managers collaborate and communicate with state and federal agencies, using GIS to track build-out progress.
- Digital maps of the existing and planned network guide field crews,
   contractors, sales teams, customer service staff, and executives.

Esri® ArcGIS® solutions provide the necessary data, mapping, field apps, analytics, and reporting capabilities for local governments and internet service providers. With these GIS capabilities, both regulators and ISPs can proactively address a community's broadband needs, effectively partner with federal agencies to fund equitable expansion, and ultimately secure broadband access for all.

# Collaboration and the Infinite Loop between Government Broadband Offices and Internet Service Providers

The issue of bridging the digital divide involves three fundamental problems—access, affordability, and adoption. While the government aims to address all three, the meeting point for governments and ISPs centers on the problem of access.

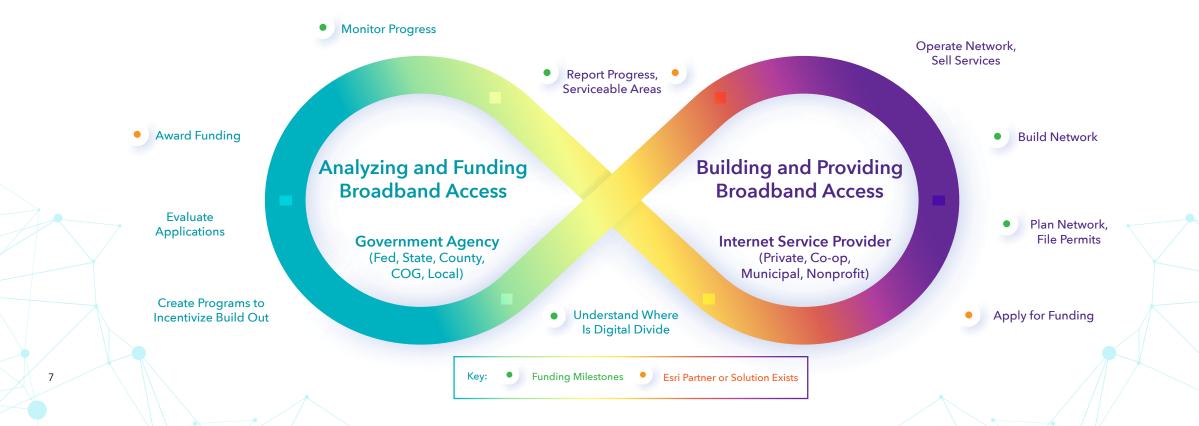
The lack of a physical wire or wireless signal requires a collaborative effort to first understand where gaps exist and who will be served by new infrastructure and then balance the expense with the market opportunity.

Access, at the most basic level, is a geography question, and GIS is used by both ISPs and governments. Government agencies (e.g., cities, counties, states, and tribes) use GIS to examine the intersection of networks and people, with the aim of providing access to everyone. ISPs use GIS to build networks, looking at distances and obstructions and performing cost justifications by determining how many potential customers are along the route.

Most of the gaps exist where ISPs have determined that the location doesn't meet their profitability model. And that's where billions of federal money from the IIJA will go. One way to think about how both parties tackle the problem of the digital divide with geography is the following graphic of an infinity loop. On the left is the role of government to use GIS to see where the network is needed, put projects out to bid, evaluate applications, award funding, and then monitor progress. On the right, ISPs have a role in revealing where coverage doesn't exist, planning the construction and estimating costs,

deciding if the incentive is enough, applying for contracts to fill gaps where it meets their business model, building the network, obtaining customers, and reporting on progress.

GIS is uniquely poised to meet the needs of both parties, enhance overall efficiency, and visualize progress on the map to provide complete transparency. With GIS, governments and ISPs can communicate geographically.



Government agencies and ISPs use GIS to make data-driven decisions, and both need GIS to meet reporting requirements associated with funding awards. As federally funded projects progress, government agencies will need to track and report on spending. They will also have to illustrate progress on coverage expansion and enhanced network performance. In turn, ISPs will need to report on ongoing improvements to ensure compliance with funding programs.

Both ISPs and government agencies have a role in providing transparency to the public, especially related to equitable access. The work of relating who is served is done in coordination. Governments supply the data and mapping related to community needs and infrastructure. ISPs bring expertise in building, marketing, and managing networks.

With GIS, communities and ISPs can measure, evaluate, report, and analyze network performance improvements while providing greater service to internet users.



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Government concerns are many. Government is responsible for financial stewardship, ensuring broadband for all with a focus on underserved communities, providing internet to fuel economic mobility, and gathering data to accurately identify all service gaps.

With federal government leadership and dollars, state and local governments have an opportunity to deliver new levels of service and change their roles from overseeing industry to enabling it.

Across the nation, state and tribal broadband offices are on a hiring kick to oversee and invest the historic federal investment in broadband

expansion. These offices need GIS specialists to map the gaps, analyze equity, and put systems in place to track progress.

According to analysis by the Pew Charitable Trusts, GIS and data management teams with dedicated staff have long been core components of state broadband programs. But these positions are becoming a priority as states verify and supplement the federal broadband map, which is based on provider-submitted data and has historically overrepresented the availability and quality of service.

Clearly, governments have a new mapcentric role to play, ensuring accurate understanding of where internet is available and where it is lacking. They also have to ensure that unserved and underserved communities receive affordable, reliable, high-speed broadband internet service.



All the pieces of information essential for equitable and efficient broadband expansion are spatial in nature, making GIS the ideal platform for creating this common operating picture.

A map can unify community data—such as demographics, rights-of-way, and public utility asset records—with information from collaborators—such as network and coverage data, building information models (BIM), and real-time service feeds—for a single source of truth that keeps public and private sector partners aligned.

An enterprise-wide GIS gives state broadband offices a secure, scalable experience for sharing more data inside and outside their organization.

Members of the public can use maps to view their own community and see where and how local projects are making a difference.

Regulators can see at a glance where networks have grown to fill gaps.

Governments and collaborators can locate patterns in substandard performance to address service issues quickly—ultimately following through on providing consistent, equitable service that remains relevant and effective over time.

### CASE STUDY

### Appalachian Ohio's Desire for Equitable Broadband Leads to Innovation

**SITUATION:** With funding for broadband infrastructure available through multiple federal programs, a coalition of local government councils and business leaders in Ohio wanted an accurate assessment of existing networks and potential for growth. The coalition, known as **Connecting Appalachia**, considered broadband a linchpin for a prosperous future.



Those living in Appalachian Ohio have a lower per capita income than the rest of the state, and the average poverty rate of 16.4 percent is higher than the rest of the country, according to the Appalachian Regional Commission. A little more than 82 percent of Appalachian households have access to a computer device, compared with a national average of about 87 percent, the commission reported in 2019. Large areas of Ohio do not have high-speed internet. Many of the underserved areas are rural, but this digital divide can also impact urban locales.



High-speed internet is not only the access point for important information and services but also a significant driver of economic growth. Our research suggests that many Appalachian residents and communities could be at a disadvantage, today and in the future, as the result of this digital divide.

–Kelvin Pollard, Senior Demographer,Population Reference Bureau

**CHALLENGE:** Leaders needed to collect data directly from residents to gain a more accurate, authoritative, and complete picture of their state's broadband challenges and opportunities.

**SOLUTION:** GIS provided automation and data analysis to more accurately document internet speeds across 32 southern and eastern counties that make up Appalachian Ohio. First, the coalition used social media to invite Ohio residents to participate in a survey that determined internet speeds and each respondent's location. In addition to fact-checking service provider and Federal Communications Commission (FCC) data, a survey conducted from February 2020 through August 2021 increased public input across a larger area.

Organizers carried out the survey and compiled the results using ArcGIS Survey123 with Ookla Speedtest Intelligence data. Next, planners used GIS to create a color-coded digital map that shows internet speeds around the region.

**RESULT:** With GIS, the coalition identified nearly 800,000 households that lacked reliable broadband, compared to the FCC's estimate of 190,000 households. The coalition learned that 55 percent of households in populated areas access the internet at speeds less than 10 Mbps for downloads and 1 Mbps for uploads. The lowest speeds ranged from 0 to 9 Mbps; the highest were more than 100 Mbps. Appalachia, it turned out, was the state's least-connected region. The digital map of the existing broadband network and its gaps, along with other information collected, gave the coalition direction and authoritative data as it developed proposals for broadband network expansion. Survey data helped the coalition build strong proposals for state and federal funding that could create opportunities for hundreds of thousands of residents.

**CASE STUDY** 

### Inequities Exposed during the Pandemic Guide Broadband Policies in California County

**SITUATION:** The value of broadband connectivity became abundantly clear in Placer County, California, when many residents found themselves working from home or going to school online at the start of the COVID-19 pandemic. Those without adequate broadband service were at a distinct disadvantage, especially in rural communities.



**CHALLENGE:** Placer County allocated \$10 million of its \$78 million in American Rescue Plan Act (ARPA) grant funds to broadband improvement. While grant funding would go far in helping the county meet its broadband goals, leadership recognized that building out broadband infrastructure to cover more than 400,000 residents spread across 1,052 square miles of mountainous terrain would require careful and considerate planning. Specific data on broadband service quality was needed to better support the business community as well as provide internet access to students and employees working from home.



We have the tools in GIS for data collection and a broadband design framework. We see GIS as a vehicle to visualize things we need to know, like existing providers in the county and even community demographics.

–Phil Salter, GIS Manager,Placer County, California

**SOLUTION:** County planners took a geographic approach, employing GIS technology to better understand coverage, see gaps in service, and make a positive impact on vulnerable populations. Fortunately, GIS was already a mainstream technology in Placer County. GIS was already central to a special project for understanding and addressing homelessness, which gave the county a sense of where vulnerable people were located. The geospatial infrastructure in place could be turned toward planning and implementing broadband expansion.

The Placer County information systems team mapped existing provider networks with GIS. Planners launched a public survey using ArcGIS Survey123 to further identify communities with inadequate coverage and link survey responses to a location on the map.

GIS-based data visualization and analysis helped the county plan accurately. Leaders could see and understand the magnitude of the issues, know where those issues are, and determine an equitable distribution of service across rural districts.

**RESULT:** Placer County rolled out its 2021 Last Mile Broadband Grant program to provide resources to new and existing ISPs. The program encourages investment in broadband infrastructure that will support economic development, public safety, remote learning, telehealth services, and overall community prosperity. The county continues to seek new grant opportunities at the federal and state levels to further its broadband infrastructure improvements. GIS has been an essential part of this successful modernization strategy.



## Location Data Supports Accessibility, Affordability, and Adoption in Wisconsin

**SITUATION:** Gaps in broadband service kept underserved and unserved communities from excelling as the population shifted to working and learning from home during the COVID-19 pandemic. Yet, little was known about residents who were falling behind or factors that limited their opportunities to get connected.

CHALLENGE: Wisconsin governor Tony Evers was determined to make data-driven decisions in expanding broadband connectivity, with more than \$100 million in federal funding to fill in gaps. However, he and his team first needed more socioeconomic data for a holistic understanding of residents in each community and their access to and use of high-speed internet. For the state's expansion initiative priorities—accessibility, affordability, and adoption—location data had to be gathered first.



We knew we needed a tool that would allow us to pinpoint the exact communities that needed attention. We determined that ArcGIS Survey123 served as a reliable and user-friendly foundation that would allow us to accomplish this.

-Colter Sikora, GIS Lead, Public Service Commission of Wisconsin

The Public Service Commission of Wisconsin (PSC) set out to collect a range of data from Wisconsin's 5.8 million residents. Yet, many jurisdictions lacked the bandwidth and resources to stand up their own data collection and analysis systems. Some counties and communities had sporadically collected broadband surveys, but the data rarely reached PSC for analysis.

**SOLUTION:** To ensure that each jurisdiction could efficiently collect data, PSC planners used ArcGIS Survey123 to create a reproducible digital questionnaire. The survey made standardized reporting possible for the state's 72 counties.

Planners launched the Wisconsin Internet Self-Report (WISER) survey in February 2022. Through this effort, respondents answered questions

regarding their geographic locations; property details (whether at a home, business, or school); internet service quality; and their age, ethnicity, and status as a renter or homeowner. The survey also asked whether the respondent resided on a Native American reservation. Integrating socioeconomic data provided insights the PSC needed to make equity a priority.

**RESULT:** For the first time, planners captured firsthand data on individual households in the state and drew an accurate map of broadband service gaps in rural areas. The findings were captured in GIS data layers and added to public maps.

The highly visual and easily shareable map-based presentation of the data now guides planning for current and future broadband expansion projects. The survey is still active, allowing for reporting and analysis of changes to the network over time.



North Dakota Leads Rural Internet Speeds with a Collaborative Fiber Initiative

**SITUATION:** High-speed internet advancements in North Dakota were initially fueled by the Broadband Technology Opportunities Program (BTOP) in 2009 that aimed to stimulate the economy after the Great Recession. With BTOP funds, the state created a broadband program office to install hundreds of miles of high-speed fiber cable, connecting universities and creating a network of hubs that communities could

build on. The effort was fostered by rural cooperatives, with local providers becoming the predominate deliverers of internet service in the state. Like electric co-ops that brought electricity to rural areas when bigger companies deemed it unprofitable, internet co-ops have flourished in North Dakota. A co-op of co-ops, the Dakota Carrier Network was formed from 14 independent providers to connect middle- and last-mile networks and foster collaboration in the state.

**CHALLENGE:** The initial investment provided a backbone of fiber across the state, supported in part by the North Dakota Department of Transportation, to facilitate broadband installation in rights-of-way next to roadways. However, there were still North Dakotans who lacked basic internet access. The City of Fargo took on the last mile to homes in this urban area. Staff there required a solution to map and track the creation of the fiber-optic utility network.

**SOLUTION:** With the US Department of Agriculture's (USDA)

ReConnect Loan and Grant Program, additional cooperatives are getting funding to expand high-speed access in remaining pockets of the state. The City of Fargo installed cables, intersection by intersection, until the entire city was covered, resulting in more than 75 miles of fiber-optic cable. With ArcGIS, city staff was able to trace fiber-optic routes using a mobile phone or tablet, efficiently roll out service, and pinpoint any breaks.

**RESULT:** North Dakota achieved some of the best internet coverage in the country, even better than East Coast cities or West Coast tech hubs. According to the FCC, rural North Dakotans are more likely to have access to fiber broadband and gigabit speeds than urban residents in the state and most Americans. City of Fargo staff can now trace an individual fiber-optic strand from beginning to end over 75 miles, eliminating the time spent having to go back and forth from the office to the field. With GIS, Fargo staff achieved a greater level of convenience and efficiency—a rollout pattern that can be realized in other cooperatives across the state and the country.

### PERSPECTIVE:

### Telecommunications Companies and Internet Service Providers

Once the demand for broadband infrastructure is uncovered and visualized on a map, the need for location data hardly stops. The coordinated building out of a network, or expanding an existing one, requires a choreographed series of tasks by a distributed workforce of specialists. One missed or delayed step can disrupt the entire project, escalating costs. When public grants are involved, it's also critical to record what's happening and where.

That may seem like a purely operational issue, but when each task—be it building a tower or laying cable—is tied to a location tracked in a GIS, all stakeholders can see a project's progress as well as the status

of individual work orders. As a system of record, engagement, and insight, GIS is uniquely suited to help telecommunications companies understand where to expand or improve service. In addition to mapped data on internet use and speeds, the location of infrastructure can illustrate where affordability rather than access may be an issue.

GIS is also an operational intelligence tool that can take on all phases of the work—to bid, plan, design, construct, and operate equitable networks while meeting reporting obligations. Esri's ArcGIS consolidates essential but disparate data from architecture, engineering, and construction (AEC) and government collaborators (such as BIM, CAD, and right-of-way information) into a sophisticated common operating picture.



Mobile GIS tools and dashboards keep all workers on task and guide where they go. When a task is completed, the technology can trigger an automated alert for the next job to be finished. With spatial awareness of workers and projects, managers gain the ability to assess progress along the way and identify issues before they cause expensive delays. The work becomes an on-location assembly line of sorts, coordinating efforts in the interest of saving time and costs.

Accurate data on what gets built and where can also be crucial for maintenance and eventual network upgrades. With a clear view of where disruptions occur, telecoms can restore and improve service while building trust and transparency with customers and collaborators.

Ultimately, internet providers can use map-based reports to show their government counterparts exactly where projects are making a difference, who is benefiting, and what is changing for communities as a result of better broadband access.

### CASE STUDY

### Colorado Broadband Provider Quickly Mobilizes to Deliver Faster Speeds

**SITUATION:** In less than one year, a new ISP went from concept to reality, delivering broadband services to residents of **Loveland, Colorado**. Called Pulse, the city's new fiber utility had a goal to bring affordable and reliable high-speed internet to the 78,000 people living there.



**CHALLENGE:** To launch a new network, Pulse's leaders in the city of Loveland knew they would need engineering, analysis, maintenance, and customer support. They would also need to ensure that all involved in the deployment–including those working remotely on mobile devices—were able to share and collaborate in near real time. To support a startup broadband enterprise, the system also needed to be flexible and scalable.



There's quite a bit of moving parts and pieces, and using Esri technology allows all those pieces to stay in sync and stay relatively in tune with each other.

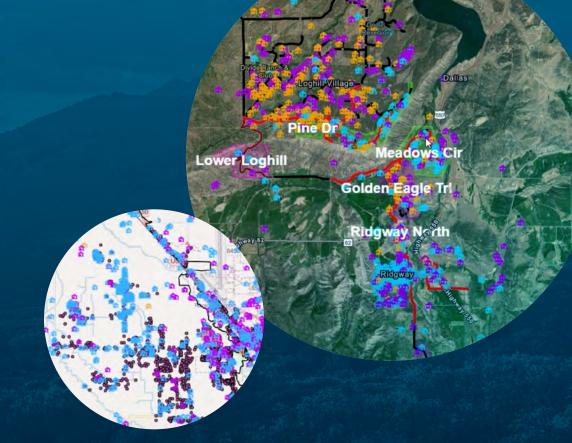
–Sarah Rose, Senior GIS Specialist,City of Loveland, Colorado

**SOLUTION:** Leaders in the city, an early adopter of location intelligence technology, turned to GIS. Using GIS as a foundation allowed Pulse to

- Facilitate fast and efficient data exchanges between different formats and platforms, as well as when working remotely on laptops, Android and iOS devices, Toughbook computers, and more.
- Power effective communication across administrative teams, field crews, planning and network engineers, and decision-makers.
- Share and maintain up-to-date data for crew safety and liability.

**RESULT:** Construction on the fiber-optic network began in November 2019, and by June 2020, the first customer was already connected. The ability for all teams to communicate in real time allowed the work to proceed quickly and efficiently.





### CASE STUDY

### Providing High-Speed Connections to Colorado's Western Slope

**SITUATION:** Two sister companies work together to serve mostly underserved communities across the Western Slope of Colorado, which includes such towns as Montrose, Telluride, Ouray, and Gunnison. Deeply Digital designs, constructs, and manages the fiber utility network, and Clearnetworx is the fiber internet service provider. During the COVID-19 pandemic, when reliable internet proved a necessity, demand grew astronomically as more people moved to the area.

**CHALLENGE:** Given the growing demand and the complexity of laying fiber through mountain passes and along stretches of remote highway, the two companies needed better visibility into their respective supply and demand. Clearnetworx wanted a way to better communicate where there was interest in high-speed internet, and Deeply Digital wanted a better handle on where to extend the network to meet that demand.

We now have a map that clearly shows what zones are ready for installations. This allows us to communicate clearly to our customers and sales teams on when they can expect installations to occur in each area. Now, we can place them on a schedule that we are confident in achieving.

–Jonathon Cook, Project Director,Clearnetworx and Deeply Digital

**SOLUTION:** The companies now have GIS apps and maps to conduct work in the field and track demand on a map. The map of demand and construction progress is accessible via a shared GIS dashboard. The tool provides a clear view of residential and commercial customers and shows where the network needs improvement. The customer service team maintains a shared map that includes data layers for the existing network, areas where service has been requested, and places where the network will expand next. Design team members can use GIS maps to gather conduits and fiber counts in a given area, determine how many homes they can serve with existing infrastructure, and calculate what added materials are needed to expand service.

**RESULT:** The shared GIS maps provide clear visualizations, connecting sales and customer service teams with upper management. In a shared environment, both companies can see progress as well as the places where they can improve their subscriber base or add more infrastructure. On the design side, laying out a recent network expansion to 6,000 homes took just two weeks when it would have taken two months. The GIS pulls existing network details and design tools together to speed up the work. The teams are now creating a network model, showing exactly what assets are where to improve future maintenance and design.

### CASE STUDY

### Midco Invests in Small-Town Expansion with Location Intelligence

**SITUATION:** Midco serves fiber internet to 490,000 homes and businesses in 400 communities across Kansas, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. Founded in 1931, the company has evolved from shared party line telephone connections to today's high-speed internet, transforming its business with the latest technology tools. It continues to expand delivery of internet service

to rural areas that previously had none. Often Midco collaborates with supportive local governments to deliver vital high-speed connectivity to small businesses, students, and those who work remotely.

**CHALLENGE:** Midco plans to nearly double its fiber network to 22,000 miles through its Fiber Forward initiative. This will pave the way for 10 gig speeds in some of the most remote regions of the country.

It's all about our customers and getting them service when they want it and being very reliable once they have it. When there's a fiber cut in the middle of the night, our technicians and engineers need to have maps at their fingertips to quickly solve the problem.

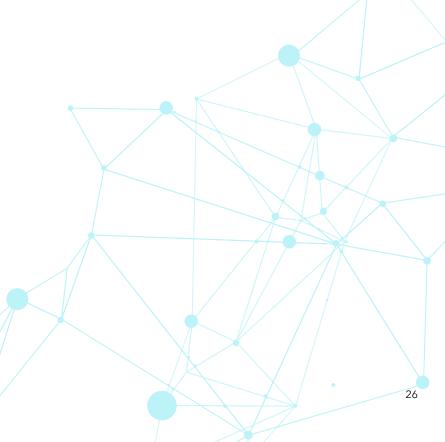
-Derek Rieckmann, Director of GIS, Midco

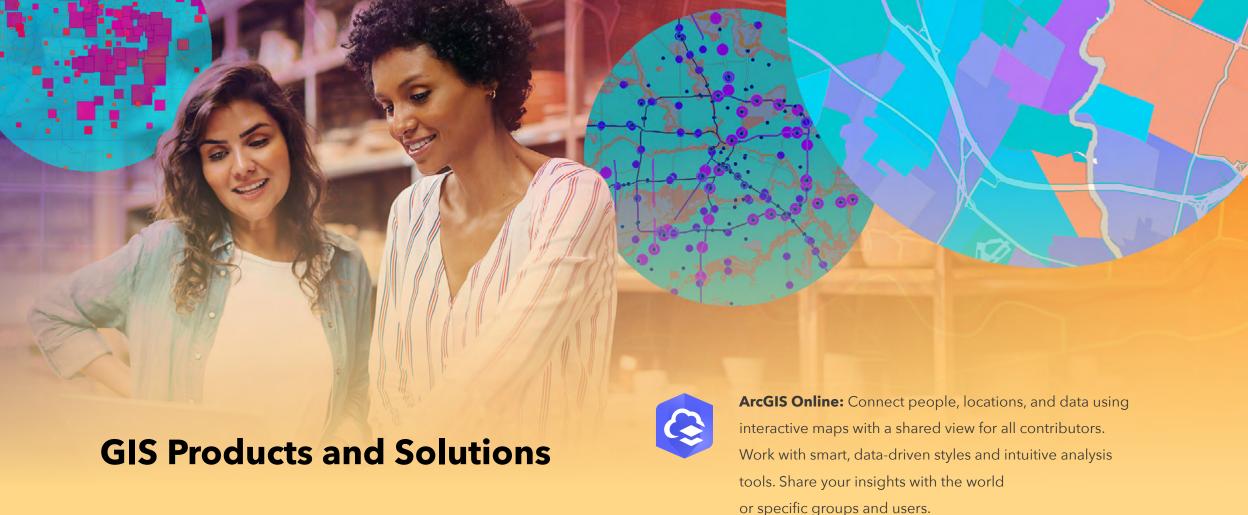
Midco prides itself on always investing in the next big thing to bring advanced technology to the people of the Midwest. But company leaders also have a business to run. As such, they must plan expansion carefully to make sure there's a market that will pay for the service.

**SOLUTION:** In 2008, Midco embraced GIS to support the initial expansion of its fiber-optic cable network. The technology has been the foundation of its work, identifying where service is needed and who will be served. Now GIS is being used to set the stage for future network growth. The company can track where its existing fiber-optic and coaxial cables are in relation to its fixed wireless network and strategically route its latest ambitious expansion. GIS has also allowed the company to see

market potential in rural areas where other companies may have balked at the cost. The company implemented a GIS solution to design and build its network efficiently, making the most of every dollar.

**RESULT:** From operations and maintenance to marketing and customer service, Midco has tied GIS to all aspects of its business. With one system of record, crews in the field are seeing the same network picture as those in the office. The results save time and money.





Team members, internal departments, and external stakeholders can more easily collaborate by using the cloud-based web and mobile apps that are available through ArcGIS Online. State broadband offices and ISPs take advantage of the flexibility of GIS tools for every step of their workflows—exchanging data, viewing smart maps, tracking progress, and keeping each other informed.



ArcGIS Hub<sup>sM</sup>: Work with internal and external stakeholders, acquire and analyze input, track the progress of initiatives, and improve community outcomes with accountability and transparency using this focused, initiative-driven community engagement software as a service.



**ArcGIS Survey123:** Capture data anytime, anywhere with surveys that enable rapid data collection. Data is immediately available in the ArcGIS system to optimize field operations, understand information, and communicate work.



**ArcGIS Dashboards:** Present data and analytics on an intuitive and interactive screen to visualize trends, monitor status in real time, and inform stakeholders.



### **Social Equity Analysis ArcGIS Solution:**

Government and telecommunications users can identify and analyze demographics, assets, conditions, and outcomes to create an equity analysis index and optimize plans for community investment.



### **Broadband Outreach ArcGIS Solution:**

State broadband offices, with ready-to-deploy enterprise solutions, can identify and analyze demographics, understand neighborhood broadband coverage, and optimize plans for bridging the digital divide with broadband infrastructure.



### **More ArcGIS Solutions for Telecommunications:**

Esri provides a number of industry-specific ArcGIS configurations—for network planning, coverage processing, outage damage assessment, communications data management, and more—to ensure telcos are best prepared to meet demands and achieve goals.



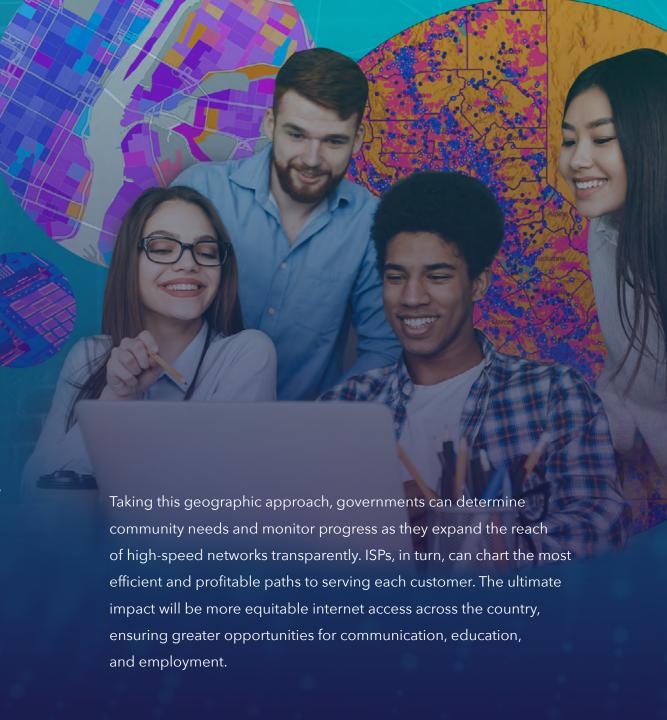
### **Conclusion**

Since the United Nations declared internet access a fundamental human right in 2016, there's been a growing worldwide effort to expand broadband infrastructure and deliver this service to all. Now, the US is making an unprecedented level of federal infrastructure investment.

Money is not enough. Bridging the digital divide will require detailed analysis, documentation, and reporting throughout the project life cycles.

These projects must start with *where* questions specific to each location, each underserved community in need of access, and each expansion in need of funding. Answers can be found on a data-driven map.

GIS technology provides these smart maps while also supporting advanced analysis, insightful visualization, and real-time collaboration—among ISPs, governments, and all stakeholders.





Esri, the global market leader in GIS software, offers the most powerful mapping and spatial analytics technology available.

Esri, the global market leader in GIS software, offers the most powerful mapping and spatial analytics technology available. Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Today, Esri software is deployed in more than 350,000 organizations including the world's largest cities, most national governments, 75 percent of Fortune 500 companies, and more than 7,000 colleges and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to inform the most authoritative maps in the world.

For more information, visit <u>esri.com/en-us/federal-funding/funded-areas/broadband</u> or esri.com/en-us/industries/telecommunications/digital-divide.

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