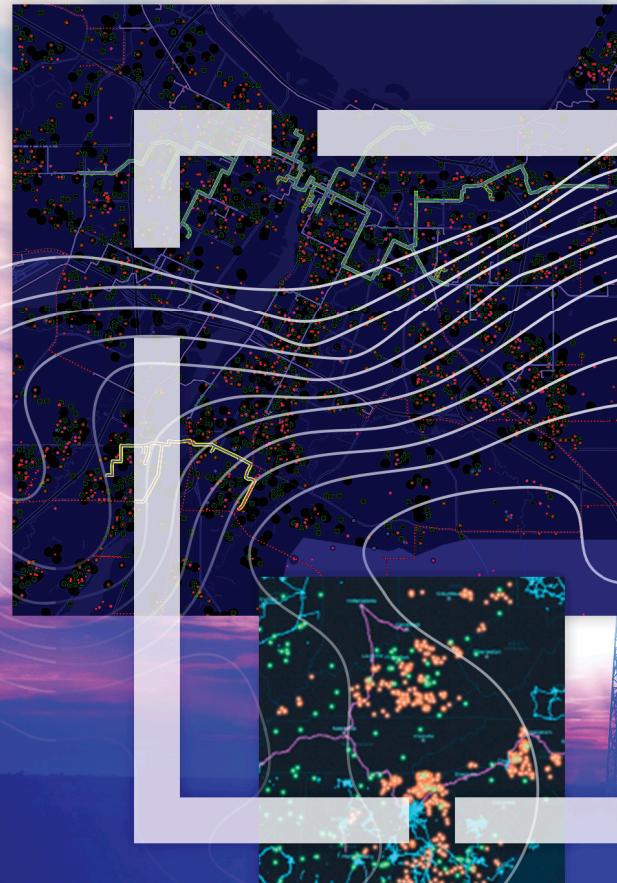




THE
SCIENCE
OF
WHERE®

WHERE EQUITY AND PROFIT MEET

Using Location Intelligence to Extend Broadband's Reach





Bridging the digital divide so more people living in the US have access to affordable and reliable high-speed internet is an undeniable challenge that is clearly a priority. With \$65 billion in federal funds flowing to states through the Infrastructure Investment and Jobs Act (IIJA), momentum is accelerating. Telecoms must be ready with data-driven maps and plans to extend high-speed internet reach, especially in underserved and disadvantaged communities.

Pandemic-era lockdowns illustrated just how vital high-speed internet was to work, learn, and receive medical care from home. Nearly overnight, broadband went from being a nice-to-have to a must-have as society transitioned from businesses, schools, and other locations

purposefully designed for large-scale broadband access to our homes. This created an immediate challenge for service providers as network design requirements changed overnight.

Determining who needs it—either because of a lack of infrastructure or affordability—and how to extend broadband to them is fundamentally a geographic problem requiring a geographic approach. Analyzing and visualizing data—such as socioeconomic demographics, existing broadband networks and coverage, asset records, and internet speeds on maps and dashboards—help telecoms of all sizes locate where equity and profit intersect.

Esri's ArcGIS® software supports the data management, analysis, and visualization of all relevant information—simultaneously—consolidating

it into a single location-based system. Having critical information in one place enables coordinated, collaborative decision-making to help set priorities, keep projects moving, track performance, and automate reports to share with regulators.

A geographic information system (GIS) producing location intelligence is also uniquely suited to not only help identify where expanded service is needed but also where to do so most efficiently with the least number of materials and environmental impact, providing the geographic context of terrain and distance.

Location intelligence enhances each step of this unprecedented push to modernize America's telecommunications systems.



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Telecommunications through
Location Intelligence

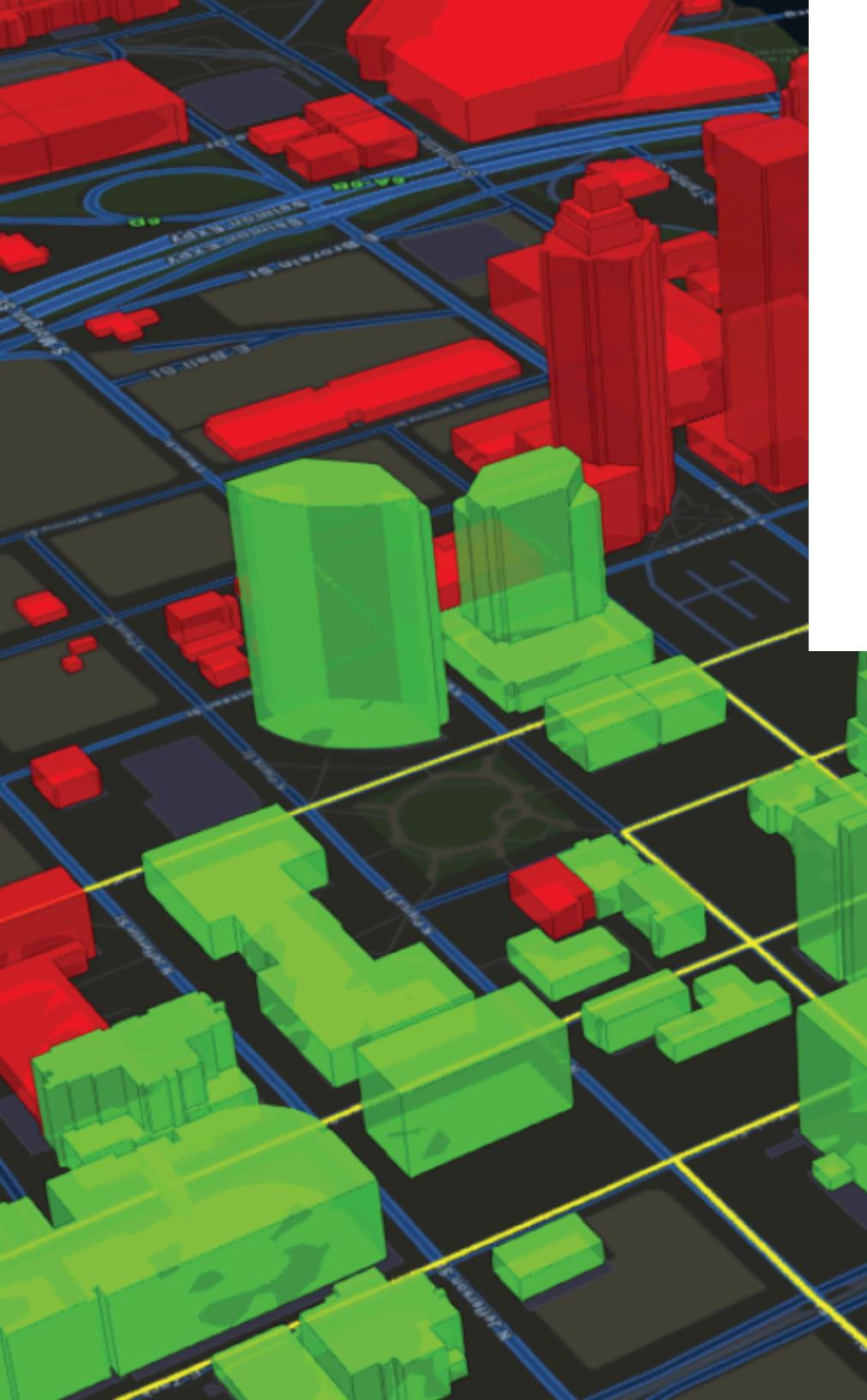
Business Benefits

Planning and Engineering
Network Operations and Maintenance
Sales and Marketing
Customer Service
Information Technology and New Services

"The return on investment is incredible, and I can tell you without hesitation that ArcGIS has been the most successful implementation that I have seen in my 35 years in the industry."

— Sid Blackwelder

*Chief Executive Information Operations,
HTC*

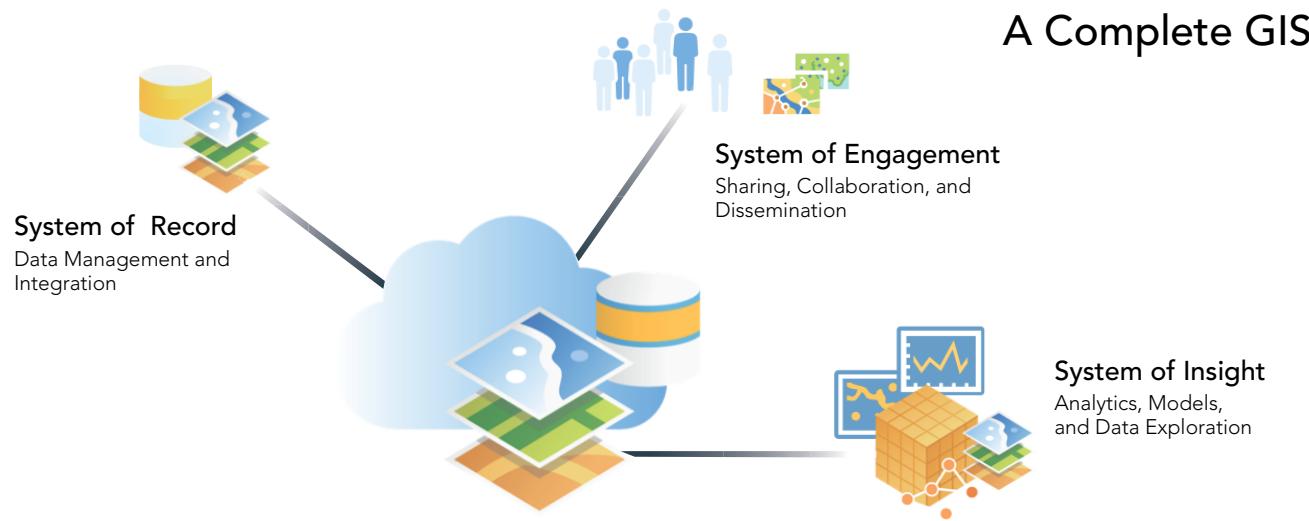


Introduction

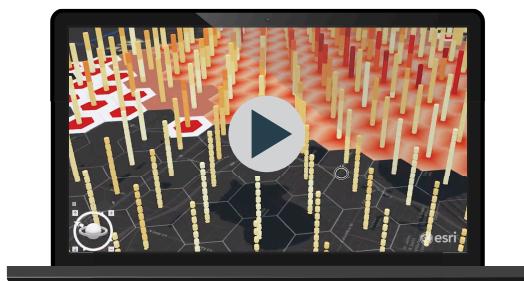
DIGITALLY TRANSFORMING TELECOMMUNICATIONS through **LOCATION INTELLIGENCE**

Today's communication service providers (CSPs) need to know more about their potential customers and the geographies they live in than ever before. Key to facilitating that understanding is GIS that manages, analyzes, and maps data. GIS visualizes data on a map, integrating information about where things are with important geographic context, revealing patterns and relationships. The produced location intelligence is fundamental to communications services whether mobile or fixed, residential or enterprise. GIS provides a scientific foundation for mapping and analysis that is used in almost every industry as organizations look to digitally transform their operations. The benefits include improved communication and efficiency as well as better management and decision-making.

Esri's ArcGIS technology offers a system of record, a system of engagement, and a system of insight that leverage the power of location intelligence to directly support planning and engineering, network operations and maintenance, customer service, sales and marketing, and IT. With ArcGIS, meet your organization's next generation network initiatives and digitally transform your business.



A *Complete* GIS—More than Making Maps



Everything in telecommunications happens somewhere. As the world leader in location technology, Esri provides the most advanced capabilities in the industry.

Changes in the telecommunications environment and the explosion of data demand better ways of managing, examining, and communicating information.

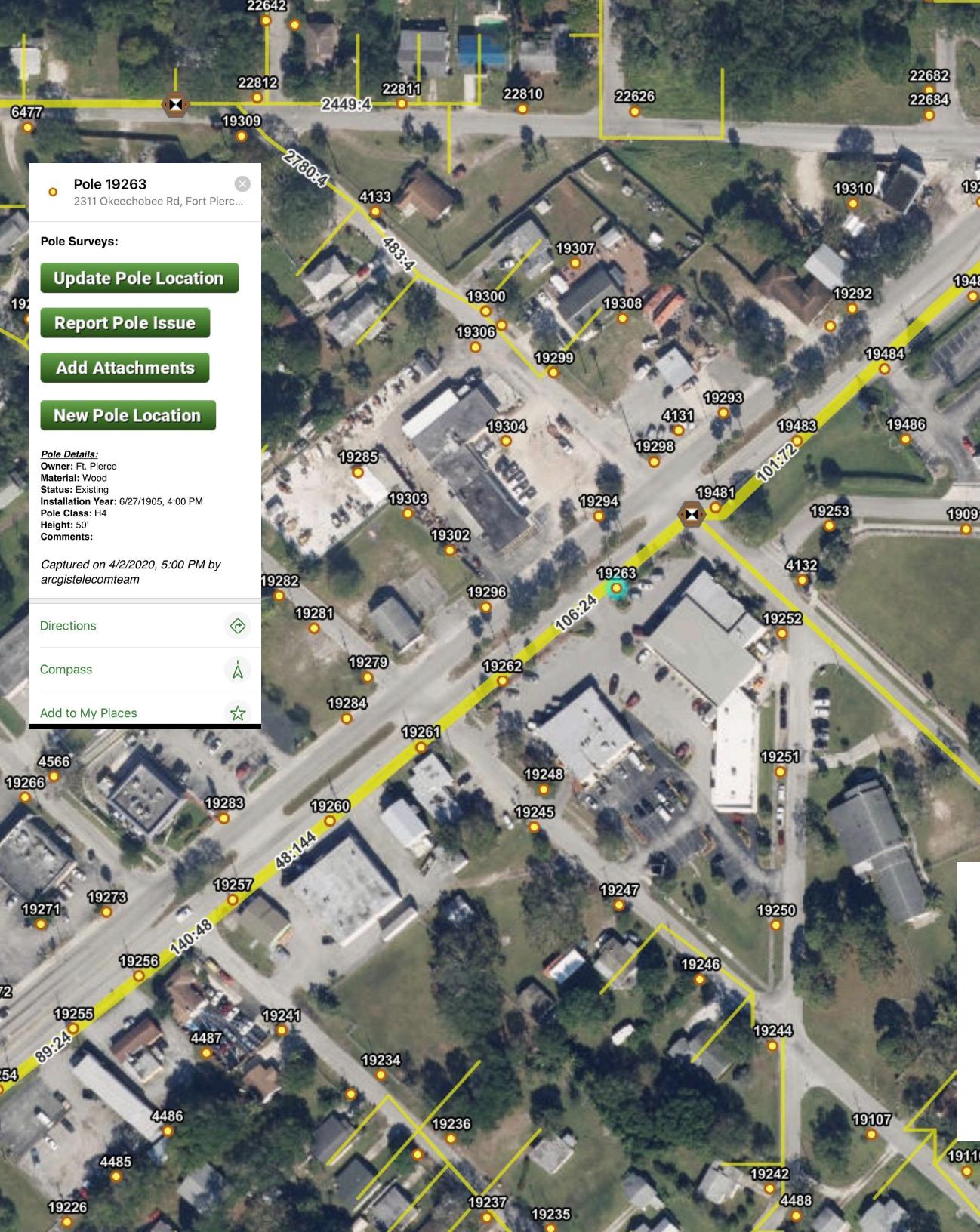
ArcGIS is a complete GIS. *Complete* means it contains all the elements needed to solve telecommunications challenges, not just make conventional maps faster. It maintains key information, analyzing and distributing it to everyone that needs business intelligence.

ArcGIS does things traditional mapping GIS can't touch. It employs an unparalleled data model and consumes almost any form of external data. The rich data supports out-of-the-box analytics and the latest artificial intelligence (AI) and machine learning tools. The results are easily exploited with engaging apps personalized to each user's role. They provide focused capabilities and align with how people work today.

These capabilities create a seamless experience when using the following systems needed to thrive:

- System of record—Data management and integration
- System of engagement—Sharing, collaboration, and dissemination
- System of insight—Analytics, models, and data exploration

The telecom industry is asking for new digital tools that show the complete picture and provide powerful insights—insights that include exceptional visualization on any device, anywhere, at any time. As the requirements for GIS have evolved, so has ArcGIS, helping telecoms be more effective in every corner of their business.

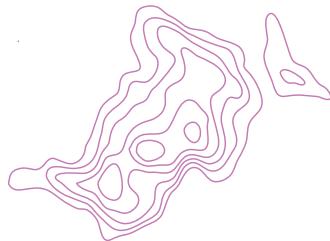


Business Benefits

PLANNING and ENGINEERING

CSPs need new tools to help them be more strategic in their planning and engineering; reduce time to market through remote engineering; and maintain better project operational awareness as they invest and build out 5G, DOCSIS 4.0, software-defined networks (SDN), and expanded fiber optics to deliver next generation networks. Esri's ArcGIS technology provides the essential tools to identify market opportunities and assess existing capacity, helping decision-makers invest where they can maximize their return on investment (ROI). With ArcGIS, you get one complete, real-time network view to manage network build-outs, from planning to design to construction to as-builts.

Maximize ROI on Existing Assets and Efficiently Plan New Networks



Digital Twin and Connectivity

ArcGIS models the entire network with spatially accurate data. It has the tools to model fiber-optic, coaxial cable, wireless, and hybrid networks as they are on the ground. ArcGIS offers connectivity modeling of assets in two and three dimensions, supporting best practices and industry standards.



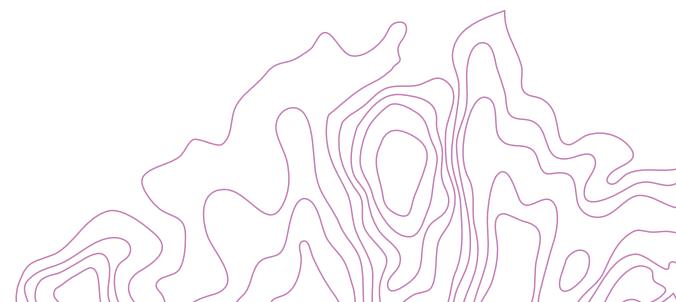
Remote Engineering and Collaboration

Reduce the number of engineering field visits by bringing the field to the engineer. By leveraging ArcGIS, CSPs are delivering field information directly to the engineer's desktop. It is now possible to remotely collect field data, develop designs, create final engineering documents, and submit permits with a minimum number of field visits.



Location Intelligence and Strategic Planning

Whether CSPs are planning a greenfield area or upgrading networks in an existing service area, they need to evaluate revenue potential against legacy network capacity and capability. ArcGIS is ideally suited for this analysis, with optimized tools for big data geospatial analysis to visualize subscriber network behavior.





NETWORK OPERATIONS and MAINTENANCE

Optimizing network operations and maintenance applies not only to communication networks but also to the processes, systems, and people that maintain and manage telecom networks. Esri's ArcGIS technology can help telecom organizations and CSPs optimize their resources using location intelligence and GIS technology. ArcGIS unifies the data from an operations support system (OSS), such as network design, work orders, capacity metrics, and construction databases, and data from a business support system (BSS), including customer information, billing, and key performance indicator (KPI) metrics, and visualizes it in maps, apps, and scenes. The view enhances situational awareness through real-time network operations and field operations.

***Insights and
Capabilities beyond
the Location of
Assets***



OSS/BSS Integration

With all the location information within telecommunications, a geospatial platform can integrate OSS and BSS with a common set of maps and geospatial tools. ArcGIS is open and extensible, allowing you to integrate all your systems with your GIS, improving network operations and spatial awareness.



Real-Time Situational Awareness

ArcGIS allows you to configure real-time network operation views through web-based dashboards, analyze network capacity using location analytics, and provide restoration times to your customers through outage viewer maps.



Resource and Network Optimization

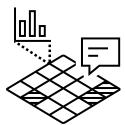
To reduce costs, you need to optimize network assets, people, and processes. ArcGIS maximizes network resources through network suitability analysis for new wireless or fixed-line services planning. Save time and costs by optimizing field technician territories using location analytics and by improving customer satisfaction with mobile apps for field technicians.



SALES and MARKETING

Communications service providers are always looking for ways to increase revenues. Revenue growth starts with understanding market demand and performing sales analytics. Next, it moves into ensuring a successful customer journey by accurately qualifying a prospect and service fulfillment. Finally, it goes into retaining and upselling the customer for continued revenue streams. Esri's ArcGIS technology can help CSPs increase revenue by leveraging spatial analytics with existing marketing and sales analysis to locate high-growth areas and upsell opportunities. ArcGIS solutions can enable presales engineers and customer sales representatives (CSRs) to qualify customers in a quarter of the time. ArcGIS provides geospatial tools and maps to the organization for improving customer retention.

***Increase Your Top-Line
Revenues with Location
Intelligence and GIS***



Coverage and Market Demand

Understanding market demand allows the right product or service to be offered to the right customer at the right time. Improve market and revenue forecasts with geospatial insights provided by ArcGIS tools and maps. ArcGIS enhances geotargeted marketing campaigns with location analytics and rich demographic datasets.



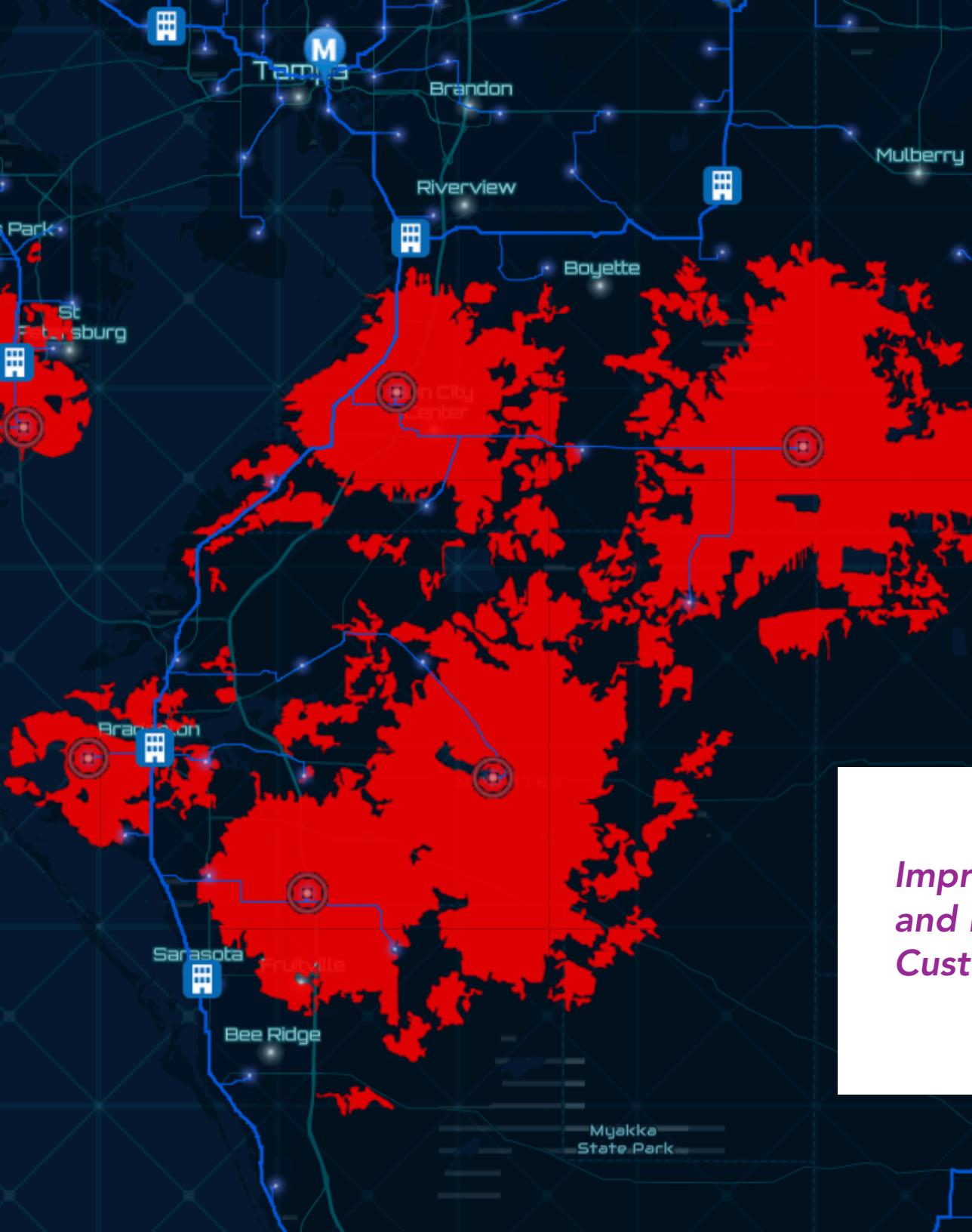
Community and Staff Enablement

Reducing churn and upselling customers drives revenue growth. ArcGIS brings location information from across the organization to the hands of the sales and marketing teams so they can make the most accurate decisions possible. Boost customer engagement and improve the customer journey with ArcGIS. ArcGIS allows CSPs to geographically monitor the Net Promoter Score (NPS) and customer sentiment to better understand the demographic characteristics of their customers.



Business Intelligence

Location analytics supports sales analytics in many ways—from retail analysis to 360-degree customer view analysis to service qualification analysis. ArcGIS offers hundreds of ready-to-use spatial analytics tools to geographically analyze customer data and qualify customers faster. Business intelligence apps in ArcGIS can be used by data scientists, analysts, and management teams alike.



CUSTOMER SERVICE

What's just as important as download speeds for today's telecom organizations? Customer experience. Esri's ArcGIS technology can play an important role in helping telecom organizations improve the customer experience by refining operations and maintenance. ArcGIS solutions can support faster disaster response, reduce network downtime, and support location-based customer sentiment analysis.

*Improve the Quality of Service
and Experience throughout the
Customer Journey*



Communication and Engagement

ArcGIS allows CSPs to share service information, coverage availability, and outage time to restoration through easy-to-use maps. This can make it easy for customers to report locations of service issues and coverage gaps while allowing management teams to visualize customer sentiments.



Geoenabled Customer Care

ArcGIS improves customer experience with geoenabled customer care. Easily visualize service availability, real-time customer locations, and network outages on web-based maps that integrate with customer experience management (CEM) systems.



360-Degree Customer View

Location-based customer sentiment reporting as well as a 360-degree customer view database enriched with demographics and location intelligence can provide deeper insights as can leveraging geospatial intelligence (GeoAI) to help predict the likelihood of customer satisfaction, quality of experience, and potential for churn.



INFORMATION TECHNOLOGY and NEW SERVICES

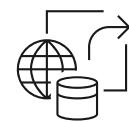
Keeping up with the competition and customer expectations means CSPs are having to digitally transform to become the telecom of the future. CSPs are turning to location and GIS to help them transform faster while gaining a competitive edge by leveraging location services and maps in new Internet of Things (IoT) products and services for smart cities. ArcGIS provides a geospatial platform approach to a complete GIS for IT. ArcGIS enables innovative products and services through emerging technologies while supporting traditional lines of business as an enterprise system. Esri's location services and maps make the IoT come to life.

Prepare for Software-Defined Networks and Offer Innovative Services



Authoritative Geospatial Data Management

Business intelligence analytics and smarter OSS/BSS are becoming critical needs for CSPs. The common denominators across the business are location and maps, and ArcGIS spatially enables other systems and brings business data together through an open web services architecture that is cloud ready.



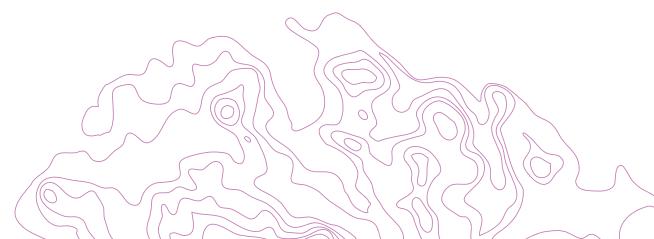
Interoperable and Extensible Platform

While the requirements for GIS across the organization are growing, many GIS solutions are siloed architectures. ArcGIS is the only complete GIS platform that brings location information, maps, and location analytics to anyone in the organization through an open, containerized, microservices architecture with APIs and SDKs to integrate and extend ArcGIS.



Innovative Digital Services and Offerings

The emergence of everything IoT is creating new opportunities for CSPs. New digital products and services for consumers, commercial businesses, and city governments can be enhanced with the power of location and maps. ArcGIS offers an open and strong developer framework to build location services into your products and services, giving you a competitive edge.





Reliance Jio Infocomm Limited

Jio uses location intelligence to fine-tune workflows for all phases of network implementation and marketing. Decision-makers at Jio use GIS to model and test the best sites to locate towers for optimum coverage. Jio operators use that same technology to coordinate materials for just-in-time deliveries and to dispatch crews for network construction when and where they are needed. This tight integration of tasks helped Jio quickly build its network and expand its customer base. With the infrastructure in place, JioFiber added 250,000 miles of fiber across India delivering broadband to 20 million households.

"We start with nothing more than a standard map," says Milind Deshpande, senior vice president of Jio. "It gets enriched by adding how many customers we can reach, how many towers we need to build and connect, how much cable we need, and so forth—always keeping the where dimension in the picture."



To streamline internal communications, HTC took information that resided in multiple systems and made it accessible in one place—ArcGIS. With access to critical information in one location, employees started to directly pull what they needed. In addition, information was spatially enabled, enhancing visualization in ways not possible with tabular data.



Esri, the global market leader in geographic information system (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.

Visit us at esri.com.



For more information, visit go.esri.com/telecom.

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