Fiber-to-the-home leaders and innovators for 2020

A BBC Staff Report

"Building a Fiber-Connected World" is the tagline of **BROADBAND COMMUNITIES** magazine, and each year the FTTH Top 100 list recognizes organizations that lead the way in this endeavor.

Fiber-to-the-home (FTTH) deployment in the United States is beginning to outpace legacy copper broadband, a trend that is impacting service providers and their vendor suppliers.

Fiber continues to be a significant factor in the broadband race. Market research firm RVA revealed in its *2019-2023 North American Fiber Broadband Report* that broadband providers had passed 49.2 million homes with fiber, up 17 percent in 2019.

RVA reports that smaller players will continue to have a role. In 2019, smaller providers represented 25 percent of new homes marketed and 41 percent of FTTH capital expenditures. Interestingly, the research firm said smaller providers have higher take rates – a higher percent with connections completed. As they continue to participate in FCC broadband funding programs such as the Rural Digital Opportunity Fund, electric co-ops will continue take an active role in building out FTTH services. About 12 percent of U.S. rural electric co-ops have announced fiber builds.

However, RVA noted that "due to a dramatic cutback in AT&T fiber deployment, 2020 deployment will almost certainly be down – but still good by historic standards."

Vendors also are seeing a transition in equipment sales. For example, Dell'Oro Group reported that the total global PON OLT equipment revenue reached $3 billion, up 16 percent from 2018. The research firm said 2019 PON OLT revenue gains come as vendors see sharp revenue declines in both DSL and cable infrastructure.

Gigabit service – and beyond – continues to drive fiber deployment. Large and small providers alike are not only offering 1 Gbps services but also eyeing a path to 10 Gbps via either XGS-PON or NG-PON2. Dell'Oro said total XGS-PON OLT port shipments increased 222 percent year over year, as more operators continue their shift to 10 Gbps fiber-to-the-premises networks.

Another key question is what effect the COVID-19 pandemic will have on the telecom industry overall. Dell'Oro reported that telecom capex outlook remains favorable, even with increased uncertainty caused by the COVID-19

ORGANIZATIONS ADDED OR *REINSTATED TO THE FTTH TOP 100 LIST IN 2020

Advantage Engineers	**www.advantageengineers.com**
Nex-Tech	www.nex-tech.com
OSPInsight	www.ospinsight.com
OTELCO	www.otelco.com
*UTOPIA Fiber	www.utopiafiber.com

pandemic. It expects worldwide telecom capex – the sum of wireless and wireline telecom investments – to grow at a 1 percent CAGR between 2019 and 2022.

It is no wonder the industry is expanding and the number of companies competing for the Top 100 slots continues to grow. That is great for the country, even if it makes life difficult for the editors who assemble this list.

The 2020 FTTH Top 100 list represents the whole fiber-to-the-home ecosystem. Optical fiber and fiber cables; passive equipment for connecting, protecting and managing fiber; and active equipment for sending and receiving signals over fiber are the most basic components of an FTTH network, along with software for planning, setting up and managing networks and for provisioning and billing fiber services. The list contains many companies that design, manufacture and distribute these essential products.

To put these pieces together requires firms that finance, plan, design, engineer, construct and install fiber optic networks, as well as those that make equipment for digging, pushing, pulling and attaching fiber. These, too, are represented on the list. Also included are several organizations that advocate for better broadband.

Finally, there would not be any fiber to the home if not for the deployers – large and small, private and public,

incumbent and competitive – that invest in FTTH networks.

Companies newly added or reinstated to the list represent a variety of ecosystem niches.

Two of the new entrants – Nex-Tech and OTELCO – are incumbent telcos with CLEC subsidiaries. Having launched one of the first FTTH networks in Hill City, Kansas, in 1996, Nex-Tech was an early FTTH bloomer. Since that time, Nex-Tech has deployed fiber to more than 60 communities and previously underserved areas in Kansas. OTELCO, which traces its roots to the 1880s, is building out FTTH networks in towns and cities in parts of its seven-state territory that includes Alabama, Maine, Massachusetts, Missouri, New Hampshire, Vermont, and West Virginia. It also works with communities in a variety of partnership arrangements.

The list also features UTOPIA Fiber. Created by a consortium of Utah cities, UTOPIA Fiber is a community-owned, open-access fiber network that promotes competition by giving customers the freedom to choose from various last-mile internet providers.

Joining these network operators are two companies that provide network planning and engineering services. Advantage Engineering has expertise designing more than 6,000 miles of fiber. Finally, OSPInsight, with roots providing network planning for metro area fiber-based Ethernet, has in recent years turned its attention to providing

software for FTTH network operators to plan, design, build and operate their networks.

SELECTION CRITERIA

In selecting the FTTH Top 100, the editors looked for organizations that advance the cause of fiber-based broadband by

- Deploying networks that are large or ambitious, have innovative business plans, or are intended to transform local economies or improve communities' quality of life
- Supplying key hardware, software or services to deployers
- Introducing innovative technologies with game-changing potential, even if they have not yet been commercially deployed
- Providing key conditions for fiber builds, such as advocacy or demand aggregation

To be listed among the FTTH Top 100, an organization may be based anywhere in the world but must do business in North America. Except for broadband service providers, which inherently are local, we give preference to organizations that serve national rather than local markets. Overall size is unimportant, as is corporate form – in addition to for-profit companies, the list includes municipalities, a telephone cooperative, an electric cooperative and a nonprofit research organization.

Although some organizations on the list focus entirely on fiber to the premises or other fiber-based broadband technologies, most deliver or support a mix of broadband technologies. For some, broadband represents only a small part of their business. In making these selections, the editors considered how important the organizations are to advancing fiber broadband rather than how important fiber broadband is to them.

The FTTH Top 100 list was researched by Marianne Cotter, Rachel Ellner and Kassandra Kania and overseen by associate editor Sean Buckley, with recommendations and advice from editor-in-chief Masha Zager. To nominate a company for next year's FTTH Top 100, email sean@bbcmag.com.

FIBER-TO-THE-HOME TOP 100 LIST

COMPANY	WEBSITE	PHONE	KEY PRODUCTS AND SERVICES
3-GIS	www.3-gis.com	256-560-0744	Web-based tools and services for mapping, network design and management
ACRS	www.acrsokc.com	405-843-9966	Broadband engineering and consulting, construction management
Adams Telephone Co-Operative / CheckPoint Solutions	www.adams.net; www.checkpointsolutions.net	217-214-2774	Consulting services for FTTH deployers, including opportunity assessment software, support and systems automation
ADTRAN	www.adtran.com	256-963-8000	FTTH, FTTN and FTTdp solutions; software-defined access; subscriber experience; network modernization and management; system integration
Advanced Media Technologies	www.amt.com	954-427-5711; 888-293-5856	Fiber optic transmission equipment, headends, set-top boxes, cable modems
Advantage Engineers	www.advantageengineers.com	443-367-0003	Engineering and consulting services
AFL	www.aflglobal.com	864-433-0333; 800-235-3423	Fiber optic cable and connectivity, outside-plant fiber and electrical conductor hardware, fusion splicers, test and inspection equipment, training, design, engineering, integration
Alianza	www.alianza.com	801-802-6400	Cloud-based VoIP platform
Allo Communications	www.allocommunications.com		Internet access, Metro Ethernet, phone and video services
Alpha Technologies	www.alpha.com	800-322-5742; 360-647-2360	Power supplies, surge suppressors, enclosures and batteries, installation and construction services
Altice USA	www.alticeusa.com	516-803-2300	Internet, video and voice services
Amphenol	www.amphenol.com	203-265-8900	Fiber distribution solutions, fiber optic enclosures
AT&T / AT&T Connected Communities	www.att.com/connectme		High-speed internet, next-generation TV, voice, advanced mobile services
Atlantic Engineering Group	www.aeg.cc	706-654-2298	Turnkey outside-plant services for FTTH networks
Baller Stokes & Lide	www.baller.com	202-833-5300	Legal services, public policy advocacy
BHC RHODES	www.ibhc.com	913-663-1900	Planning, design and construction of FTTx projects
Biarri Networks	www.biarrinetworks.com	303-524-1710	Software and services for FTTx design automation, network planning, outside-plant engineering, mapping
Black & Veatch	www.bv.com	913-458-2000	Consulting, engineering, construction, operations, program management
C Spire Home Services	www.cspire.com/home-services	855-438-1009	Voice, video and internet access delivered over a fiber-to-the-home network
Calix	www.calix.com	408-514-3000; 877-766-3500	Fiber access solutions for residential and business services, network and services management software, value-added software as a service
CCG Consulting	www.ccgcomm.com	202-255-7689	Regulatory, engineering, marketing, and strategy and planning services; raising money for broadband projects
CenturyLink	www.CenturyLink.com/ConnectedCommunities	855-748-6123	Fiber solutions, internet, voice, TV, managed services, cloud, hosting and security solutions
Charter Communications / Spectrum Community Solutions	www.charter.com; www.spectrum.com	855-243-8892	Advanced broadband services, including internet, TV, fiber Wi-Fi and MDU Wi-Fi solutions
CHR Solutions	www.chrsolutions.com	713-351-5111	Engineering, network planning, managed NOC and managed IT services; communications billing software
Cincinnati Bell	www.cincinnatibell.com, www.cincinnatibell.com/Fioptics	513-397-9900	Telephone, data, video, wireless and information technology solutions
Clearfield	www.Seeclearfield.com	763-476-6866	Fiber distribution and protection systems for inside plant, outside plant and access networks

COMPANY	WEBSITE	PHONE	KEY PRODUCTS AND SERVICES
Comcast Cable / XFINITY Communities	www.xfinity.com/ xfinitycommunities		Internet, video and voice and home security services
CommScope	www.commscope.com	828-324-2200; 800-982-1708	Cable and connectivity products
Co-Mo Connect	www.co-mo.net; www.co-mo.coop	660-433-5521; 800-781-0157	Internet, phone and video services
Comsof	www.comsof.com	416-594-9777	FTTx network planning and design software
Conexon	www.conexon.us	202-798-3884	Consulting services, fiber design and construction management, funding and operations for rural electric cooperatives deploying fiber to the home
Consolidated Communications	www.consolidated.com	844-968-7224	Internet, data, phone, security, managed services, cloud services, wholesale carrier solutions
Corning Optical Communications	www.corning.com	828-901-5000	Optical fiber, optical fiber cable, cabinets, splitters, closures, connectors, terminals, engineering services
COS Systems	www.cossystems.com	800-562-1730	Demand aggregation software, BSS/OSS for managing open-access fiber networks
Cox Communications	www.cox.com		High-speed internet, video, voice and smart-home services
CTC Technology & Energy	www.ctcnet.us	301-933-1488	Fiber and wireless broadband network design, engineering, financial analysis, strategy, assessment and implementation
Danella Companies	www.danella.com	610-828-6200	FTTH network design, engineering, construction, testing
Design Nine / WideOpen Networks	www.designnine.com; www.wideopennetworks.us	540-951-4400	Planning and feasibility studies; business and financial planning; project management; network design, buildout and operations
Ditch Witch	www.ditchwitch.com	580-336-4402; 800-654-6481	Construction equipment for laying fiber
Dura-Line Corporation	www.duraline.com	800-847-7661	Conduit, cable-in-conduit, microducts, accessories
Dycom Industries	www.dycomind.com	561-627-7171	Program and project management, engineering, construction, maintenance, installation services
EPB Fiber Optics	www.epb.com	423-648-1372	Voice, video, data and smart-grid services provided over a fiber optic network
ESPi	www.espicorp.com	877-799-3774	UPS batteries for fiber installations
ETI Software Solutions	www.etisoftware.com	770-242-3620; 800-332-1078	Software products for managing broadband service and subscriber activation, device management and analytics
EXFO	www.exfo.com	418-683-0211; 800-663-3936	Testing, monitoring and analytics solutions for the communications industry
Fiberdyne Labs	www.fiberdyne.com	315-895-8470; 800-894-9694	Optical passive devices, multiplexers, fiber optic cable assemblies, termination boxes, FTTH drop cables, fiber testing and installation services
Finley Engineering	www.finleyusa.com	800-225-9716	Broadband network consulting, design and engineering services
Foresite Group	www.foresitegroup.net	770-368-1399	Broadband engineering, wireless services
Fujitsu Network Communications	www.fujitsu.com/telecom	888-362-7763	Consulting, solution design, deployment, integration, operation, project management, NOC services
GEOGRAPH	www.geograph.tech	800-674-4803	GIS-based software and support for designing, planning, mapping and managing fiber, copper and coax networks
GigabitNow	www.gigabitnow.com	866-748-8066	FTTH network solutions and internet services, including design, construction, operations, connectivity and customer support

FIBER-TO-THE-HOME TOP 100 LIST

COMPANY	WEBSITE	PHONE	KEY PRODUCTS AND SERVICES
GLDS	www.glds.com	800-882-7950	Software for subscriber management, billing, provisioning and workforce management
GoNetSpeed	www.gonetspeed.com	855-891-7291	Voice, video and gigabit internet services
Graybar	www.graybar.com	800-GRAYBAR (472-9227)	PON electronics, fiber cabinets and enclosures, fiber optic cable, fiber splice closures and pedestals, DC power, fiber terminals
GVTC	www.gvtc.com	830-885-4411; 800-367-4882	Internet, cable TV, smart-home security, phone
Henkels & McCoy Group	www.henkelsgroup.com	888-HENKELS (436-5357)	Planning, design, engineering, project management, construction, operations management and installation
Hotwire Communications	www.hotwirecommunications.com	800-409-4733; 800-355-5668	Residential, commercial and municipal high-speed data; network management; Wi-Fi solutions; security; whole unit/home automation; digital voice and HD IPTV video services
InfiniSys Multifamily Technology	www.rrh.com	386-236-1500	Telecommunications network design for multifamily buildings, technology amenity engineering
Institute for Local Self-Reliance	www.ilsr.org; www.MuniNetworks.org	612-276-3456	Broadband policy research and municipal broadband advocacy
Inteleconnect	www.inteleconnect.com	734-604-1563	Service provider negotiations, financial feasibility plans, fiber infrastructure design, consultation, situation analysis
KGPCo	www.kgpco.com	800-755-1950	Equipment for wireline and wireless networks; inventory management, logistics, site development, sourcing, supply chain management
Last Mile Communications	www.lastmile.net	239-202-2975	Management partnering, consulting and capital-funding services
Lumos Networks	www.lumosnetworks.com	855-465-8667	High-speed residential and business-class broadband internet, managed Wi-Fi, digital television and digital voice services
Magellan Advisors	www.magellan-advisors.com	888-960-5299	Broadband and telecom planning, deployment and management services
Mapcom Systems	www.mapcom.com	804-743-1860	Software for visual operations, workforce management and service assurance
MasTec North America	www.mastec.com	305-599-1800	FTTx deployment, outside-plant cabling, engineering, inside-plant construction and installation, splicing, testing, systems integration, maintenance
Michels Corporation	www.michels.us	920-583-3132	Fiber optic network construction, including outside-plant construction, structured cabling and fiber splicing and testing
Mid-State Consultants	www.mscon.com	435-623-8601	Communications engineering services
Multilink	www.gomultilink.com	440-366-6966	Fiber distribution and cable management solutions, connectors, splice enclosures and cabinets; MDU enclosures; raceway and pathway solutions
NEO Connect	www.neoconnect.us	970-309-3500	Consulting, feasibility studies, design and engineering services
Nex-Tech	www.nex-tech.com	785-567-4281; 877-625-7872	Internet, video, voice, mobile, home security and business services
Nokia / Nokia Networks	www.nokia.com	908-582-3000	Wireline and wireless network equipment, software for network management, IoT technology, cloud solutions
OFS	www.ofsoptics.com	770-798-5555; 888-342-3743	Optical fiber, optical cable, fiber management and connectivity products, splicers, network design services
On Trac	www.ontracinc.net	423-317-0009	FTTx consulting, design, installation and splicing services
ONUG Communications	www.onugsolutions.com	919-876-5455	Outside-plant engineering, planning and design; project management, feasibility studies, consulting services, quality assurance, construction

COMPANY	WEBSITE	PHONE	KEY PRODUCTS AND SERVICES
OSPInsight	www.ospinsight.com	801-936-0970	Fiber network management software
OTELCO	www.otelco.com	833-683-5261	Internet, video and voice services
Pavlov Media	www.pavlovmedia.com	800-677-6812	Internet, video and voice services; managed services, including support for leasing offices
Power & Tel	www.ptsupply.com	800-238-7514	Fiber optic and cable products, optical networking electronics, test gear, IPTV, home networking solutions
PPC Broadband	www.ppc-online.com	315-431-7200; 800-800-6652	Fiber cable, microduct, enclosures, cabinets, optical passives, optical splitters, fiber test equipment
Preformed Line Products	www.preformed.com	440-461-5200	Fiber optic and copper splice closures, high-speed cross-connect devices, cable anchoring, control hardware systems
Prysmian Group	www.prysmiangroup.com	859-572-8000; 803-951-4800	Optical fiber and telecommunications cables
Render Networks	www.rendernetworks.com	833-293-9013	Network design and construction solutions
Smithville Communications, Inc. / Smithville	www.smithville.com	812-876-2211; 800-742-4084	High-speed internet, streaming TV, voice, cellular, home automation and security services; cloud services; IoT/big data support
Sonic	www.sonic.com	888-766-4233	Internet access, voice service, co-location, business networking
Superior Essex	www.superioressex.com	770-657-6000	Premises and outside-plant fiber and copper cable products, FTTH closures
Synergy Fiber	www.synergyfiber.com	734-222-6060	Design, integration, installation and support for MDU networks and technology solutions; internet access and video and voice services; co-located hosting
TDS Telecom	www.tdstelecom.com; www.tdsfiber.com	866-571-6662	Internet access, phone and TV services
Tesmec USA / Marais	www.samarais.com	817-473-2233	Construction equipment for laying fiber
The Broadband Group / TBG Network Services	www.broadbandgroup.com	702-405-7000	Telecommunications master planning, network design and engineering, financial modeling, construction management
Ting	www.ting.com/internet	855-846-4626	Gigabit internet access, video service
TVC Communications / MaxCell	www.tvcinc.com; www.maxcellinnerduct.com	888-644-6075 (TVC); 888-387-3828 (MaxCell)	Broadband electronics, connectivity products, outside-plant hardware, test equipment, fabric innerduct, conduit technology
UTOPIA Fiber	www.utopiafiber.com	801-613-3880	Open-access network services
Vantage Point Solutions	www.vantagepnt.com	605-995-1777	Broadband engineering and consulting services, including feasibility studies, network design, engineering, and deployment
Verizon Communications / Verizon Enhanced Communities	www.verizon.com; www.verizon.com/communities		Internet, video and digital voice services
Vermeer Corporation	www.vermeer.com	641-628-3141; 888-837-6337	Horizontal directional drilling equipment, utility and pedestrian trenchers and plows
VETRO FiberMap	www.vetrofibermap.com	207-221-6627	Fiber mapping software
VIAVI Solutions	www.viavisolutions.com	408-404-3600	Field and lab broadband test equipment, network monitoring systems, network performance monitoring, diagnostic services
Walker and Associates	www.walkerfirst.com	800-925-5371	Products and services for deploying communications networks; kitting and integration; product selection consulting
Zyxel Communications	www.zyxel.com	714-632-0882; 800-255-4101	Gigabit home gateways and other customer-premises equipment, mesh Wi-Fi systems, Ethernet switches, security

"The need for improved and affordable high-performance broadband has become a critical issue with the COVID-19 crisis. Now more than ever, neighborhoods and rural roads are business districts that require high-speed wireless and fiber to the home."

– Andrew Cohill, CEO, Design Nine

3-GIS

www.3-gis.com
256-560-0744

Key Products: Web-based tools and services for mapping, network design and management

Summary: 3-GIS software and services provide anywhere, anytime access, geospatial data and mapping, visibility of network connections and logic, an adaptable data model, and enterprise data access through a configurable interface. The applications include 3-GIS | Web, a browser-based application that provides asset editing and connection management functionalities; 3-GIS | Mobile, an Android-based mobile application allowing network data to be put directly into the hands of work crews in the field, syncing with the server upon establishing internet connection; 3-GIS | Admin, a browser-based configuration console for web and mobile, allowing system administrators to create a system of rules and guidelines to define how the software is accessed and used; and Prospector, an extension tool for automating network planning and design. The company also provides various support services, including design automation, data conversion and project management. 3-GIS | Augmented Design Services (ADS) provides a team of fiber network engineers, OSP engineers, project managers, GIS and database experts and software developers to assist network planning and operations. Athena Broadband tapped 3-GIS to implement a cloud-based fiber design and management system to deploy an FTTH network. The company's offices are in Decatur, Alabama, and Tampa, Florida, with development, design services, product support and project management in Bern, Switzerland.

ACRS

www.acrsokc.com
405-843-9966

Key Products: Broadband engineering and consulting, construction management

Summary: Established in 1987, ACRS provides turnkey engineering and consulting to rural telcos, cable TV operators, wireless ISPs, competitive providers, electric co-ops, municipalities, Native American tribes and large carriers across the United States. Services include feasibility studies, financing acquisition, regulatory consulting (FCC licensing, CLEC and ETC filings, and state corporation commission filings and testimony), detailed engineering, construction management and acceptance testing. ACRS has extensive experience in acquiring RUS broadband loans and grants and competitive Connect America Fund awards for its clients, including four grants in late 2019. These grants, which totaled $10 million, will help fund a mix of FTTH and wireless broadband projects in Minnesota, North Carolina, North Dakota, Oklahoma, Tennessee, Utah and Virginia. ACRS engineered the first full-motion distance learning network in the United States and the first FTTH system in Oklahoma. Recent projects include several FTTH networks for electric co-ops, including Northeast Rural Services (Bolt Fiber Optic) and Valley Electric Association, a winner of a BROADBAND COMMUNITIES Cornerstone Award. ACRS is headquartered in Oklahoma City, Oklahoma, and has about 50 employees.

Adams Telephone Co-Operative / CheckPoint Solutions

www.adams.net; www.checkpointsolutions.net
217-214-2774

Key Products: Consulting services for FTTH deployers, including opportunity assessment software, ongoing support, and systems automation

Summary: Adams Telephone Co-Operative, a member-owned telco in Illinois, has deployed fiber for more than a decade. All the premises in its traditional service area have access to fiber broadband, making it 100 percent FTTH, and its Adams Fiber subsidiary continues to build out fiber as a competitive provider in nearby towns. With more than 2,600 miles of fiber deployed and a set of well-developed processes and in-house software tools for deployment, Adams now serves 28 communities with fiber to the home, focusing on places where there was previously little or no coverage. Adams now applies its experience and customer service spirit to help other rural providers plan and build their own FTTH networks. The company formed a new subsidiary, CheckPoint Solutions, in 2016, to share its expertise with other small companies that wanted to build FTTH in underserved communities and guide them through a software-developed automation process from beginning to end. CheckPoint Solutions counts several other independent companies as clients, such as Loretto Telecom and Green Hills Communications, and has been

responsible for helping telcos and utility companies from coast to coast successfully build thousands of fiberhoods across the United States. Checkpoint Solutions offers strategic advice and support that includes software-defined needs analysis, identification of growth opportunities, ROI analysis, risk management, demand measurement, customized reporting and more. CheckPoint Solutions is also currently equipping clients nationally with analytic abilities when they make bids for the FCC's Rural Digital Opportunity Fund (RDOF). Adams Telephone, founded in 1952 and based in Golden, Illinois, has 108 employees.

ADTRAN

www.adtran.com
256-963-8000

Key Products: Solutions for FTTH, FTTN and FTTdp architectures; mobile backhaul; software-defined access; subscriber experience; network modernization and management; system integration

Summary: ADTRAN is a global supplier of next-generation broadband access solutions for residential, enterprise and mobile services markets served by cable MSOs, telecom service providers, municipalities, utilities and electric co-ops. The ADTRAN Total Access 5000 multiservice platform is a widely deployed solution, supporting thousands of gigabit communities in North America. In addition, ADTRAN's next-generation 10 Gbps FTTH technologies allow operators to double the lives of their fiber optic distribution networks while lowering operational expenses by supporting enterprise and residential customers on the same network. These solutions are complemented by a full suite of subscriber experience, network modernization and system integration services and a pool of next-generation alliance partners. ADTRAN has bolstered its FTTH and 10G presence with ILEC and electric cooperative customers. Lumos Networks is leveraging ADTRAN's 10G fiber access portfolio to deploy 10G fiber services for small-business customers. United Cooperative Services (UCS) selected ADTRAN to deliver multi-gigabit services to the electric cooperative's membership in 14 counties across North Texas. In the U.K., Openreach will use ADTRAN's SDX Series of OLTs and Mosaic Cloud Platform to make gigabit and multi-gigabit services available to 20 million homes by the mid-to-late 2020s with its Full Fibre network. ADTRAN expanded its 10G PON portfolio with several new ONTs and launched a managed, cloud-based, CAF performance test. In February, ADTRAN unveiled its Global Services Portfolio, which offers an ecosystem of turnkey network implementation and maintenance, professional, managed and cloud services. It also expanded its SDX series of open and disaggregated network elements and added support for Combo PON within the ADTRAN Total Access 5000 (TA5000) fiber access platform. Based in Huntsville, Alabama, ADTRAN has 1,790 employees and reported revenue of $530 million in 2019.

Advanced Media Technologies

www.amt.com
954-427-5711; 888-293-5856

Key Products: Fiber optic transmission equipment, cable modem termination systems, new and refurbished modems, Wi-Fi solutions, headends, IP and QAM set-top boxes

Summary: Advanced Media Technologies (AMT), a value-added reseller, offers a complete line of DOCSIS, Wi-Fi, FTTH, IPTV and CATV products. AMT specializes in data solutions for private cable operators. It offers products from several large manufacturers, including Actiontec, Amino, ATX Networks, Blonder Tongue, Casa Networks, CommScope/ARRIS, Dasan Zhone, Harmonic, Nokia, Olson Technology, Plume, Ruckus, and ZeeVee. In addition to providing expert in-house technical support to cable companies, AMT's systems integration arm provides turnkey solutions for digital TV headends, CMTS and VoIP deployment and design and on-site technical support. Customers include major cable operators, telcos and private cable operators. AMT is also an authorized CommScope refurbished partner. All modems are refurbished based on customer requirements, including installation of new firmware. AMT's latest offering, the Plume in-home adaptive Wi-Fi service, is designed to help providers improve revenue and reduce trouble calls and truck rolls while producing a better end-user experience. Plume is widely deployed by many large cable operators and ISPs. Located in Deerfield Beach, Florida, AMT keeps an extensive inventory in its 32,000-square-foot warehouse. Founded in 2003, it is now a wholly owned subsidiary of ITOCHU International, the North American subsidiary of ITOCHU Corporation, one of Japan's largest companies, with operations covering a broad range of industries in more than 80 countries.

Advantage Engineers

www.advantageengineers.com
443-367-0003

Key Products: Engineering and consulting services

Summary: Advantage Engineers is an engineering and design firm that provides solutions for complex telecommunications projects. The company has more than 200 full-time professionals in 18 locations who are professionally licensed in 49 states and Washington, D.C. Advantage has extensive fiber optic expertise and has designed more than 6,000 miles of fiber. From cable-route design to more advanced network engineering, the Advantage engineering team provides the support required for planning, designing, permitting, documenting and managing clients' fiber optic network deployment. Sample projects include a Wake Forest, North Carolina, middle-mile project consisting of 19 miles with 12 community anchor institutions, plus the addition of FTTH, and a Westminster, Maryland, 74.1-mile fiber network that connects residences and businesses (approximately 6,500 addresses).

> "With COVID-19, home internet use increased by 92 percent. The pandemic sheds a stark light on those areas of the country where people lack internet service and are not able to work, attend classes or be connected.
>
> – Diane Kruse, CEO, NEO Connect

AFL

www.aflglobal.com
864-433-0333; 800-235-3423

Key Products: Fiber optic cable and connectivity, outside-plant fiber and electrical conductor hardware, fusion splicers, test and inspection equipment, training, design, engineering, integration

Summary: AFL products, services and engineering expertise help broadband providers create or improve their infrastructures and enable delivery of voice, video and high-speed data communications. AFL's product portfolio includes fiber optic cable and connectivity, outside-plant closures and terminals, demarcation devices, WDM/splitter modules, fusion splicers, test and inspection equipment, electrical conductor accessories and Light Brigade training and education. AFL plans, designs, builds and maintains communications networks, offering FTTx and MDU solutions for master-planned community networks serviced by telephone, cable TV and wireless providers; utilities/electric cooperatives; and industrial companies and enterprises. The company continues to release and promote new technologies for applications in metro and access networks, such as the Fujikura 90 series fusion splicers, Xpress Fiber Management dual-access module panel and the ROGUE OLTS Certifier. Founded in 1984, AFL is headquartered in Spartanburg, South Carolina, and is a division of Fujikura Ltd. The company has more than 5,000 associates around the world and has operations in the United States, Canada, Mexico, Europe, Asia and Australia.

Alianza

www.alianza.com
801-802-6400

Key Products: Cloud-based VoIP platform

Summary: Though early fiber-to-the-home deployers were mainly telephone companies, many new FTTH entrants have no history of providing voice services. For a broadband operator without telephone equipment or expertise, using a cloud-based system is the simplest, most economical way to add a voice offering – typically a high-margin service. Alianza's Cloud Communications Platform, a web-scale VoIP software-as-a-service solution built for broadband providers, provides the functions required to deliver and support residential and business VoIP services. The platform does not require capital expenditure or equipment installation, and Alianza alleviates most operational and regulatory burdens associated with phone services. Since announcing a solution specifically for FTTH providers in February 2017, Alianza has made inroads with electric cooperatives, utilities and municipalities that deliver FTTH broadband to their communities. More than 70 ISPs, with a total of more than 300,000 subscribers, use the Alianza platform. In fall 2019, Alianza announced several new customer acquisitions: Cumberland Connect in Tennessee and ecoLink in Oklahoma. Pennsylvania ISP PenTeleData launched a suite of cloud-based voice services for business customers powered by Alianza's Cloud Voice Platform. Founded in 2009 and with new headquarters in Pleasant Grove, Utah, Alianza has more than 100 employees.

ALLO Communications

www.allocommunications.com

Key Products: Internet access, Metro Ethernet, phone, TV and video services over fiber optic networks

Summary: Founded in 2003, ALLO Communications, based in Imperial, Nebraska, has built fiber broadband networks throughout Nebraska as a competitive provider. ALLO has a broad vision of fiber as a transformational technology and builds its fiber networks citywide rather than in selected neighborhoods. It helps communities use their networks to expand business opportunities, create jobs and improve quality of life. ALLO provides services in 11 Nebraska communities and two communities in Colorado. Several current projects involve partnerships with city governments. Breckenridge, Colorado, selected ALLO Communications to be the service provider for its new fiber9600 infrastructure project, which began connecting homes in late 2019. In Lincoln, Nebraska, ALLO leases city conduits, and extended the conduit system into residential neighborhoods and built fiber to the home. ALLO also is providing 77 Lincoln, Nebraska, nonprofits 10 years of free internet service. In Fort Morgan, Colorado, ALLO leases the city-owned fiber network to deliver broadband services. In 2019, ALLO reported revenue of $65.8 million, up from $44.7 million in 2018.

Alpha Technologies

www.alpha.com
800-322-5742; 360-647-2360

Key Products: Standby, non-standby and uninterruptible power supplies; surge suppressors; enclosures and batteries; installation and construction services

Summary: Founded in 1976, Alpha Technologies is a worldwide broadband power systems player. Alpha products provide power conditioning and emergency backup for video, data and voice networks. Alpha's installation and construction services include structural engineering, rights of way and easement procurement, site preparation, equipment installation, and system turnup and testing. Customers in 50 countries include major cable television system operators, telecommunications service providers and full-service communications providers. Alpha Technologies' FTTH powering options include the FlexPoint line of 12V DC single-family solutions and the FlexNet line of 48V DC multiple-dwelling-unit and small office/home office power supplies. Alpha, with more than 1,000 employees, has sales and service centers in the United States, Canada, Europe, the Middle East, China and Australia. It is a member of the Alpha Group, which EnerSys acquired last year.

Altice USA
www.alticeusa.com
516-803-2300

Key Products: Internet, video and voice services

Summary: Altice USA is one of the largest broadband and video providers in the United States, delivering broadband, pay TV, voice, Wi-Fi hot spot access, proprietary content, and advertising services through its Optimum and Suddenlink brands. Symmetrical 1 Gbps internet service over Altice's new FTTH network is being rolled out to residential customers in select areas of Long Island, New Jersey and Connecticut. Altice USA plans to expand gigabit broadband services via an accelerated fiber build and its whole home mesh smart Wi-Fi service. This positions it to offer 10 Gbps speeds for residential and business customers next year. Altice USA is enhancing its existing hybrid fiber coax network in the Optimum service area and plans to launch 1 Gbps broadband service via DOCSIS 3.1. The cable MSO is also adding gigabit capacity in the Suddenlink service area and expanding the Altice footprint through new-home builds. In February, it gave Optimum and Suddenlink customers access to smart Wi-Fi and brought Altice One entertainment to Apple TV. Headquartered in Long Island City, New York, Altice USA serves 4.9 million customers across 21 states and posted $9.76 billion in 2019 revenues.

NETWORK PLANNING, SYSTEMS INTEGRATION, DESIGN, ENGINEERING, CONSTRUCTION, INSTALLATION

(Excludes companies that provide these services only for networks they will own or manage.)

COMPANY NAME	WEB ADDRESS	COMPANY NAME	WEB ADDRESS
3-GIS	www.3-gis.com	GEOGRAPH	www.geograph.tech
ACRS	www.acrsokc.com	GigabitNow	www.gigabitnow.com
Adams Telephone Co-Operative / CheckPoint Solutions	www.checkpointsolutions.net	Henkels & McCoy Group	www.henkelsgroup.com
Advantage Engineers	www.advantageengineers.com	InfiniSys Multifamily Technology	www.rrh.com
AFL	www.aflglobal.com	Inteleconnect	www.inteleconnect.com
Alpha Technologies	www.alpha.com	KGPCo	www.kgpco.com
Atlantic Engineering Group	www.aeg.cc	Last Mile Connections	www.lastmile.net
BHC Rhodes	www.ibhc.com	Magellan Advisors	www.magellan-advisors.com
Biarri Networks	www.biarrinetworks.com	MasTec North America	www.mastec.com
Black & Veatch	www.bv.com	Michels Corporation	www.michels.us
CCG Consulting	www.ccgcomm.com	Mid-State Consultants	www.mscon.com
CHR Solutions	www.chrsolutions.com	NEO Connect	www.neoconnect.us
Conexon	www.conexon.us	Nokia	www.nokia.com
Corning Optical Communications	www.corning.com	OFS	www.ofsoptics.com
CTC Technology & Energy	www.ctcnet.us	On Trac	www.ontracinc.net
Danella Companies	www.danella.com	ONUG Communications	www.onugsolutions.com
Design Nine	www.designnine.com	OSPInsight	www.ospinsight.com
Dycom Industries	www.dycomind.com	Render Networks	www.rendernetworks.com
Fiberdyne Labs	www.fiberdyne.com	The Broadband Group / TBG Network Services	www.broadbandgroup.com
Finley Engineering	www.finleyusa.com	Vantage Point Solutions	www.vantagepnt.com
Foresite Group	www.foresitegroup.net	VETRO FiberMap	www.vetrofibermap.com
Fujitsu Network Communications	www.fujitsu.com/telecom	Walker and Associates	www.walkerfirst.com

> "Through the lens of the pandemic, we realize the culture in which we live is held together by the fiber of communications, especially in this time of social distancing."
>
> – Daniel Huffman, President, ONUG

Amphenol

www.amphenol.com
203-265-8900

Key Products: Fiber distribution solutions, fiber optic enclosures

Summary: With headquarters in Wallingford, Connecticut, Amphenol offers a wide range of coaxial cable, interconnect and passive products to serve the broadband market, from customer premises cables and interconnect devices to distribution cable and fiber optic components. The company's interconnect products are deployed in a range of broadband equipment, from headend equipment to digital set-top boxes, cable modems and satellite interface devices. The primary end markets for the company's products are communications and information processing markets, including cable television, cellular, and data communication and information processing systems; aerospace and military electronics; and automotive, rail and other transportation and industrial applications. In 2019, Amphenol acquired Charles Industries, a manufacturer of integrated environmental housings and enclosures for wireless, telecom and broadband service providers. Sales for 2019 were $8 billion.

AT&T / AT&T Connected Communities

www.att.com/connectme

Key Products: High-speed internet, next-generation TV, voice, advanced mobile services

Summary: AT&T is the largest FTTH provider in the United States. After undertaking a massive deployment, AT&T markets FTTH services to 22 million locations in 85 metropolitan areas. AT&T Fiber gained about 1.1 million subscribers over the past year, bringing the total AT&T Fiber subscriber base to about 3.8 million. As part of a plan to virtualize last-mile network access functions, AT&T tested a 10 Gbps XGS-PON virtualized network in Atlanta and Dallas. It is an active participant in two Open Networking Foundation broadband virtualization projects: Virtual OLT Hardware Abstraction (VOLTHA) and SDN-Enabled Broadband Access (SEBA). In addition to FTTH, AT&T also offers a G.fast option for MDUs. AT&T Connected Communities works with multifamily and single-family builders, developers, management groups and homeowners associations to provide communications and entertainment services. As the largest U.S. provider of pay TV, AT&T offers video entertainment through its AT&T TV platform, which it launched in March. AT&T TV is the telco's main national pay television service, positioned to succeed U-verse TV and satellite service DirecTV. (Although AT&T will support existing customers, it no longer sells U-verse TV.) In May 2020, AT&T launched HBO Max, a new streaming service with content from HBO, CNN, TNT, TBS and TCM. AT&T's revenue for 2019 was $181 billion, and the company employs more than 247,000 people in the United States alone.

Atlantic Engineering Group

www.aeg.cc
706-654-2298

Key Products: Outside-plant engineering, design and construction of FTTH networks

Summary: Atlantic Engineering Group (AEG), founded in 1996, focuses exclusively on the design and construction of fiber networks for long-haul, middle-mile, last-mile, and in-building applications. The company helps lead the drive to combine FTTH and smart-grid technologies into a single business plan for municipalities, rural electric cooperatives, and new entrants into the FTTH arena. AEG is headquartered in Buford, Georgia, but deploys in-house personnel and on-site project managers globally. It performs project management, service planning, engineering, underground and aerial construction, splicing, testing and many other professional and technical services. It has completed or is currently working on design or build commissions for more than 130 networks, including 65 FTTH projects that pass more than 2.5 million homes. AEG is currently building FTTH networks for clients in the cities of Fort Collins, Colorado; Newport, Tennessee; Muscatine, Iowa; and Hagerstown, Maryland, as well as in rural areas of New York and Vermont.

Baller Stokes & Lide

www.baller.com
202-833-5300

Key Products: Legal services, public policy advocacy

Summary: Baller Stokes & Lide has a long, consistent record of supporting the use of advanced broadband infrastructure to drive the development of economically strong local

communities. The firm represents public and private entities on a broad range of wired and (increasingly) wireless communications matters, both nationally and in more than 40 states. During the last two decades, the firm has worked on many leading public and public-private communications projects in the United States and has participated in most of the battles at the federal and state levels involving restrictions on local internet choice. As founder and president of the U.S. Broadband Coalition, the firm's president, Jim Baller, played a leading role in forging a national consensus on the need for a national broadband strategy and on the framework for such a strategy. He is co-founder and president of the almost 600-member Coalition for Local Internet Choice (CLIC), which works to preserve and protect the right of local governments to make the critical broadband infrastructure decisions that will affect their communities for decades to come. Founded in 1983, Baller Stokes & Lide is based in Washington, D.C. It has four full-time attorneys and a network of local and regional counsel across the United States.

BHC Rhodes
www.ibhc.com
913-663-1900

Key Products: Planning, design and construction of FTTx projects

Summary: BHC Rhodes provides civil engineering services to telecom firms that build and maintain fiber networks across the United States. It has designed and managed thousands of miles of telecom network infrastructure for clients that range from small communities and telcos to large international service providers. BHC Rhodes FTTx services include feasibility studies, cost estimating and budgeting; planning, layout and network architecture; GIS and AutoCAD mapping; hut site development and construction; outside-plant design; site surveys; right of way permitting and asset management. A key BHC Rhodes project is the Springfield, Missouri, SpringNet FTTH network. Based in Overland Park, Kansas, BHC Rhodes was founded in 1992 and has more than 135 employees.

Biarri Networks
www.biarrinetworks.com
303-524-1710

Key Products: Software and services for FTTx design automation, network planning, outside-plant engineering, mapping

Summary: Biarri Networks helps providers design and deliver fiber, fixed wireless and mobile wireless networks quickly by providing Fiber Optic Network Design (FOND), a web-based optimization and collaboration platform for digital engineering, planning and design that can automatically generate much of the deployment design. The company continues to roll out new updates for FOND; for example, to help customers navigate the utility pole attachment process for FTTH networks, Biarri introduced pole and aerial span editing tools in FOND. Biarri's team of experts also performs automated designs for fiber networks, combining technology, analytics, geospatial data and industry best practices. Besides FOND, Biarri offers custom-built design engines for enterprise clients, design services and consultancy services. The company recently provided automated network design for City Utilities in Springfield, Missouri, for its SpringNet FTTH network, which will connect more than 113,000 residents. Biarri, based in Australia, has American headquarters in Denver.

Black & Veatch
www.bv.com
913-458-2000

Key Products: Consulting, engineering, construction, operations, program management

Summary: Founded in 1915 and based in Overland Park, Kansas, Black & Veatch is a global engineering, consulting and construction company that specializes in telecommunications, energy, water and government services. Employee-owned Black & Veatch has approximately 10,000 professionals in more than 110 offices worldwide and has completed projects in more than 100 countries. Services include engineering, procurement, construction, design, management consulting, asset management, environmental consulting and security. Black & Veatch has deployed more than 30,000 miles of fiber for commercial carriers, cities and utilities. In February, the Pennsylvania Turnpike Commission chose Black & Veatch to install a new fiber optic network along more than 200 miles of the Pennsylvania Turnpike. Revenue in 2019 was $3.7 billion. In 2019, Black & Veatch's telecommunications business was ranked No. 1 by Engineering News-Record.

FIBER AND FIBER CABLE

These firms supply optical fiber for fiber access deployments.

COMPANY NAME	WEB ADDRESS
AFL	www.aflglobal.com
Clearfield	www.Seeclearfield.com
CommScope	www.commscope.com
Corning Optical Communications	www.corning.com
Fiberdyne Labs	www.fiberdyne.com
OFS	www.ofsoptics.com
PPC Broadband	www.ppc-online.com
Prysmian Group	www.prysmiangroup.com
Superior Essex	www.superioressex.com

"If we have learned anything from the COVID-19 crisis and subsequent lockdown, the time for fiber-based broadband is now. Those without it are at a severe disadvantage. Our industry must work closely with our Congressional leaders to prioritize sustainable funding of connectivity for high-cost rural areas."

— Darby A. McCarty, Chairman and CEO, Smithville

C Spire Home Services

www.cspire.com/home-services
855-438-1009

Key Products: Gigabit-speed internet access, live streaming video, digital home phone and smart-home services delivered over a fiber-based network

Summary: C Spire, a diversified telecommunications and technology services company, is building a fiber-based broadband network in Mississippi to attract investment and economic growth and pave the way for improvements in health care, education, civic life, business development and expansion, and municipal services. C Spire Home is bringing its Gigabit FTTH platform to Saltillo and Gulfport, Mississippi, with plans to add Biloxi this year to cover roughly 78,000 new households. Using a demand-based model, C Spire Home Services – the company's residential broadband unit – expanded to 20 markets at the end of 2019. In addition to its fiber builds, C Spire has advanced its network reach through electric utility partnerships with Entergy and Alabama Power. It completed an $11 million infrastructure project with Entergy, which serves 2.9 million electric customers. This agreement enables it to offer broadband services to some of Mississippi's most isolated rural areas. C Spire signed a similar partnership with Alabama Power to bring fiber-based internet to Birmingham and other parts of Alabama this year. The provider will use a demand aggregation model in Alabama to help gauge community interest and guide decisions on broadband deployment. New and existing customers can take advantage of its Smart Wi-Fi solution. Powered by smart-home services provider Plume, Smart Wi-Fi improves coverage while offering online security. Headquartered in Ridgeland, Mississippi, C Spire has 1,499 employees.

Calix

www.calix.com
408-514-3000; 877-766-3500

Key Products: Fiber access solutions for residential and business services, network and services management software, value-added software as a service

Summary: With more than 1,500 customers worldwide, Calix serves a wide range of North American FTTx providers and several international markets with fiber and copper solutions. In 2017, it completed a multiyear transformation from being a wireline-access systems provider to offering software platforms, cloud analytics, services and solutions. Calix Intelligent Access EDGE and Revenue EDGE solutions leverage its software platforms. Calix Cloud now delivers Calix Marketing Cloud and Calix Support Cloud to more than 500 customers. AXOS, a premises software platform that supports residential and business subscribers, powers the Calix EDGE Systems as well as third-party devices. The AXOS platform allows software functions in the access network to run independently of the underlying hardware. About 1,000 independent application modules run on AXOS. Calix's AXOS systems power Verizon's strategic One Fiber initiative to move residential, business and mobile transport services into a converged NG-PON2 network. To help service providers transition to SDN-enabled automation, Calix introduced AXOS SMx, which allows providers to deploy SDN networks with automated workflows over existing back-office systems. Earlier this year, Calix Professional Services added network consulting services to its lineup. Headquartered in San Jose, California, Calix had 2019 revenue of $424 million and more than 750 employees.

CCG Consulting

www.ccgcomm.com
202-255-7689

Key Products: Regulatory, engineering, marketing, strategy and planning services; raising money for broadband projects

Summary: In business since 1997, CCG is a full-service consultant for small communications carriers. The company specializes in launching new broadband ventures and making existing businesses more profitable. CCG offers a wide range of regulatory, engineering, strategy and planning, operations, budgeting and billing services. CCG helps clients design, upgrade and maximize fiber, coaxial, copper and wireless networks. CCG also offers direct operational assistance in areas such as number portability, new product development, cable programming, carrier disputes and billing audits. It is active in helping companies create workable public-private partnerships and secure funds for broadband projects – a

specialty for which demand is growing. CCG continues to work on numerous feasibility studies for communities of all sizes and is helping several communities build and launch new broadband businesses.

CenturyLink

www.CenturyLink.com/ConnectedCommunities
855-748-6123

Key Products: Fiber solutions, internet, voice, TV, managed services, cloud, hosting and security solutions

Summary: Offering DSL internet service across 50 states, CenturyLink is the third-largest residential provider in the country. CenturyLink markets fiber broadband services to residential customers in six metro areas, including Seattle; Portland; Denver; Salt Lake City; Omaha, Nebraska; and Minneapolis. It recently expanded its fiber network in several cities, including Boulder, Colorado, where it is completing a fiber construction project to bring 1 Gbps to homes and businesses. It will be the anchor tenant in a citywide broadband network called SpringNet in Springfield, Missouri, where it will build and own the final drops to connect homes and businesses and provide services. A key goal of the telco's fiber broadband expansion is to refresh its focus on the MDU segment and CenturyLink ON, its rapid-service-provisioning platform. Following an assessment, CenturyLink delivers service to MDU properties via Ethernet, Wi-Fi, or a combination of both solutions, including propertywide Wi-Fi. One MDU property taking advantage of CenturyLink's fiber broadband service is Grand Central at the Junction, a new development in Wentzville, Missouri. Headquartered in Monroe, Louisiana, CenturyLink has about 43,000 employees and posted operating revenue of $24.4 billion in 2019.

Charter Communications /
Spectrum Community Solutions

www.charter.com; www.spectrum.com
855-243-8892

Key Products: Advanced broadband services, including internet, TV, fiber Wi-Fi and MDU Wi-Fi solutions

Summary: Charter Communications, the second-largest cable operator in the United States, markets its services under the Spectrum brand. Spectrum Business provides broadband communications solutions to small and medium-sized business organizations. Charter serves more than 30 million customers in 41 states, offering internet, mobile and voice to residential customers, with more than 80 percent subscribing to 100 Mbps and higher speed tiers. Charter has doubled minimum internet speeds to 200 Mbps in several markets at no additional cost to new and existing Spectrum internet customers. Spectrum Community Solutions helps property owners offer technology amenities to residents, including professionally managed Wi-Fi, TV and voice. In February 2020, Charter announced plans to move toward 10G

symmetrical broadband speeds. As a first step, the company finished digitizing its 41-state footprint and rolled out DOCSIS 4.0. In response to the COVID-19 virus, Charter expanded its free, 60-day Spectrum broadband internet and Wi-Fi offer to include educators who are new Spectrum subscribers. Later, the company moved to virtual recruiting, hired more than 3,000 new employees nationwide and continues to hire during the COVID-19 crisis. With 91,000 employees, the company reported $45.8 billion in annual revenue in 2019.

CHR Solutions

www.chrsolutions.com
713-351-5111

Key Products: Outside-plant engineering and field services, network planning and design, managed NOC and managed IT services; communications billing software

Summary: CHR provides a range of engineering, business and technology solutions to communications service providers. The company offers engineering, consulting and design solutions and services to ILECs, CLECs, electric co-ops and utility and municipal service providers nationwide. CHR has designed FTTx networks that pass more than 2 million premises. Services include preparing applications for loans and grants; broadband planning; performing high-level, detailed design of outside plant for FTTx networks; permitting; converting GIS/CAD files and implementing outside plant. CHR engineering specializes in fiber design and has expertise in various communications technologies, including xDSL, PON, active Ethernet, Carrier Ethernet, fixed wireless, microwave and Wi-Fi. In addition, CHR provides B/OSS solutions and outsourced managed IT/NOC services utilized by several communications service providers. The company is headquartered in Houston.

NETWORK TESTING, MONITORING AND MANAGEMENT SERVICES

COMPANY NAME	WEB ADDRESS
AFL	www.aflglobal.com
Atlantic Engineering Group	www.aeg.cc
CHR Solutions	www.chrsolutions.com
Conexon	www.conexon.us
Design Nine / WideOpen Networks	www.wideopennetworks.us
Last Mile Communications	www.lastmile.net
Magellan Advisors	www.magellan-advisors.com
Michels Corporation	www.michels.us
Nokia	www.nokia.com
OSPInsight	www.ospinsight.com
VIAVI Solutions	www.viavisolutions.com

> "The increased interest GigabitNow has seen from communities looking for a FTTH solution over the last year and the demands of the recent global pandemic have had a direct effect on the availability of FTTH equipment, requiring us to adapt to meet expectations."
>
> – Dan Sivils, COO, GigabitNow

Cincinnati Bell

www.cincinnatibell.com; www.cincinnatibell.com/Fioptics
513-397-9900

Key Products: Telephone, data, video, wireless and information technology solutions

Summary: Cincinnati Bell and its consolidated subsidiaries provide integrated communications and IT solutions. Through its entertainment and communications segment, the telco provides high-speed data, video and voice solutions to consumers and businesses over an expanding fiber network and a legacy copper network. In March, the service provider was acquired by Macquarie Infrastructure Partners (MIP) for $2.9 billion. The company's combined fiber network in Cincinnati and Hawaii was approximately 17,000 fiber route miles at the end of 2019. As of December 31, 2019, Fioptics was available to approximately 75 percent of Greater Cincinnati, which includes a combination of fiber-to-the-premises (FTTP) and fiber-to-the-node (FTTN) addresses. In 2019, an additional 12,500 homes and businesses were passed with FTTP, which was available to 484,800 addresses, or approximately 60 percent of Cincinnati's total addressable market. Through a new partnership with Butler Rural Electric Cooperative, the telco will make FTTH available to more than 2,000 premises. As of December 31, 2019, consumer/SMB FTTP and FTTN service was available to approximately 50 percent of Hawaii. During 2019, an additional 6,500 homes and businesses were passed with FTTP, which was available to 173,500 addresses, or approximately 35 percent of Hawaii's total addressable market. Cincinnati Bell's revenue in 2019 was $1.5 billion.

Clearfield

www.Seeclearfield.com
763-476-6866

Key Products: Fiber distribution and protection systems for inside plant, outside plant and access networks

Summary: Headquartered in Minneapolis, Clearfield designs and manufactures fiber management, fiber protection and fiber delivery products that accelerate fiber services activation. The company has four main product lines: FieldSmart fiber distribution systems for the inside plant and FieldSmart fiber scalability centers for the outside plant; a fiber delivery point series for access networks; FieldShield, an optical fiber delivery and protection platform made of microduct and preconnectorized pushable fiber; and the YOURx platform, which accepts multiple types of drop cable media. All Clearfield product lines integrate with the Clearview Cassette 12-fiber management system. In 2020, Clearfield introduced three products to accelerate fiber deployments and reduce material and labor costs. The FieldSmart Fiber Active Cabinet for outdoor enclosures provides a single point of contact for passive and powered cabinet solutions. In April, Clearfield introduced the StreetSmart Fiber Hand-Off Box for fiber-based 5G deployments and its Home Deployment Kits, allowing DIY customers to complete the fiber connection from outside the home to the customer premises. In addition to enhancing its product line, Clearfield added a manufacturing plant in Tijuana, Mexico. Clearfield, which has 240 employees, posted $85 million in revenue for the year ending September 2019.

Comcast Cable / XFINITY Communities

www.xfinity.com; www.xfinity.com/xfinitycommunities

Key Products: Internet, video, voice and home security services

Summary: Comcast delivers internet, phone and media services to residential and business customers under the XFINITY and Comcast Business brands. XFINITY Communities works with building and property owners, developers, leasing agents and homeowners associations to provide services to MDU residents. Comcast offers 1 Gbps service to nearly all the homes and businesses in its U.S. territory over its HFC network, using DOCSIS 3.1 technology. It also delivers FTTH-based gigabit residential service in greenfield MDUs and offers a premium 2 Gbps symmetrical residential FTTH service to about 18 million homes. In 2019, Comcast launched an in-home Wi-Fi digital security service and expanded its managed broadband footprint into Canada. The cable MSO has also enhanced its Wi-Fi management and smart-city capabilities. Comcast acquired Deep Blue Communications, which provides engineering, installation and commercial Wi-Fi network management services. Meanwhile, its internet of things subsidiary, machineQ, collaborates with Neptune Technology

Group to accelerate smart-city projects for advanced water metering and infrastructure. During the COVID-19 pandemic, Comcast raised speeds of its Internet Essentials offering for lower-income subscribers from 15/2 Mbps to 25/3 Mbps for all new and existing customers. New families who connect will get 60 days of free internet service. As of the end of 2019, Comcast Cable had 31.5 million total customer relationships, including 29.1 million residential and 2.4 million business relationships. Passing more than 58 million homes and businesses, Comcast's total penetration of homes and businesses was 54 percent. A total of 26.4 million residential customers subscribe to Comcast's high-speed internet services, and 20.3 million subscribe to video services. Headquartered in Philadelphia, Comcast Cable is a division of Comcast Corporation. Comcast Cable reported 2019 revenue of $58 billion.

CommScope

www.commscope.com
828-324-2200; 800-982-1708

Key Products: Cable and connectivity products

Summary: With a suite of headend/central office, outside-plant and end-user broadband solutions, CommScope provides carriers, electric co-ops and other operators solutions to address residential, MDU, commercial and cellular backhaul applications. Founded in Hickory, North Carolina, CommScope is the largest supplier of subscriber-premises connectivity products and conduit products. By acquiring ARRIS and its subsidiary, Ruckus Networks, in 2019, CommScope solidified its position as a wired and wireless communications infrastructure solution provider. To capture the strategic value of these acquisitions, CommScope realigned into four business segments in 2020 – Venue and Campus Networks, Broadband Networks, Outdoor Wireless Networks and Home Networks. Ruckus Wi-Fi products continue to gain traction. XFINITY Communities has equipped Vantage, an off-campus housing development for Temple University students, with Ruckus Wi-Fi platforms. The new Ruckus R750 802.11ax indoor Wi-Fi access point is Wi-Fi CERTIFIED 6 from the Wi-Fi Alliance. For 2019, CommScope's Connectivity Solutions segment, which includes the company's fiber and copper cable connectivity offerings, reported $605.9 million, down 9.1 percent from 2018. However, the company's overall revenue was $8.34 billion, up 82.7 percent over 2018 because of the ARRIS acquisition.

Co-Mo Connect

www.co-mo.net; www.co-mo.coop
660-433-5521; 800-781-0157

Key Products: Gigabit internet, HDTV, phone service

Summary: A decade ago, Co-Mo Electric Cooperative, headquartered in Tipton, Missouri, served an area only 15 percent covered by broadband. In response to customer demand, it launched a successful FTTH pilot project that eventually led to the construction of a privately funded, $70 million, 4,000-mile fiber network covering the co-op's entire 2,300-square-mile territory. Operating under the name Co-Mo Connect, the network set an example that other electric co-ops have followed. Co-Mo Connect offers internet speeds that range from 100 Mbps to 1 Gbps. In 2018, Co-Mo was awarded more than $21 million over 10 years from the FCC Connect America Fund II auction. The money will support the current network and help expand it into adjacent areas. It is in the process of building out its network in three new areas – Barnett, Jamestown, and Prairie Home – and is conducting an active sign-up campaign in Otterville. Before Co-Mo begins building out services in a new city, it must hit a sign-up goal of 30 percent of residents. Co-Mo Connect serves thousands of subscribers with internet speeds that can support smart-home technologies as well as farm technologies that are proven to increase revenue. The company has about 80 employees.

NETWORK MANAGEMENT SOLUTIONS

These companies provide OSS or software for network monitoring, optimization, provisioning, service management, subscriber management, billing and related functions.

COMPANY NAME	WEB ADDRESS
3-GIS	www.3-gis.com
ADTRAN	www.adtran.com
Calix	www.calix.com
CHR Solutions	www.chrsolutions.com
COS Systems	www.cossystems.com
ETI Software Solutions	www.etisoftware.com
EXFO	www.exfo.com
GEOGRAPH	www.geograph.tech
GLDS	www.glds.com
Mapcom Systems	www.mapcom.com
Nokia	www.nokia.com
OSPInsight	www.ospinsight.com
VETRO FiberMap	www.vetrofibermap.com

"The next nine years are going to look a lot different for everyone, and broadband is going to shape it."

– Jay O'Neill, Fiber Program Director, Advantage Engineers

Comsof
www.comsof.com
416-594-9777

Key Products: FTTx network planning and design software

Summary: Comsof Fiber is a fiber network planning and design solution used by companies in more than 50 countries. The software allows users to automate and optimize fiber network design, saving time and capital on network deployments. The GIS-based solution can determine the cost of a network (bill of materials), select optimal equipment and routes, determine splice locations and even model pre-connectorized terminals. All the functionality is built with users in mind, integrating into existing GIS platforms (QGIS, ESRI ArcGIS) and/or network inventory solutions. Comsof even allows for optimized wireless and wireline planning, with a combined 5G-optimized design solution. The company currently provides software to a host of domestic and international providers, including SiFi Networks, ALLO Communications, TUV Rhineland and Proximus. ALLO Communications, which offers fiber-based broadband services to residents and businesses across Nebraska and Colorado, says Comsof's software enabled it to achieve about 25 percent in cost savings. Comsof is based in Ghent, Belgium, with North American headquarters in Toronto, Canada.

Conexon
www.conexon.us
202-798-3884

Key Products: Consulting services, fiber design and construction management, funding and operations for rural electric cooperatives deploying fiber to the home

Summary: As the urban-rural digital gap continues to widen, rural residents throughout the United States have begun to look to electric cooperatives as potential internet service providers. Conexon was founded in 2015 to help electric cooperatives leverage their fiber infrastructures to provide broadband services to their members. Conexon performs feasibility studies, secures financing, manages construction, optimizes business performance, advocates for rural broadband and manages ISP operations for co-ops that prefer to outsource operations. The company has two subsidiaries: a VoIP telephone and regulatory service business and a fiber splicing company. Conexon has worked with more than 175 electric co-ops on projects that have the potential to deliver fiber broadband services to millions of homes and businesses. Recent examples include its work with the Monroe County Electric Power Association (EPA) and Tombigbee Electric Power Association (TEPA), both based in Mississippi. Monroe County EPA will serve 10,800 members, and Tombigbee will deploy FTTH to its 43,980 members. More than 40 of those co-ops now actively deploy fiber to the home. Conexon has 100 employees and is headquartered in Kansas City, Missouri.

Consolidated Communications
www.consolidated.com
844-968-7224

Key Products: High-speed internet, data, phone, security, managed services, cloud services, wholesale carrier solutions

Summary: Mattoon, Illinois-based Consolidated Communications is a broadband provider serving consumers, business and wireless customers, and wireline carriers across rural and metro communities in a 23-state area. Through a series of acquisitions of providers such as FairPoint and its own organic initiatives, Consolidated has built a fiber network spanning 37,500 fiber route miles. The service provider has entered public-private partnerships to build fiber-to-the-premises networks to several Maine and New Hampshire rural communities. After New Hampshire passed a law enabling towns to issue bonds for broadband, Chesterfield, New Hampshire, struck a deal with Consolidated to build out a townwide FTTH network that will provide up to 1 Gbps speeds to residents. Consolidated completed a project delivering faster broadband speeds to 500,000 residents and small businesses throughout Northern New England, including delivering 1 Gbps to more than 86,000 New Hampshire locations. In 2019, the company launched CCiTV, a next-gen television service, and released enhanced security and business solutions, including DDoS Mitigation, Cloud Secure and several productivity solutions. Consolidated Communications reported $1.34 billion in 2019 revenues and has 3,400 employees.

Corning Optical Communications
www.corning.com
828-901-5000

Key Products: Optical fiber, optical fiber cable, FTTx product suite (cabinets, splitters, terminals, housings, drops), closures, connectors, cable assemblies, wireless access networks, engineering services, training

Summary: In 2020, Corning marks the 50th anniversary of launching the first commercial, low-loss optical fiber – an

innovation that transformed the communications industry. Corning remains a top provider in passive optical products and is the world's largest fiber producer. The company has been behind several innovations: loose-tube cable design, plug-and-play solutions for fiber to the home, and its modular data center solution. Its hardened, pre-connectorized products offer providers new FTTH network deployment options, and its ultra-bendable ClearCurve product suite lowers MDU installation costs. Designed for long-haul, metro and fiber-to-the-home network applications, Corning's SMF-28 Ultra Optical Fiber combines low attenuation with improved macro bend performance. Corning responded to the need for higher fiber counts with RocketRibbon, which doubles the density of fiber in a 200-micron outer diameter. Clear Track fiber pathways solve the challenge of pathway creation by creating less-invasive adhesive paths for fiber within MDUs. In 2020, Corning launched the Pushlok connector, reducing terminal size, facilitating lower costs and allowing quick connectivity. In 2019, Corning's optical communications business reported $4.2 billion in revenue.

COS Systems
www.cossystems.com
800-562-1730

Key Products: Demand aggregation software, BSS/OSS for managing open-access fiber networks

Summary: COS Systems' cloud-hosted software helps network owners plan, deploy and manage broadband networks to deliver services from one or more providers. COS Service Zones is a demand aggregation tool that enables network builders to identify grassroots interest in better broadband, spread awareness of their projects and presell internet connections using a fiberhood approach. COS Business Engine is a BSS/OSS suite for managing and operating fiber networks. It enables operators to market and sell services from multiple providers in an online marketplace. COS clients include private ISPs and operators, public-private partnerships, municipalities, and utilities and cooperatives in North and South America, Europe, Africa and Asia. In 2019, COS Systems launched COS Business Engine Cloud 2.0 – an upgrade to the cloud-hosted version of the BSS/OSS – and several new features for the COS Service Zones platform. It partnered with the Northwest Open Access Network (NoaNet) to deliver demand aggregation projects in Washington state. In 2020, COS Systems and Nokia integrated the COS Business Engine with Nokia's element management system, AMS, to attract U.S. providers. The platform allows open-access network operators to offer automated provisioning for multiple service providers over GPON and active Ethernet networks. Privately held COS Systems is headquartered in Umeå, Sweden, and has U.S. headquarters in New York City. With 19 employees, it posted revenue of $3.5 million for 2019.

Cox Communications
www.cox.com

Key Products: High-speed internet, advanced digital video, digital voice and smart-home services

Summary: As the largest private telecom company in the United States, Cox Communications serves 6 million homes and businesses across 18 states. Cox was one of the first to launch residential gigabit internet speeds, now available to more than 60 percent of its customers nationwide. A large portion of Cox's greenfield gigabit deployments, both single-family and multifamily, use FTTH; upgrades of existing plant typically use "deeper fiber" HFC networks. The cable MSO joined NCTA, CableLabs, Cable Europe and other large cable operators to implement the 10G initiative, a technology platform that provides a path from 1 Gbps to 10 Gbps over existing HFC plant. Cox Communications teamed with US Ignite to help make Las Vegas, Phoenix and San Diego among the first "Smart Gigabit Communities" and teamed with the White House and HUD to bridge the digital divide for low-income families with school-age children through its Connect2Compete internet offer. Later, it increased Connect2Compete program speeds to 25/3 Mbps. Cox also launched Cox2M, which provides custom IoT solutions for businesses and cities. In December 2019, Cox partnered with Henderson, Nevada, to pilot its smart technology in the city's Water Street District Innovation Corridor. Cox Communications is the largest division of Cox Enterprises, a family-owned business founded in 1898 by James M. Cox, who later served three terms as governor of Ohio.

CTC Technology & Energy
www.ctcnet.us
301-933-1488

Key Products: Fiber and wireless broadband network design, engineering, financial analysis, strategy, assessment and implementation

Summary: CTC provides independent business and engineering consulting services to public-sector and nonprofit clients. Its expertise includes fiber and wireless network feasibility analysis, strategic planning, business planning, financial analysis, market assessment, design, engineering, construction oversight, QA/QC, RFP/RFI preparation, grant applications, grant compliance and negotiations with private-sector partners on behalf of clients. CTC provided broadband engineering and network financial planning services to the cities of Baltimore, Boston, Boulder, Madison, Palo Alto, Portland, San Francisco, Seattle, and Washington, D.C. CTC played a key role in helping negotiate broadband public-private partnerships on behalf of the city of Westminster, Maryland; the coalition of the cities of Urbana and Champaign and the University of Illinois; and rural Garrett County, Maryland. CTC has also provided strategic broadband guidance to Connecticut, Delaware, Massachusetts and New Mexico. Founded in 1983, CTC is headquartered in the Washington, D.C., area and has satellite offices in many other states.

> "One thing that is certain in this environment is that internet connectivity is fundamental to our lives and livelihoods; deployment speed and efficiency have therefore never been more important."
>
> – Sam Pratt, CEO, Render Networks

Danella Companies
www.danella.com
610-828-6200

Key Products: FTTH network design, engineering, construction and testing

Summary: Founded in 1972 and headquartered in Plymouth Meeting, Pennsylvania, Danella Companies has 17 divisions operating from 29 geographically diverse facilities in 12 states. Danella Construction performs approximately $225 million in work per year and is a leading installation contractor for all types of utilities, providing services for the power, gas distribution, water and communications industries. Danella continues to expand its FTTH services for Tier-1 service providers and municipalities. By acquiring Florida-based Viking Utility Services earlier this year, Danella expanded its underground utilities power and communications infrastructure installation and repair expertise. Viking's capabilities include new construction development infrastructure, overhead to underground electric conversion, communications (fiber, coax, FTTX), directional drilling, and locating services. Danella bolstered its ranking on the 2019 Engineering News-Record's report. The company was ranked No. 87, moving up from No. 93. It also ranked No. 8 in the Top 20 Utility Firms listing.

Design Nine / WideOpen Networks
www.designnine.com; www.wideopennetworks.us
540-951-4400

Key Products: Broadband planning and feasibility studies; network technical design, cost estimates, implementation plans, network and business financial planning; broadband project management; network buildout and operations

Summary: The broadband planning and network design firm Design Nine is well known for its expertise in local-transport and open-access networks. Design Nine's services include fiber and wireless network design, grant-writing assistance, needs assessment, broadband network buildout assistance, financial modeling, business planning, legal and organizational design of community-owned broadband systems, and project management. Open-access networks it planned and designed include Bozeman Fiber in Montana; Palm Coast FiberNET in Florida; nDanville, Rockbridge and Wired Road in Virginia; FastRoads in New Hampshire; AccessEagan in Minnesota; and fiber to the home in Blacksburg, Virginia, and Charles City County in Virginia. Design Nine's subsidiary, WideOpen Networks, manages community-owned and private-sector networks, providing network monitoring, service provisioning, service provider attraction, asset management, billing and outside-plant management. Design Nine's broadband planning work continues to expand, with a sharp increase in the number of feasibility studies completed and a steady increase in the number of municipalities requesting help. In the past 12 months, Design Nine has worked with 33 localities to develop broadband planning and feasibility recommendations in five states and managed four fiber and wireless broadband network buildouts. Headquartered in Blacksburg, Virginia, Design Nine works on projects throughout North America.

Ditch Witch
www.ditchwitch.com
580-336-4402; 800-654-6481

Key Products: Construction equipment for laying fiber

Summary: Ditch Witch offers tools that allow service providers to dig efficiently through challenging terrain, congested roadways and manicured lawns to build FTTH networks. It specializes in developing underground construction equipment, including trenchers, microtrenchers, vibratory plows, horizontal directional drills, mud recycling and fluid systems, drill pipe, HDD tooling, vacuum excavation systems and mini skid steers. Ditch Witch microtrenchers are designed to improve productivity and reduce the cost per foot on fiber job sites. The company's newest fiber installation offering is the JT20XP horizontal directional drill package, which features the JT20XP drill and XP44 mixing system for midsize utility installation jobs. In 2019, Toro Company acquired Ditch Witch's parent company, Charles Machine Works, for $700 million, a deal that allows Ditch Witch and other associated Charles Machine Works brands to access Toro's reach and presence as a large international brand. Charles Machine Works is also the parent of several other underground-construction brands, including Subsite Electronics, DW/TXS, HammerHead, Radius HDD, American Augers, Trencor and MTI Equipment. Among the company's latest underground construction products are the RT80 Trencher and the JT24

Directional Drill. To help contractors centralize fleet and machine information, Ditch Witch launched the Stand-On Skid Steer, the HX30G Vacuum Excavator and the Orange Intel Fleet Management System. Ditch Witch's factory is in Perry, Oklahoma, and the company has more than 1,400 employees. Its equipment is distributed through a worldwide dealer organization that operates in more than 100 countries through more than 170 locations.

Dura-Line Corporation
www.duraline.com
800-847-7661

Key Products: Conduit, cable-in-conduit, microducts, accessories

Summary: Dura-Line develops and manufactures high-density polyethylene conduits for protecting fiber optic, electrical and coaxial cables. It supplies fiber optic conduit and related products to telecom, data, cable TV, power and other markets. Customers include leading U.S. and international telephone and cable providers. Dura-Line developed the first ducts for installing and protecting fiber optic cables in 1981, introduced a complete line of fiber optic microduct products in 2001, and followed up in 2003 with FuturePath, a bundled package of microducts that can be installed the same way as traditional conduit. FuturePath allows up to 24 pathways in a single conduit, and the FuturePath Figure-8, introduced in 2018, allows seven microducts to be bundled into one conduit for aerial fiber. Other recent product releases include new conduit and microducts made from a low-smoke, zero-halogen material designed for use where smoke, toxic fumes and acidic gases pose risks. Dura-Line, which is owned by Orbia, has 20 locations and 1,500-plus employees worldwide.

Dycom Industries
www.dycomind.com
561-627-7171

Key Products: Program and project management, engineering, construction, maintenance, installation services

Summary: Dycom provides specialty contracting services, including engineering, construction, program and project management, materials provisioning, installation and maintenance, to telecommunications, CATV and broadband providers throughout the United States. Its subsidiaries provide services to construct, install, optimize and maintain communications facilities. The company offers a full suite of turnkey services for wireline and wireless networks, including planning, site identification and acquisition, architectural and engineering services, design, project management, materials purchasing and distribution, infrastructure construction, tower construction, equipment and antenna installation, cable placement and splicing, central office EF&I, commission,

integration, residential and commercial installations, customer acquisition, locating services and maintenance. AT&T, Comcast and Charter all recently awarded Dycom construction and fulfillment service contracts and extensions, and Dycom recently signed a rural fiber services contract covering two states. Founded in 1969 and headquartered in Palm Beach Gardens, Florida, Dycom has more than 14,920 employees. It posted $3.1 billion in revenue for fiscal year 2019.

EPB Fiber Optics
www.epb.com
423-648-1372

Key Products: Voice, video, data and smart-grid services provided over a fiber optic network

Summary: EPB's fiber-to-the-premises network is frequently cited as a municipal broadband success story. It delivers internet, voice and video services and serves as the backbone for Chattanooga's smart grid. This self-healing electric distribution system automatically reroutes power around storm damage and other disruptions to increase power reliability and reduce outage durations by more than 50 percent, which helps business and residential customers avoid $55 to $60 million in annual losses associated with spoiled goods, lost productivity and other outage-related damages. The smart grid also improves operational efficiency and provides detailed usage information for electricity customers in tandem with the myEPB app. Launched in 2009, EPB Fiber Optics serves more than 100,000 homes and businesses. Following the debut of 1 Gbps speed in Chattanooga, EPB launched a 10 Gbps internet service, which is available as a standard offer to all residential and commercial customers anywhere in the EPB service area, in 2015. Last year, EPB tripled its 100 Mbps starting internet speed to 300 Mbps at no additional cost. To help students affected by the COVID-19 crisis, it is providing Hamilton County students and their families access to free EPB Quick Connect Wi-Fi hot spots at 27 locations across the community. In collaboration with such organizations as the Company Lab and the Chattanooga Area Chamber of Commerce, the community launched a business accelerator, called GIGTANK, aimed at spurring innovation. The program brings students and entrepreneurs from all over the world to Chattanooga to develop next-generation apps and disruptive business ideas using EPB's gigabit network. Since 2015, EPB has played a role in 60 research projects by Oak Ridge National Laboratory and other national research partners.

"We believe in the potential for powerful breakthroughs in a connected world."

– James Salter, President, AEG

ESPi
www.espicorp.com
877-799-3774

Key Products: UPS batteries for fiber installations

Summary: Kansas-based ESPi manufactures several lines of UPS (uninterrupted power supply) batteries for FTTH installations. UPS batteries provide immediate protection against input power interruptions with batteries that take over for a short period of time until a standby power source kicks in or the equipment shuts down properly. The company offers indoor and outdoor solutions as well as solar and hybrid batteries. ESPi introduced the first onboard ONT reset button with remote reset capabilities. ESPi's UPS product line includes NEO Indoor, TITAN Outdoor, TITAN Solar and TITAN Duplex. VOLTAR, an off-grid solution, supplies power to remote locations. Customers include Valley Telecom Cooperative in Clifton, Arizona, which recently installed the Titan battery system for its fiber customers. ESPi distributes its products through various partners, including Border States, United Tel-Supply, Graybar, Goldfield Telecom, KGP Logistics, and Power & Tel. Founded in 2009 and based in Clay Center, Kansas, ESPi is privately owned.

ETI Software Solutions
www.etisoftware.com
770-242-3620; 800-332-1078

Key Products: Software for managing broadband service and subscriber activation and configuration, device management and analytics

Summary: ETI Software Solutions specializes in operational software for service and subscriber provisioning, network configuration, inventory control and performance management for broadband service providers. Designed for fiber network operators, including municipalities, utilities and electric co-ops, its Vision360 software features order entry and work order management, automated service provisioning, device inventory and device management, network management tools and advanced visual analytics to help maximize revenue. ETI's software manages more than 15 million devices globally and completes 7 billion transactions per day. In 2019, ETI Software launched its Vision360 platform, which provides 10G provisioning on XGS-PON networks. This is an important step toward enabling service providers to deliver new ultra-broadband services, such as streaming 4K, 8K and 12K video, and business applications, such as telehealth. Partnerships with other software and consultants are also key to the company's mission. ETI announced a northbound integration between its flagship product, Vision360 OSS, and Amdocs's Smart Pack. The Smart Pack–Vision360 OSS integration is now operational at Hotwire Communications.

EXFO
www.exfo.com
418-683-0211; 800-663-3936

Key Products: Testing, monitoring and analytics solutions for the communications industry

Summary: EXFO, headquartered in Quebec, Canada, has offered testing, monitoring and analytics solutions for nearly 35 years. The company has expertise in lab and field testing and provides solutions that automate FTTH testing and workflows to boost efficiency and subscriber quality of experience. EXFO's FTTH test portfolio includes fiber inspection solutions; OLTS, OTDR and iOLM, including CWDM and DWDM models; PON power meters; Ethernet protocol testers; and end-to-end monitoring solutions for the physical and service layers. In mid-2019, it introduced the Optical Xplorer, an optical fiber multimeter that verifies optical links and automatically finds and identifies faults. It also introduced the Optical Wave Expert, a device that integrates DWDM channel power validation and intelligent OTDR fault-locating capabilities on a single port. The company has more than 1,900 employees in more than 25 countries and counts 95 percent of the world's top communications service providers as customers. In fiscal 2019 (ended August 31, 2019), EXFO reported revenue of $287 million.

Fiberdyne Labs
www.fiberdyne.com
315-895-8470; 800-894-9694

Key Products: Optical passive devices, multiplexers, fiber optic cable assemblies, termination boxes, FTTH drop cables, fiber testing and installation services

Summary: Fiberdyne Labs, Inc., established in 1992, is a manufacturer of stock and custom fiber optic products, including termination boxes, passive modules (WDM and fiber splitters), fiber jumpers, pigtails and MPO cables and cassettes. Recent product introductions include FTTH drop cables, various wavelength-division-multiplexing solutions and a new 1RU termination box. The company also offers fiber characterization testing and installation services nationwide.

With its fiber characterization service, Fiberdyne can determine whether a fiber plant will support a network provider's network equipment and transmission speed. Its installation services include managing, terminating, troubleshooting and testing copper and fiber optic cabling. It also offers fiber optic splicing services to repair broken fiber optic cables or to splice on factory terminated pigtails. Headquartered in Frankfort, New York, Fiberdyne has 92 full-time employees.

Finley Engineering
www.finleyusa.com
800-225-9716

Key Products: Broadband network consulting, design and engineering services

Summary: Finley Engineering has 67 years of communications and electric power engineering experience and 30-plus years of experience with fiber communication and data projects. It works with organizations that provide fiber connections to improve quality of life and economic opportunities. Finley has more than 250 employees nationwide and is one of the largest communications network design companies in the United States. Specializing in end-to-end engineering consulting, Finley works with telecom providers, electric cooperatives, municipalities and counties to find the best broadband strategies to fit specific needs. Every project starts with a strategic discussion regarding broadband and includes all stakeholders to gather critical information and perspectives. Finley's approach is from start to finish – from the initial feasibility study to project completion. Finley helps clients secure rural broadband funding from the FCC's Rural Development Opportunity Fund (RDOF) and the USDA's ReConnect Program. Recently, Finley clients Ballard Rural Telephone Cooperative and Duo County Telephone Cooperative secured a $2.4 million and an $18.7 million grant to deploy an FTTP network in several rural Kentucky areas.

Foresite Group
www.foresitegroup.net
770-368-1399

Key Products: Broadband engineering, wireless services

Summary: Foresite Group is a multidisciplinary engineering, planning and consulting firm providing collaborative services to public- and private-sector clients nationwide. Its broadband engineering practice area integrates expertise in fiber optic engineering services, management and consultation to provide comprehensive broadband connectivity programs to clients and communities. Clients include Huntsville Utilities; the city of Broomfield, Colorado; Verizon and AT&T. Foresite Group was instrumental in the Huntsville Utilities fiber infrastructure network buildout, in which HU designated fibers for its own use and smart grid applications while leasing a portion to Google Fiber. The firm also completed an FTTH feasibility study for a Tier-1 service provider in Charleston, South Carolina, in coordination with CHC Consulting. Headquartered in the Atlanta area, Foresite Group has 180 associates in 14 offices nationwide.

Fujitsu Network Communications
www.fujitsu.com/telecom
888-362-7763

Key Products: Consulting; broadband solution design, deployment, operations and maintenance; managed network services; hardware and software integration services; multivendor equipment selection; project management; network operations center

Summary: Fujitsu Network Communications Inc., based in Richardson, Texas, builds middle-mile and last-mile fiber and wireless networks, partnering with states, municipalities and utilities. It works with customers or their consultants to plan, design, build, operate and maintain broadband networks, delivering custom, end-to-end network integration. Fujitsu offers a vendor-agnostic approach to provide turnkey solutions for FTTx implementations with the best of multivendor wireline, wireless and software technology. It has served as a prime integrator for high-profile projects that include an FTTH deployment by Kit Carson Electric Cooperative in Taos, New Mexico, and a middle-mile network for Horizon Telcom in southern and eastern Ohio. Another key project was serving as prime network integrator for municipal broadband provider FairlawnGig, where Fujitsu currently maintains the network. A recent online survey revealed overall customer satisfaction with FairlawnGig is 94 percent. Traverse City (Michigan) Light & Power also tapped Fujitsu, launching a gigabit broadband service for businesses, public facilities, and residents in fall 2019. Fujitsu Network Communications is a subsidiary of Fujitsu Limited, a global information and communications technology company based in Japan that offers a full range of technology products, solutions and services in more than 100 countries. Fujitsu Limited, which has approximately 132,000 employees, reported consolidated revenues of $36 billion for the fiscal year that ended March 31, 2020.

FIBER-TO-THE-HOME ELECTRONICS

These companies provide FTTH electronic equipment for central offices, customer premises and home networking equipment designed to work with FTTH.

COMPANY NAME	WEB ADDRESS
ADTRAN	www.adtran.com
Calix	www.calix.com
Nokia	www.nokia.com
Zyxel Communications	www.zyxel.com

"The hypothetical use cases of yesterday – telemedicine, augmented reality, remote workforces, remote learning, automated manufacturing and delivery – are now the reality of today. The need for digital transformation built upon a dense, reliable and resilient network infrastructure of fiber optics and 5G wireless connectivity is not a nicety but a necessity in what will forever be our new world."

– Seán Adam, VP of Market Strategy and Innovation, AFL

GEOGRAPH
www.geograph.tech
800-674-4803

Key Products: GIS-based software and support for designing, planning, mapping and managing fiber, copper and coax networks

Summary: GEOGRAPH provides service providers, government agencies and universities with the tools and expertise to control their networks. Built for Esri's platform, GEOGRAPH offers several extensions – CrescentLink Network Manager, CrescentLink Project Planner and the FourSevens (477) tool. Built by engineers and developers to manage fiber, copper and coaxial networks, CrescentLink Network Manager can track and manage equipment, individual cable strands, splices, poles, pedestals, hand holes, panels and every connection right down to the port level. Engineered to combine design, construction, staking, reporting, cost estimation and project management within a GIS, CrescentLink Project Planner is an extension that can be used alongside the Network Manager or as a stand-alone product. The most recent development, FourSevens, is a free tool designed to make it easier for broadband providers to submit the FCC Form 477 by parsing feature classes and generating the required CSV file. GEOGRAPH also shares its expertise with companies looking to plan and build out network assets, seeking to audit and inventory existing assets, and migrating data to a GIS platform. GEOGRAPH works with a wide range of customers, including HTC, Mid Atlantic Broadband and the University of Kentucky. A spinoff of Palmetto Engineering and Consulting, GEOGRAPH was founded in 2018 and is headquartered in Clemson, South Carolina.

GigabitNow
www.gigabitnow.com
866-748-8066

Key Products: FTTH network solutions and internet services, including design, construction, operations, connectivity and customer support

Summary: GigabitNow offers communities of all sizes fast, reliable and affordable fiber internet without bandwidth caps and free from privacy worries or service constraints. The company offers customized solutions for the development, construction, operations, support and delivery of gigabit fiber internet networks. GigabitNow concentrates on providing gigabit-class networks and services to unserved and underserved municipalities, multi-tenant buildings, and private communities. In the last year, GigabitNow began deploying teams into southern California focused on working with businesses and residents in the city of Fullerton as part of its FiberCity project with SiFi Networks; it has also started working with customers in neighboring communities on new connectivity services. Several new FiberCity projects with SiFi are expected to be announced this summer. The company is in the middle of deployment and turnup of new FTTH community networks in Oregon and Arizona. GigabitNow also began a long-term partnership with a developer of independent senior living communities in 2019. Founded in 1991, GigabitNow is a division of IsoFusion, one of the largest privately held full-service ISPs and colocation providers in Washington state.

GLDS
www.glds.com
800-882-7950

Key Products: Software for broadband customer management, billing, provisioning and workforce management

Summary: Since 1980, GLDS has helped small operators look big by providing billing and management software at affordable prices – including cloud-based options that require a much smaller investment. Partnering with major equipment suppliers, GLDS supports FTTH, IPTV, DOCSIS, OTT, LTE, wireless and legacy delivery systems. GLDS supports native (not DOCSIS) provisioning for Calix, ADTRAN, Nokia and other FTTH platforms. GLDS has installed solutions for more than 800 small and midsize broadband operators, including FTTH, cable, satellite and wireless operators ranging from small startups to providers

with more than 550,000 customers. GLDS has offices in California, Wisconsin, Alabama and Lithuania and supports operators in 49 U.S. states and 47 countries worldwide. Key products include BroadHub for customer management and billing and SuperController for automated provisioning. MyBroadbandMarket allows operators to win new subscribers 24/365 by providing a virtual salesperson that can take customers through an online shopping and self-subscribe "mall." WinForce tech, a mobile workforce management platform, empowers field techs with tools previously available only to office staff. The GLDS best-of-suite approach ensures that critical features come pre-integrated, eliminating the need for expensive, lengthy development timelines.

GoNetspeed

www.gonetspeed.com
855-891-7291

Key Products: Internet access, video, voice services

Summary: An ambitious startup headquartered in Rochester, New York, GoNetspeed serves residential and small-business customers on its high-speed fiber optic network. The company was founded by Frank Chiaino, who formed Fibertech Networks, a company that built more than 14,000 miles of fiber network across the Northeast. It launched services late in 2017 and, during the first six months of 2018, built 100 miles of network across 13 towns in two states, making service available to more than 30,000 homes. In 2018, GoNetspeed began building fiber in West Hartford, New Haven, and Bridgeport, Connecticut, providing residential customers and small businesses access to internet speeds up to 1 Gbps. It announced in February that it will expand to more than 30,000 homes in the West Hartford area. In Pennsylvania, it constructed an initial footprint in select areas of Pittsburgh and plans to quickly expand to nearby communities as part of its multiyear, multimillion-dollar private investment. In tandem with its aggressive network buildout strategy, GoNetspeed is taking an unusual approach to customer care and pricing. It offers 24/7 customer support and a "Lifetime Price Pledge" guaranteeing that for the entire time a resident is a customer and within its service territory, GoNetspeed will not raise its monthly internet fee.

Graybar

www.graybar.com
800-GRAYBAR (472-9227)

Key Products: PON electronics, fiber cabinets and enclosures, fiber optic cable, fiber splice closures and pedestals, DC power, fiber terminals

Summary: Graybar is a North American distributor of products and materials for telecommunications and other industries. FTTH and related solutions represent a significant portion of Graybar's broadband business. Independent telephone companies, competitive phone companies,

municipalities, RUS plow contractors, wireless backhaul providers, central-office contractors and cable companies all depend on Graybar. Founded in 1869 as Gray and Barton, today Graybar sells thousands of items from major manufacturers; its value-added services include kitting and integrated solutions. Graybar observed its 150th anniversary and 90 years of employee ownership in 2019. A Fortune 500 company with net sales of $7.5 billion in 2019, Graybar employs 9,000 people at 288 locations throughout the United States, Canada and Puerto Rico. It is one of North America's largest and oldest employee-owned companies.

GVTC

www.gvtc.com
830-885-4411; 800-367-4882

Key Products: Internet, cable TV, smart-home security, phone

Summary: GVTC is an independent ISP delivering high-speed internet, cable TV, smart-home security and phone to residential and business customers in far northern San Antonio, the Texas Hill Country and South-Central Texas. Today, more than 80 percent of GVTC's service area has FTTH capability, with more expansion projects in the pipeline for 2020. In early 2019, GVTC simplified its FTTH offerings with a new tier structure. The new plans feature standard symmetrical speeds of up to 250 Mbps, with options to upgrade to 500 Mbps and 1 Gbps. Later, GVTC launched a premium Wi-Fi service with a Wi-Fi 6 router and a mobile app to control and customize subscribers' Wi-Fi experiences. To date, GVTC has installed nearly 10,000 new routers. As of March 2020, GVTC ranked No. 1 nationwide among all U.S. internet service providers on the Netflix ISP Speed Index. A key element of GVTC's fiber buildout strategy is ongoing collaboration with the local economic development agencies and municipalities that use its fiber network to recruit and retain businesses. For example, GVTC built out fiber across Boerne, Bulverde and Gonzales in partnership with the cities to make them attractive destinations for residents and businesses, and GVTC is working with other nearby communities on similar fiber expansion partnerships. Located in New Braunfels, Texas, GVTC has 224 employees.

TEST AND MEASUREMENT EQUIPMENT

COMPANY NAME	WEB ADDRESS
AFL	www.aflglobal.com
Corning Optical Communications	www.corning.com
EXFO	www.exfo.com
Nokia	www.nokia.com
PPC Broadband	www.ppc-online.com
VIAVI Solutions	www.viavisolutions.com

"We will continue to see emerging wireless technology and services dominate and making these new services a reality brings us back to fiber. Widespread deployment of wireless services will require more wireline infrastructure than ever."

– Kevin Morgan, Chief Marketing Officer, Clearfield

Henkels & McCoy Group
www.henkelsgroup.com
888-HENKELS (436-5357)

Key Products: Planning, design, engineering, project management, construction, operations management, installation

Summary: Founded in 1923, Henkels & McCoy Group Inc. (HMG) is a utility construction firm that provides critical infrastructure for power, oil and gas pipeline; gas distribution and communications markets in North America. It is the parent holding company of Henkels & McCoy Inc., HMI and H&M Shared Services. HMG has been an FTTH pioneer, performing feasibility studies, project management, construction management, implementation of outside plant and inside plant and underground and aerial construction. It has regional, area and project offices across the United States; more than 5,000 employees; and more than 8,300 pieces of modern equipment, allowing the provision of end-to-end solutions. The company headquarters is in Blue Bell, Pennsylvania. In 2019, it advanced from eighth to sixth among construction magazine ENR's top specialty contractors.

Hotwire Communications
www.hotwirecommunications.com;
https://gethotwired.com/
800-409-4733; 800-355-5668

Key Products: Residential, commercial and municipal high-speed data; network management; Wi-Fi solutions; security; whole unit/home automation; digital voice and HD IPTV video services delivered over FTTP networks

Summary: Launched in 2002, Hotwire Communications, headquartered in Fort Lauderdale, Florida, is one of the largest independent providers of fiber-to-the-premises broadband solutions in the United States. It provides services to private residential communities, condominiums, apartments, hotels, multi-tenant commercial buildings, government buildings, student housing, and senior and assisted living facilities across several southeastern and northern states. The provider designs, builds and operates its telecom and in-home entertainment services as a competitive local exchange carrier and franchised cable operator under its Fision brand. As the first residential gigabit internet provider in Florida, Hotwire recently provided a 10 Gbps symmetrical connection to the Fontainebleau

Miami Beach. It also completed a 10 Gbps network (scalable to 100 Gbps) for the Miami Beach Convention Center and was selected to operate the Salisbury, North Carolina, municipal fiber network. In November, Hotwire completed a back-office project with Amdocs that allows it to not only introduce new offerings and cross-product bundles and promotions more rapidly but also optimize technician workflows and schedules. Last year, it partnered with CareerSource Broward and Broward College so Hotwire employees could enroll in the Broward College IT Apprenticeship Program, covering up to 60 weeks of instruction.

InfiniSys Multifamily Technology
www.rrh.com
386-236-1500

Key Products: Telecommunications and broadband network design for multiple-dwelling-unit buildings, amenity selection, low-voltage and wireless system engineering, contract negotiation, project management, acquisition assessment

Summary: To differentiate their communities, MDU owners call on InfiniSys, a company focused on building multifamily electronic architectures. Based in Daytona Beach, Florida, the firm represents developers and property owners in negotiations with service providers and low-voltage contractors nationwide. As an independent technology adviser and developer, InfiniSys creates comprehensive, standards-based amenity solutions that include IoT, entertainment, access control, video surveillance, digital signage and messaging, energy management and leisure-space control systems for new and existing apartments, condominiums, student housing, senior housing, hotels, mixed-use developments and master-planned communities. The thousands of projects InfiniSys has undertaken since its inception in 1990 have garnered many awards for forward-thinking solutions and exceptional customer support. InfiniSys works with electronics and infrastructure manufacturers, software developers and public and private service providers to create new products and service offerings, including IoT solutions. It developed and successfully trademarked both the NetworkedApartment and SmartApartment brands.

Institute for Local Self-Reliance

www.ilsr.org; www.MuniNetworks.org
612-276-3456

Key Products: Broadband policy research and municipal broadband advocacy

Summary: Since 1974, the Institute for Local Self-Reliance (ILSR) has championed local self-reliance based on human-scaled institutions and widely distributed ownership. The nonprofit organization, which has offices in Maine, Minnesota and Washington, D.C., conducts research, advocacy and education that support local control of energy, recycling, financing, broadband and other initiatives. ILSR promotes the intelligent use of advanced technology to achieve locally determined goals. Its Community Broadband Networks Initiative is a source of information and analysis about locally based fiber-to-the-premises projects (those owned by municipalities, cooperatives and public-private partnerships). ILSR's publications, including its MuniNetworks.org blog, toolkit and weekly podcast that covers broadband and more (Community Broadband Bits, on Apple Podcasts and elsewhere), have shown communities that controlling their broadband destinies is feasible and has the potential to improve local economies and quality of life.

Inteleconnect

www.inteleconnect.com
734-604-1563

Key Products: Service provider negotiations, financial feasibility plans, fiber infrastructure design, consultation, situation analysis

Summary: Founded in 1998, Inteleconnect develops telecommunications strategies for municipalities, college and university campuses, mixed-use developments, and small, medium and large businesses. The company designs and manages service-provider-neutral networks (it designed, implemented and currently manages the St. Joe Valley Metronet in South Bend, Indiana); negotiates for in-building distributed antenna systems for such institutions as Clemson University, Nemours Children's Hospital and Lake Nona Medical City; and negotiates telecommunications service contracts to enable advanced internet, cable TV and telephone networks. Projects include the design and implementation of the statewide research and medical fiber network that connects the three research universities and seven major medical facilities in South Carolina. Other projects include Avalon for North American Properties in Alpharetta, Georgia, and outdoor distributed antenna systems for Nemours Mansion and Gardens (Wilmington, Delaware). Another key project is Playa Vista (Los Angeles, California), an 1,100-acre development planned for 12,000 residential units and 6 million square feet of commercial space. Inteleconnect developed the strategic plan to replace the incumbent LEC and CATV companies with a next-generation telecommunications platform for voice, data, internet and video services.

KGPCo

www.kgpco.com
800-755-1950

Key Products: Equipment for wireline and wireless networks, cloud networks, SDN/NFV/IoT, data centers, distributed antenna systems; inventory management, logistics, site development, sourcing, supply chain management

Summary: Founded in 1973, KGPCo provides network transformation and supply chain solutions for the communications industry in U.S. and Canadian markets. The company enables customers to build, optimize and transform their networks by providing a single brand to deliver a complement of network solutions. The largest communications product distribution and service solution provider in the United States, KGPCo combines a suite of technical strategy and implementation services with a global logistics network and a portfolio of technology partnerships. The company's Solution Innovation Center evaluates, designs and engineers cloud, virtualization and disaggregated solutions developed and operationalized in the live network environment. Last year, KGPCo partnered with ECI to upgrade the network infrastructure of Iowa-based CL Tel, a full-service telecommunications and broadband service provider. KGPCo is headquartered in Faribault, Minnesota.

PASSIVE COMPONENTS FOR FTTH NETWORKS
(OUTSIDE PLANT AND INSIDE PLANT)

These companies provide fiber management solutions, enclosures, cabinets, connectors, ducts, conduits, powering solutions and related equipment for fiber access networks.

COMPANY NAME	WEB ADDRESS
AFL	www.aflglobal.com
Alpha Technologies	www.alpha.com
Amphenol	**www.amphenol.com**
Clearfield	**www.Seeclearfield.com**
CommScope	www.commscope.com
Corning Optical Communications	**www.corning.com**
Dura-Line	www.duraline.com
ESPi	**www.espicorp.com**
Fiberdyne Labs	www.fiberdyne.com
Multilink	www.gomultilink.com
OFS	**www.ofsoptics.com**
PPC Broadband	www.ppc-online.com
Preformed Line Products	www.preformed.com
Prysmian Group	www.prysmiangroup.com
Superior Essex	www.superioressex.com
TVC Communications/MaxCell	www.maxcellinnerduct.com

"The COVID-19 pandemic has put the spotlight on the importance of high-capacity broadband infrastructure and the widespread lack of it in the USA. We believe it can push the industry forward and make municipalities realize that broadband is not a luxury for some – it's critical infrastructure that every community needs to ensure is available to their residents and businesses."

– Isak Finer, CMO and VP of North America, COS Systems

Last Mile Communications

www.lastmile.net
239-202-2975

Key Products: Management partnering, consulting and capital-funding services

Summary: Last Mile Communications (LMC), an international telecommunications management partnering and consulting firm, offers telecom and cable customers experience across technology, sales and marketing, customer relations, finance and accounting, government and investor relations, business administration, programmer and vendor relations, and executive-level management. Among its top telecom and cable clients are CenturyLink, Comporium, C Spire, Liberty Global and TDS Telecom. It also works directly with several high-profile investment and banking firms, including AIG, Argus Capital, Deutsche Bank, Morgan Stanley and UBS. LMC offers three service lines: management partnering, consulting and capital funding. LMC personnel manage the delivery of broadband services, data management and mobile communications.
The company's consulting arm specializes in providing hands-on industry expertise to private equity investors, investment banks, institutional investors, broadband operators and telcos. It can also raise capital to start, continue and enhance the growth of broadband and telecommunications opportunities. Over the past year, LMC clients have actively expanded their networks via acquisitions and targeted builds. UBS Investment Bank, another LMC client, served as a financial adviser to Dark Fiber Systems for its sale to Hargray. Meanwhile, Liberty Global and C Spire set aggressive FTTH expansion plans. Liberty Global will extend the Virgin Media network to an additional 7 to 10 million homes in the U.K. through its Project Lightning FTTH initiative and via partnerships with other providers and investors. C Spire Home is bringing its Gigabit FTTH platform to Saltillo and Gulfport, Mississippi, with plans to add Biloxi this year to cover roughly 78,000 new households. With operational headquarters in Newtown, Connecticut, Last Mile Connections has satellite headquarters in London, England, and Bucharest, Romania.

Lumos Networks

www.lumosnetworks.com
855-465-8667

Key Products: High-speed residential and business-class broadband internet, managed Wi-Fi, digital television and digital voice services

Summary: Lumos Networks is a fiber-based incumbent local exchange carrier and part of Segra, one of the largest independent fiber bandwidth companies in the United States. The company has provided integrated telecommunications services to rural Virginia markets since 1897, and the portfolio includes high-speed residential and business-class broadband internet, digital television, digital telephone and managed Wi-Fi services. Local, professional customer care supports the full suite of services. An early FTTH and IPTV pioneer, Lumos Networks was the first in its markets to provide high-definition IPTV services and the first to reach 20 Mbps broadband speed, which it followed with its 1 Gbps service. More than half of Lumos' ILEC network is now fiber-based. Besides offering 1 Gbps services, Lumos recently doubled the speeds in its Essential and Premium broadband internet service packages. Customers who choose the Essentials package get 150 Mbps download speed, and the Premium package now supports 300 Mbps. Following the debut of its symmetrical gigabit broadband services, Lumos adopted ADTRAN's 10G fiber-access portfolio to deploy network-wide 10 Gbps fiber service for its business customers. Initially, Lumos will offer tiered symmetrical speed profiles of 2, 4 and 8 Gbps and plans to increase speed profiles on the same ADTRAN platform. Lumos provides FTTH service both within the ILEC territory and strategically in areas outside the ILEC, where it has captured many MDUs, commercial businesses and mixed-use developments. As the COVID-19 crisis drove more people and students to conduct activities in their homes, Lumos enhanced current customer download speeds by three times to 75 Mbps on its Basic 25 Mbps Fiber Internet package. There is no charge for the higher bandwidth tier, and customers are automatically upgraded.

Magellan Advisors

www.magellan-advisors.com
888-960-5299

Key Products: Broadband and telecom planning, grant writing, security consulting, deployment and management services

Summary: Headquartered in Denver, Magellan Advisors offers services from project inception through engineering and implementation and into continuing operations. Magellan helps communities (including tribal communities) identify opportunities, value assets and negotiate and forge public-private and public-public partnerships. Services include smart-city consulting, comprehensive community broadband planning, fiber master planning, financial planning, funds sourcing, business modeling, design engineering, telecommunications master planning, deployment and project management for governments, municipal utilities, electric cooperatives and private organizations. Magellan's portfolio includes more than 400 engagements for city, county, state, federal and private broadband projects. Clients range from national, regional and tribal governments to new master-planned communities, large cities and small rural communities. In November 2019, Magellan expanded its engineering and construction division with new offices in Kansas City, Missouri. Recent projects include a statewide fiber engineering study and cost estimates for Vermont's Department of Public Service to bring high-speed internet to rural Vermont; helping the City of Waterloo, Iowa, evaluate options to expand broadband services; and assisting Marion County, Oregon, with the implementation of the county's broadband strategic plan. Magellan's projects have led to more than $1 billion of investments in broadband networks that connect more than 1,000 schools, hospitals, libraries and government facilities and pass nearly 1 million homes and businesses with fiber and wireless broadband services.

Mapcom Systems

www.mapcom.com
804-743-1860

Key Products: Software for visual operations, workforce management and service assurance

Summary: Mapcom Systems offers a visualization-based approach to FTTH operations and management. Its M4 Solutions Suite encompasses the FTTH life cycle from PON or active network design and feasibility analysis through day-to-day plant/facility assignment and network maintenance and management. It maps both outside and inside plant at physical and logical levels. Providers use the M4 Solutions Suite to model their networks and service areas, integrating and correlating data from billing, accounting, GPS tracking, element management, network monitoring and vehicle-tracking applications in a visual interface. Using the suite in conjunction with M4 Workforce and M4 Process Manager technology, staff can communicate via mobile devices to handle trouble tickets, service orders, field locations and permitting. Last year, the South-Central Indiana Rural Electric Membership Corporation implemented the M4 Solutions Suite to bring FTTH service to its rural communities. In 2019, Mapcom, along with OcularIP, introduced Circuit Maintenance Windows to provide companies and their customers with more visibility into service level agreement tracking. Headquartered in Richmond, Virginia, with a staff of more than 100, Mapcom has worked since 1971 with independents, cooperatives, fiber communities and campus telecommunications providers across the United States, Canada, Central America, the Caribbean and Africa.

MasTec North America

www.mastec.com
305-599-1800

Key Products: FTTx deployment, outside-plant cabling, engineering, inside-plant construction and installation, joint trench systems, splicing, testing, systems integration, fulfillment, ongoing maintenance

Summary: MasTec provides engineering, design, construction and maintenance services for wireline and wireless communications infrastructure, including cell tower construction, fiber optic cable installation, wireline construction and emergency maintenance services across the country. MasTec has enhanced its workforce to meet ongoing last-mile FTTH and upcoming 5G wireless demands. The company's fiber business focuses on two initiatives: deploying high-speed services to homes mainly through fiber and building fiber backbones to support wireless backhaul and fronthaul services in anticipation of upcoming 5G network builds. Having seen what it says is "considerable backlog related to this initiative," MasTec expects significant growth in these areas as it goes from early-stage engineering into construction. Headquartered in Coral Gables, Florida, MasTec can supply crews and equipment to its customers 24/7. MasTec, which has nearly 22,000 employees, reported 2019 revenue of $7.2 billion.

OPTICAL LAN SOLUTIONS

The following companies sell fiber-to-the-desk solutions for corporate or campus LANs.

COMPANY NAME	WEB ADDRESS
CommScope	www.commscope.com
Corning Optical Communications	**www.corning.com**
Nokia	www.nokia.com

Michels Corporation

www.michels.us
920-583-3132

Key Products: Fiber optic network construction, including outside-plant construction, structured cabling and fiber splicing and testing

Summary: In 1983, family-owned Michels, based in Brownsville, Wisconsin, became one of the first companies to construct fiber lines. Today, it builds thousands of miles of fiber optic and broadband networks each year. Michels is a full-service construction company with clients that include oil and gas, other utilities and more. It serves all sectors of the communications industry – local telephone companies, broadband and cable TV providers, schools and enterprises. The company's construction design and management services include all phases of inside- and outside-plant engineering, including plowing, trenching, splicing, terminating, testing, constructing aerial lines, directional boring, rail plowing, installing cable, conducting site work and providing FTTx solutions. In addition, it assists clients with forecasting growth, verifying existing facilities, investigating potential migration strategies and estimating costs of numerous deployment options. For 2019, Michels ranked 27th on Engineering News-Record's annual Top 400 Contractors list, up from 38th in 2018. Last year, the company billed $3 billion in all lines of business. Michels has 8,000 employees and more than 40 regional offices throughout the United States.

Mid-State Consultants

www.mscon.com
435-623-8601

Key Products: Communications engineering services

Summary: Mid-State Consultants (MSC) provides communications engineering services for telephony, data, and video networks. MSC services a broad clientele, including local exchange carriers, RBOCs, interexchange carriers, competitive access providers, ISPs, cellular operators, communities, utilities and CATV operators. MSC services include all design and project management for FTTH projects as well as CAD/GIS mapping, conversion and construction supervision, growth forecasting, verification of existing facilities, investigation of potential migration strategies and cost estimates. Mid-State Consultants is headquartered in Nephi, Utah, and has seven regional offices throughout the United States.

Multilink

www.gomultilink.com
440-366-6966

Key Products: Fiber distribution and cable management solutions, connectors, splice enclosures and cabinets; MDU enclosures; raceway and pathway solutions

Summary: A manufacturer of telecommunications network components, Multilink, founded in 1983, focuses on fiber management solutions. Multilink's customers include independent telcos, RBOCs, utilities, local area network providers and cable MSOs. Its products are designed to meet the needs of both legacy plant and new technology applications. The company's engineering staff works closely with customers to develop innovative designs and application-oriented products to provide cost-effective solutions. Recent product introductions include the Surelight H-IP, a fiber optic drop cable solution with a field-installable application that has an OptiTap-compatible connector. In 2019, Multilink was granted new patents for fiber optic drop cable assembly and preconnectorized cable assembly. Based in Elyria, Ohio, Multilink is privately owned and has 200 employees.

NEO Connect

www.neoconnect.us
970-309-3500

Key Products: Consulting, feasibility studies, grants and funding advice; design and engineering services

Summary: NEO Connect advises clients about grant and funding opportunities, acquisitions, consulting, feasibility studies and engineering services for broadband networks. Working with more than 200 local-government clients across the United States and Canada, NEO has a track record for improving broadband and building smart-city networks. Such networks allow communities to create resilient platforms for economic development and infrastructure projects. Notable projects from 2019 include closing acquisitions and investments that totaled more than $135 million in funding for three service providers. NEO also created broadband feasibility plans for several counties and municipalities in Colorado, Minnesota, Montana and California.

Nex-Tech

www.nex-tech.com
785-567-4281; 877-625-7872

Key Products: Internet, video, voice, mobile, home security and business services to small and rural communities in Kansas

Summary: Nex-Tech was an early FTTP pioneer with its first fiber build in Hill City, Kansas, in 1996. Initially launched as the CLEC subsidiary of Rural Telephone Cooperative, the parent company eventually took Nex-Tech as its name. Since that time, Nex-Tech has deployed fiber to more than 60 rural communities and underserved areas in Kansas. The telco continues to expand its network in rural areas of Kansas and is currently building FTTP in Great Bend, Kansas. Over its FTTP network, Nex-Tech delivers up to 1 Gbps internet speeds, streaming TV, home security and local and long-distance phone service. The telco also provides business solutions, including cloud services, cloud phone, network

security, managed IT, physical security and surveillance, advertising solutions and network operations monitoring. Nex-Tech supports its customers with stores in more than 20 locations, a full-service help desk and a 24-hour Network Operations Center. By acquiring Cordell in 2019, Nex-Tech gained a suite of network solutions for alarms management, engineering and network operations management. In response to the COVID-19 pandemic, Nex-Tech launched a Continuous Learning Initiative that works with schools to provide connectivity to unserved students learning at home. Headquartered in Lenora, Kansas, Nex-Tech has delivered service for more than 69 years.

Nokia / Nokia Networks
www.nokia.com/
908-582-3000

Key Products: Wireline and wireless network equipment, software for network management, IoT technology, cloud solutions

Summary: Nokia, headquartered in Espoo, Finland, is a major wireless and wireline network equipment provider. It has a global presence with operations in Europe, the Middle East and Africa, North America, Asia-Pacific and Latin America. A third of fixed-broadband subscribers worldwide are served by access networks that use Nokia technology, including EPON, GPON, xDSL, cable, FWA and G.fast. Many providers, including EPB Fiber Optics, China Mobile, Hotwire, SKB and Frontier Communications, use Nokia technology to deliver 10 Gbps services. Hotwire deployed Nokia's XGS-PON solution to deliver 10 Gbps broadband services to its customers in Florida and North Carolina. Nokia continues to gain traction on the international FTTH front, signing deals with Italy's Open Fiber and Cambodia's SINET. Open Fiber is building a rural-focused FTTH network, and SINET will roll out a nationwide GPON-based access network. Nokia closed 2019 with net revenue of about $25 billion in sales generated in about 200 countries. It had about 95,000 employees at the end of 2019, with an annual R&D budget of almost $5 billion and R&D facilities in Europe, North America and Asia.

OFS
www.ofsoptics.com
888-342-3743 (inside the U.S.);
770-798-5555 (outside the U.S.)

Key Products: Optical fiber, optical fiber cable, fusion splicers, fiber management and connectivity products, network design services

Summary: OFS's heritage, which can be traced to the original Bell Labs, includes research and development in fiber optics. Wholly owned by Furukawa Electric of Japan, OFS designs, manufactures and supplies optical fiber, fiber cable, specialty photonics and optical connectivity solutions, providing solutions for outside- and inside-plant networks.

Last year, it doubled its fiber manufacturing capacity to meet strong customer demand for customers rolling out FTTH and 5G networks. The Furukawa Electric board approved $150 million in capital spending for further expansion in production, primarily in the United States and Europe through OFS. Products include EZ-Bend ultra-bend-insensitive optical cables and InvisiLight solutions for nearly invisible in-MDU and in-home fiber deployments. OFS recently introduced its first hollow-fiber cable for low-latency communications. It also introduced Rollable Ribbon cables, assemblies and new connectivity solutions for MDU and SFU applications. The OFS professional services group designs and builds FTTx networks for MDU and SFU applications. Headquartered near Atlanta, OFS has facilities in North America, Europe and Africa. For the fiscal year ending March 2019, Furukawa Electric had 52,000 employees worldwide and $8.9 billion in revenue.

On Trac Inc.
www.ontracinc.net
423-317-0009

Key Products: FTTx in-home installations and drops (aerial and underground), MDU network design and installation, mainline fiber splicing, structured cabling, consulting, project management, material procurement and back-office structure

Summary: Based in Eastern Tennessee, On Trac has a nationwide footprint and has provided broadband fulfillment services and partnered with FTTx deployments for local municipal electric companies, electric cooperatives, private fiber deployments, fiber optic construction companies, and private businesses for the past 17 years. To date, the company services 1 million FTTx addresses across the nation. On Trac currently serves nine clients in Alabama, Colorado, Georgia, Kansas, Louisiana, Tennessee and Texas. On Trac has also created a Mobile Work Force Management Solution designed for field operators. The software was developed over the past 10 years to help companies manage field technicians who are installing and maintaining FTTx. The company can also manage complex FTTx installations that require specialized processes, from underground construction to aerial and underground drops and completing premises and business installation and testing.

FTTH CONSTRUCTION EQUIPMENT

These companies provide equipment for trenching, boring, microtrenching and other construction tasks.

COMPANY NAME	WEB ADDRESS
Ditch Witch	www.ditchwitch.com
Tesmec USA / Marais	www.samarais.com
Vermeer	www.vermeer.com

"Fiber optic networks serve as the backbone of communications and advance the effective application of new technologies such as IoT and 5G. Communities and enterprises will utilize these networks and technologies to provide sustainable, resilient, and rapidly evolving solutions for new challenges."

– John Janchar, President of Black & Veatch's Telecommunications Business

ONUG Communications, Inc.

www.onugsolutions.com
919-876-5455

Key Products: Outside-plant engineering, planning and design; project management, feasibility studies, consulting services, quality assurance, quality auditing, construction

Summary: Approaching its 21st year as a national engineering and design firm in Raleigh, North Carolina, ONUG Communications has expanded its role with major clients such as Google Fiber, CenturyLink and Verizon. Besides working with these national companies, ONUG continues with various projects for regional telcos, rural ILECs, campuses (retirement communities), municipalities (such as Sherwood, Oregon) and local/state utilities and electric co-ops. It provides these providers with feasibility studies, plans and designs and helps navigate federal and state FTTH grant processes. In 2019, ONUG planned projects that passed 100,000 homes with FTTH services, and created more than 20,000 innovative designs that include microtrenching for both urban and rural environments. It also provided pioneering designs such as soft-scape (minimal depth and intrusion) and "no-terminal" designs. ONUG has also participated in developing fiber optic planning, small-cell predictive planning and cellular data mining. Additionally, it consulted on middle-mile projects, bringing fiber to unreached areas by utilizing major interstates and highways for FTTx distribution by ISPs. During the COVID-19 pandemic, ONUG is helping customers with quality audits, assisting the preparation and implementation for higher bandwidth demands with new network designs. ONUG also advises government agencies in employing tax dollars. Daniel Huffman, ONUG's owner and president, continues to provide fiber optic training courses through Light Brigade.

OSPInsight

www.ospinsight.com
801-936-0970

Key Products: Fiber network management software

Summary: OSPInsight provides a software suite designed to help outside-plant engineers plan, design, build and operate fiber networks. The company's software helps outside-plant engineers manage fiber optic networks through a suite of software and services. OSPInsight enables users to design, maintain, analyze and build fiber networks with user-friendly applications. Clients include telecom and cable providers, ISPs, cities, municipalities, DOTs and campuses. OSPInsight can support the design and wiring of a local community or a larger geographical region. OSPInsight clients can track physical changes to the network and run reports to understand overall network performance, including fiber usage. In addition, OSPInsight offers managers information and support to effectively monitor their networks once they are up and running. Recent clients include Bellingham, Washington; CTS Telecom; DayStarr Communications; DQE Communications and Involta. Owosso, Michigan-based DayStarr Communications uses OSPInsight to track FTTH services for 3,000 subscribers across two counties. CTS Telecom, by regaining control over its records, has been able to forgo outside help for such tasks as assigning cables, splicing and planning for future builds. Located in South Jordan, Utah, OSPInsight is a privately held company.

OTELCO

www.otelco.com
833-683-5261

Key Products: Internet, video and voice services

Summary: For more than a century, the OTELCO family of companies has provided rural communities with cutting-edge technology – first with the telephone in the late 1800s and today with broadband internet for residential and business customers. The company's footprint spans seven states – Alabama, Maine, Massachusetts, Missouri, New Hampshire, Vermont and West Virginia – in three distinctly different rural regions of the United States. In 2019, OTELCO invested $12.4 million to expand its fiber distribution network and improve its broadband capabilities. FTTP is the primary vehicle to increase customer data capacity, with fiber-to-the-node and fixed wireless options employed in more sparsely populated areas. During 2019 and in January 2020, OTELCO added 268 miles of fiber in its service territories, up 50 percent over what it built in 2018. OTELCO's Lightwave FTTP network now passes approximately 12,890

locations. This year, OTELCO completed FTTH projects in Arab, Alabama; Alton and Plymouth, Maine; and Joppa, Alabama. Last year, it partnered with Alton on a townwide FTTH network funded with a combination of municipal funds, state funds and OTELCO investment. OTELCO's revenue for 2019 was $62.8 million.

Pavlov Media
www.pavlovmedia.com
800-677-6812

Key Products: Internet, video and voice services, including support for leasing offices

Summary: Pavlov Media, a network provider that targets MDUs, is the largest private provider of broadband services to off-campus student housing communities and other multifamily apartments. It builds and runs networks for 700 properties in 44 states and Canada. More than 300,000 residents use the Pavlov Media network, which provides broadband and cable television to hundreds of apartment, condo and student housing sites. Apartments and businesses are connected to the company's 100 Gbps national fiber backbone network. Pavlov Media's fiber-to-the-unit (FTTU) services are provided to thousands of apartments. In the wake of the coronavirus pandemic, Pavlov enhanced school network connections to 10 Gbps to help teachers, staff and students meet online education demands. The provider has been active on the acquisition front, snapping up two companies that bolster its MDU presence: Velocity Online and Simplified Technologies. Tallahassee-based Velocity Online deepens Pavlov Media's reach with multifamily real estate owners in multiple states as well as Tallahassee-area businesses. Simplified Technologies brings Pavlov Media a greater arsenal of IT support services to target businesses. Founded in 1994, Pavlov Media is headquartered in Champaign, Illinois.

Power & Tel
www.ptsupply.com
800-238-7514

Key Products: Fiber optic and cable products, optical networking electronics, test gear, IPTV, home networking solutions

Summary: The distributor Power & Tel specializes in the procurement, sales and logistics of communications products. By cost-effectively and efficiently managing the supply chain, Power & Tel lets its customers – service providers, contractors and other entities large enough to maintain communications networks – focus on building and maintaining fiber networks. The company also provides materials-management services that use state-of-the-art distribution technology to accommodate the industry's rapidly changing supply needs. Recently, Power & Tel and Geneva-based ADB, a provider of end-to-end TV solutions, signed a master distribution agreement for the Americas. Founded in 1963 and privately owned, Power & Tel is headquartered in Memphis, Tennessee, and has locations in the United States, Canada, Mexico and Brazil.

PPC Broadband Inc. – A Belden Brand
www.ppc-online.com
315-431-7200; 800-800-6652

Key Products: Fiber cable, microduct, enclosures, cabinets, optical passives, optical splitters, fiber test equipment

Summary: PPC offers fiber products for the headend, outside plant and premises. The company's fiber-to-the-home and broadband solutions are used globally in cable systems, satellite networks and wireless businesses. PPC continues to expand its fiber product road map while holding more patents in connector technology than any other company worldwide. In recent years, PPC has expanded its product portfolio through strategic acquisitions. In 2018, PPC's fiber unit grew to include optical passive products acquired through the purchase of Net-Tech Technology. And in 2019, PPC acquired the FutureLink line of fiber products from Suttle; subsequently purchased OPTERNA, a global manufacturer of fiber solutions; and bought SPC, a U.S.-based manufacturer of integrated fiber enclosures. PPC Broadband is a wholly owned subsidiary of Belden and is headquartered in East Syracuse, New York, with locations in the United States, the United Kingdom, Mexico, Denmark, St. Kitts, China, Germany, India, Ireland, Saudi Arabia, Tunisia and the United Arab Emirates.

Preformed Line Products
www.preformed.com
440-461-5200

Key Products: Fiber optic and copper splice closures, high-speed cross-connect devices, cable anchoring, control hardware systems

Summary: Founded in 1947, Preformed Line Products (PLP) is an international designer and manufacturer of products and systems used to construct and maintain overhead and underground networks. Its communications segment serves telecommunications network operators, cable television and broadband service providers, enterprise networks, government departments and agencies, and educational institutions. The company updated its flagship product line of COYOTE fiber optic closures to make the devices more durable, more versatile and easier to install. PLP serves telecommunications network operators, cable television and broadband service providers, power utilities, enterprise networks, government agencies and educational institutions. Last year, PLP announced its acquisition of MICOS TELCOM s.r.o., a Czech Republic–based manufacturer that makes passive telecom network components. Headquartered in Cleveland, PLP has two domestic manufacturing facilities, 21 foreign subsidiaries and a global network of more than 3,000 employees. Net sales for 2019 were $444 million.

Prysmian Group

www.prysmiangroup.com
859-572-8000; 803-951-4800

Key Products: Optical fiber and telecommunications cables

Summary: With almost 140 years of experience, sales of more than $13 billion, nearly 29,000 employees in more than 50 countries and 112 plants, Prysmian offers a wide range of products, services, technologies and know-how. Prysmian Group manufactures cables and accessories for voice, video and data transmission, offering a range of optical fibers, optical and copper cables, and connectivity systems. In addition, it provides underground and submarine cables and systems for power transmission and distribution, special cables for applications in several industries, and medium- and low-voltage cables for the construction and infrastructure sectors. Last year, Prysmian debuted its 6,912-fiber MassLink Cable with FlexRibbon technology. Ribbons are rolled up and packed together in small diameter sub-units but still provide the advantages of mass fusion splicing. This year, the company released ezMicroduct, its smallest microduct cable with 288 fibers and an outer diameter of 8 mm. The vendor was selected by Mexico government-run Comisión Federal de Electricidad (CFE) in January to connect remote regions in the country with high-speed broadband. Prysmian is headquartered in Milan, Italy.

Render Networks

www.rendernetworks.com
833-293-9013

Key Products: Network deployment solutions

Summary: Render's digital network construction platform enables telecommunications and utility network operators and construction teams to eliminate manual processes from construction and deploy the best possible fiber network more efficiently than ever before. Using GIS and mobile and automation technologies, Render's construction management platform transforms geospatial network designs into deliverable work and digitizes real-time data flows between the office and the field, delivering a new level of resource efficiency and project visibility. Over the past year, the Render platform delivered broadband connectivity to more than 300,000 U.S. households and businesses, with more than 700,000 completed construction tasks. Significant projects include the SpringNet FTTH network in Springfield, Missouri; open and dark fiber deployments in California; and FTTH networks in Arkansas, Indiana, Mississippi, Tennessee and Texas. Customers consistently experience up to 50 percent faster build times with a 30 percent reduction in field supervision and administration resourcing costs. Throughout the COVID-19 crisis, Render technology has enabled project administrators and construction teams across the country to navigate continuity risks and keep projects moving. Render was founded in 2013. Its fast-growing team is headquartered in Virginia and Melbourne, Australia, and additional U.S. offices will soon be announced.

Smithville Communications Inc. / Smithville

www.smithville.com
812-876-2211; 800-742-4084

Key Products: High-speed internet, streaming TV, voice, cellular, home automation and security services, cloud services, IoT/big data support

Summary: Privately owned Smithville Communications, with 205 employees, is Indiana's largest independent telecom company and has built out fiber to homes and businesses for over a decade. Key projects include Smithville's symmetrical gigabit project, which is nearing completion in the city of Jasper, and the company continues to expand its gigabit fiber operations in rural Ellettsville. Aided in part by Indiana's rural Next Level Connections Broadband Grant program, Smithville also is bringing high-speed fiber connectivity to north-central Indiana near Sharpsville and an area of rural Monroe County. The Monroe County project is part of a larger initiative with South Central Indiana REMC launched to accelerate the delivery of fiber internet to about 3,400 residents and businesses in the common service areas between the two companies. Offering customers the choice of using either provider, the project is expected to be completed by June 2023. These expansions are either self-funded or funded through public-private partnerships. Smithville continues to see residential growth through "best speed available" residential service offerings with no data caps. Citing increasing content costs and changing TV user behaviors, Smithville replaced its multichannel linear TV packages with a streaming TV service and developed a partnership with DISH TV and Sling to provide additional options. The company also has been able to attract new telecom management talent, bringing in seasoned executives with national broadband experience. Smithville continues to upgrade its legacy copper areas with fiber to the cabinet to enhance speeds and capacity in rural areas.

Sonic

www.sonic.com
888-766-4233

Key Products: Gigabit fiber to the premises, fiber to the node and DSL internet access; voice service; co-location; business networking

Summary: Based in the North Bay, Sonic is the largest independent internet service provider in California and has delivered internet and phone service to homes and businesses for more than 25 years. Sonic was founded on the belief that access to fast, reliable, affordable internet should be available to all, and the provider is committed to building out a wholly owned gigabit fiber network while supporting the communities it serves. Its pricing is also unusual – Sonic offers unlimited, uncapped, symmetrical gigabit fiber internet plus unlimited domestic and international home phone service starting at $40 per month. In tandem with its ongoing FTTH expansions, Sonic enhanced its product set by partnering with eero to improve whole home Wi-Fi access. After conducting buildouts in San Francisco and the East Bay, Sonic expanded its gigabit

fiber service on the Monterey Peninsula. It also launched a big FTTH project in the North Bay, in Petaluma. The expansion enabled it to reach 19 new Bay Area cities and neighborhoods. Sonic has been awarded a perfect score for its privacy policy from the Electronic Frontier Foundation year after year.

Superior Essex
www.superioressex.com
770-657-6000

Key Products: Premises and outside-plant fiber and copper cable products, FTTH enclosures

Summary: Superior Essex designs, manufactures and supplies a large selection of premises and outside-plant fiber optic and copper wire and cable products. The company supplies products to many of the largest service providers, and its cable products are installed in thousands of enterprises around the world. It recently introduced a line of cables for distributed antenna systems; FTTH enclosures, including fiber distribution hubs; and redesigned families of fiber dome closures. Superior Essex has a co-development and marketing alliance with Legrand to create a suite of structured cabling systems, nCompass. The company recently launched PowerWise Category 5e cable, a 22-gauge communications data cable designed for internet-connected devices that utilize the Power over Ethernet (PoE) standard. Also new is EnduraLite indoor/outdoor loose-tube optical fiber cable. In early 2020, Superior Essex joined the Global Enabling Sustainability Initiative (GeSl), an organization focused on achieving social and environmental sustainability through technology. Superior Essex is headquartered in Atlanta and has more than 3,000 employees. Its product development center is in Kennesaw, Georgia, and it has manufacturing facilities in Brownwood, Texas; Tarboro, North Carolina; and Hoisington, Kansas.

Synergy Fiber
www.synergyfiber.com
734-222-6060

Key Products: Design, integration, installation and support for MDU networks and technology solutions; internet access and video and voice services; co-located hosting

Summary: Synergy Fiber offers managed communications services that provide total technology solutions for MDU buildings. Synergy's offerings include gigabit fiber infrastructure, Ruckus Wi-Fi and DISH satellite television. Its turnkey package incorporates structured cabling design, video security systems and buildingwide access control as a total building solution. With its global help desk, Synergy manages and supports building infrastructure and clients' needs after turnup. Projects include new construction and retrofitting or rebranding a property's current technology. Student housing is a natural for Synergy Fiber, which partnered with SALTO Systems to provide access control for Texas A&M's 3,400-bed Park West Student Living. Other clients include Ann Arbor's Landmark apartments. Synergy Broadband Collocated Hosting, located in Ann Arbor, Michigan, provides security,

power, cooling, fire suppression, advanced cabling systems and fully redundant managed internet connectivity. Headquartered in Ann Arbor, Synergy has offices in Highlands Ranch, Colorado; Hayward, California; College Station, Texas; Tucson, Arizona, and Hong Kong.

TDS Telecom
www.tdstelecom.com; www.tdsfiber.com
866-571-6662

Key Products: Internet access, phone and TV services

Summary: TDS Telecommunications delivers broadband internet, video, and phone services to nearly 900 rural, suburban, and metropolitan communities in 31 states. Powered by fiber optics and next-gen cable technology, TDS delivers up to 1 Gbps internet speeds and offers IP-based TV along with traditional phone services. TDS Telecom offers FTTH in 78 communities and serves about 30 percent of its wireline service addresses with fiber. Fiber investments continue with plans to light up approximately 230,000 FTTH service addresses, of which about 50,000 were turned up in 2019. After acquiring Merrimac Communications, TDS Telecom launched FTTH services in 14 new Wisconsin markets totaling more than 40,000 service addresses. In March, TDS received $1.3 million from the Wisconsin Broadband Grant program, which will fund two broadband projects in Mosinee and Stetsonville. Outside Wisconsin, TDS Telecom has been actively building out FTTH in several states, including Idaho, North Carolina, Utah and Washington. By acquiring Continuum, a North Carolina–based provider, TDS gained 36,500 new households passed by coax and fiber across four towns. Following its FTTH build in Coeur d'Alene, Idaho, it launched plans to build a fiber network in the Meridian, Idaho, area to connect nearly 58,000 addresses. BendBroadband, a TDS cable subsidiary, began rolling out 1 Gbps services in La Pine and Bend, Oregon. This summer, TDS will launch 1 Gbps speeds in its Utah, Colorado, New Mexico, Texas and Nevada coax territories. Headquartered in Madison, Wisconsin, TDS Telecom employs nearly 2,800 people and is a subsidiary of Telephone and Data Systems Inc. Its operating revenue for 2019 was $930 million, up from $927 million in 2018.

DISTRIBUTORS OF FIBER OPTIC PRODUCTS

COMPANY NAME	WEB ADDRESS
Advanced Media Technologies	www.amt.com
Graybar	www.graybar.com
KGPCo	www.kgpco.com
Power & Tel	**www.ptsupply.com**
TVC Communications/MaxCell	www.tvcinc.com
Walker and Associates	**www.walkerfirst.com**

"The coronavirus outbreak has vividly underscored the importance of advanced communications capabilities to the health, safety, economic vitality and quality of life of our communities."

– Jim Baller, President, Baller Stokes & Lide

Tesmec USA / Marais

www.samarais.com
817-473-2233; 800-851-5102 (Tesmec)

Key Products: Construction equipment for laying fiber

Summary: Tesmec USA provides open-trench solutions for fiber deployments. The company manufactures, rents and sells trenching machines for laying fiber, power cables and flexible ducts. Designed to comply with a work site's specific features, Tesmec trenchers can dig and lay more than 3,000 feet of fiber optic cable or duct a day, depending on the environment. The Tesmec Group purchased Marais in 2015 to enhance its product line. By closing its acquisition of 4 SERVICE in April 2020, Tesmec enhanced its trencher rental capabilities. Because of the rapid growth of the rental market, Tesmec says the 4 SERVICE acquisition will enable its customers to test trenching machines before deciding whether to purchase equipment for network builds. In its trenching business segment, Tesmec's Cleanfast product combines a vacuum and a microtrenching machine on a truck. All excavated material is immediately loaded by suction, so no material is thrown during the work. Veracity, an engineering construction firm that provides fiber services in the six-state New England area, uses Cleanfast as its underground fiber optic construction tool for several customers, including Crown Castle, CenturyLink, Verizon, Windstream and Zayo. Outside the United States, Cleanfast has been used for more than 15 years, reducing fiber installation time and nuisance for European operators such as Deutsche Telekom, Orange, Tele2 and BT. Marais maintains headquarters in France but, through the Tesmec acquisition, now operates a U.S. factory in Alvarado, near Fort Worth, Texas. With more than 65 years of experience and more than 750 employees, the Tesmec Group conducts business in more than 135 countries worldwide. The company reported $217 million in revenues for 2019.

The Broadband Group / TBG Network Services

www.broadbandgroup.com
702-405-7000

Key Products: Telecommunications master planning, network design and engineering, financial modeling, construction management

Summary: The Broadband Group (TBG), a technology and telecommunications consulting firm, develops business plans, network specifications, engineering designs, financial models and deployment strategies for utilities, master-planned communities, municipalities and service providers that seek to facilitate or deliver broadband services. TBG's wholly owned subsidiary, TBG Network Services (TBGNS), oversees construction management. In Huntsville, Alabama, TBGNS manages the Huntsville Utilities buildout of its 966-mile, citywide, dark fiber network. Current TBG projects include leading the fiber business plan development and deployment strategies for Ontario, California; Long Beach, California; City Utilities/SpringNet in Springfield, Missouri; and the Brambleton community in Loudoun County, Virginia. Large-scale, master-planned communities around the United States call on TBG to create technology master plans that position wired and wireless connectivity as differentiated amenities. TBG developed the utility lease model: Municipalities with fiber networks lease excess fiber to internet service providers, which in turn offer high-speed fiber broadband services citywide, handling marketing and customer service. This model has been put to work with CenturyLink for 100,000-plus homes in Springfield, Missouri, and Google Fiber in Huntsville, Alabama. Based in Las Vegas, with additional offices in Huntsville, Alabama, TBG was founded in 1997.

Ting

www.ting.com/internet
855-846-4626

Key Products: Gigabit internet access, video service

Summary: Ting, a subsidiary of Tucows – a domain management service company – launched its FTTH business with a bang in December 2014 when it acquired Blue Ridge InternetWorks, a competitive fiber provider in Charlottesville, Virginia. Ting expanded its network across Charlottesville and continues to expand to small markets in new areas, often by partnering with municipalities. Ting currently provides fiber services to towns in Virginia, Maryland, North Carolina, Idaho and Colorado. As it rolls out service in each community, Ting educates local realtors on how fiber-based connectivity can drive up home values. It also conducts community outreach to encourage collaboration with local businesses and parent-teacher organizations. Recently, the company announced that it will offer fiber connections in Fullerton, California, through a partnership with SiFi Networks and will continue its North Carolina expansion in Wake Forest. It is also preparing to expand to four additional towns. Ting created a targeting program that encourages towns and cities to nominate themselves as the next destination for its FTTH service.

In April 2020, Ting began offering free fiber-fed Wi-Fi hot spots in its Ting internet towns to help those without internet connect during the COVID-19 crisis. At the end of the fourth quarter 2019, Ting had added 3,400 new FTTH addresses, and 2,200 became serviceable, bringing it to a total of 36,400 serviceable addresses, with an additional 17,000 passed but not yet serviceable. Tucows is headquartered in Toronto, Canada. With 400 employees, it reported 2019 revenue of $337 million, down from $346 million in 2018.

TVC Communications / MaxCell

www.tvcinc.com; www.maxcell.us
888-644-6075 (TVC); 888-387-3828 (MaxCell)

Key Products: Broadband electronics, connectivity products, outside-plant hardware, test equipment, fabric innerduct, conduit technology

Summary: TVC Communications, a division of WESCO Distribution Inc., is a value-added distributor that stocks and same-day ships FTTH products and facilitates planning, launching and turning on fiber networks in broadband and utility markets. TVC provides supply-chain solutions for operators, utilities and municipalities launching fiber networks, including turnkey project development, material management, financial modeling for material management, marketing for increasing awareness/take rate and project launch team and support. The company's brands include MaxCell, the flexible fabric innerduct that allows increased cable density in a conduit while preserving space for future bandwidth expansion. MaxCell's fabric construction conforms to the cables placed within it, reducing the wasted space rigid innerduct involves.

Available in sizes to fit all conduits, MaxCell adds pathways quickly and is installed easily and cost-effectively. MaxSpace is a no-dig conduit space recovery solution designed to safely remove rigid innerduct from around active fiber cables with little to no load on the cable and no interruption of service.

UTOPIA Fiber

www.utopiafiber.com
801-613-3880

Key Products: Open-access network services

Summary: Created by a consortium of Utah cities, the Utah Telecommunication Open Infrastructure Agency (UTOPIA) operates a community owned, fiber optic network using the open-access model, which promotes competition by giving customers the freedom to choose which telecommunication providers and services they want. Now making fiber available to more than 110,000 business and residential customers in 15 cities, UTOPIA Fiber is the largest open-access network in the United States. In the past 12 months, UTOPIA has seen rapid growth: It entered an operational partnership with Idaho Falls Fiber, which expanded UTOPIA's footprint outside Utah for the first time; secured a $48 million round of funding by sister agency UIA for expanding the network; completed a $23 million FTTP project in Layton, Utah, (80,000 residents) and a $2.5 million FTTP project in Morgan, Utah (4,500 residents); started an FTTP project in West Point, Utah, (11,000 residents); and responded to a 50 percent surge of new residential customers working and studying remotely because of the coronavirus pandemic. Since 2009, subscriber revenue has completely funded all UTOPIA Fiber projects.

NETWORK DEPLOYERS AND SERVICE PROVIDERS

COMPANY NAME	WEB ADDRESS
Adams Telephone Co-Operative	www.adams.net
Allo Communications	www.allocommunications.com
Altice USA	www.alticeusa.com
AT&T / AT&T Connected Communities	www.att.com/connectme
C Spire Home Services	www.cspire.com/home-services
CenturyLink	www.CenturyLink.com/ConnectedCommunities
Charter Communications / Spectrum Community Solutions	www.charter.com; www.spectrum.com
Cincinnati Bell	www.cincinnatibell.com; www.cincinnatibell.com/Fioptics
Comcast Cable / XFINITY Communities	www.xfinity.com/xfinitycommunities
Co-Mo Connect	www.co-mo.net
Consolidated Communications	www.consolidated.com
Cox Communications	www.cox.com

COMPANY NAME	WEB ADDRESS
EPB Fiber Optics	www.epb.com
GigabitNow	www.gigabitnow.com
GoNetspeed	www.gonetspeed.com
GVTC	www.gvtc.com
Hotwire Communications	www.hotwirecommunications.com
Lumos Networks	www.lumosnetworks.com
Nex-Tech	www.nex-tech.com
OTELCO	www.otelco.com
Pavlov Media	www.pavlovmedia.com
Smithville Communications	www.smithville.com
Sonic	www.sonic.com
Synergy Fiber	www.synergyfiber.com
TDS Telecom	www.tdstelecom.com
Ting	www.ting.com/internet
UTOPIA Fiber	www.utopiafiber.com/
Verizon Communications / Verizon Enhanced Communities	www.verizon.com; www.verizon.com/communities

"The increase in work from home due to the unfortunate COVID-19 situation has shown that gigabit connectivity, specifically FTTH, is a necessity for any community to stay competitive."

– Kevin Wynne, Head of Comsof Americas

Vantage Point Solutions

www.vantagepnt.com
605-995-1777

Key Products: Broadband engineering and consulting services, including feasibility studies, network design, engineering and deployment

Summary: Based in Mitchell, South Dakota, employee-owned Vantage Point Solutions (VPS) provides engineering and consulting services to wireless and wireline broadband providers. Vantage Point's professional engineering capabilities, financial and technical expertise and regulatory knowledge enable it to design advanced, economically viable solutions customized for each client. With more than 350 employees – including 50 from its merger earlier this year with GVNW Consulting – and hundreds of clients across the country and internationally, VPS helps clients at nearly every step of broadband network development and operation, from concept to cutover and beyond. Services include feasibility studies; network design, engineering and deployment; regulatory advice; financial and business analysis; municipal code review and development; and network maintenance and security. VPS is often called upon to help clients shape grant applications; in 2018, Vantage Point introduced the BETTI Box, a hardware-software solution that enables the

FCC's CAF funding recipients to meet new requirements for periodic speed and latency testing. VPS also provides analysis and recommendations for clients participating in the FCC's Rural Digital Opportunity Funding (RDOF) program. VPS clients have been associated with $1.7 billion in spectrum, loan and grant awards.

Verizon Communications / Verizon Enhanced Communities

www.verizon.com; www.verizon.com/communities

Key Products: Internet, video and digital voice services

Summary: Headquartered in Basking Ridge, New Jersey, Verizon has more FTTH customers than any other U.S. provider. It provides converged communications, information and entertainment services in 150 countries. Verizon continues to add new Fios customers in its existing footprint, including Boston and select rural New York State communities. Fios Gigabit Connection offers 940 Mbps/880 Mbps speeds, and Fios Multi-Room DVR can record up to 12 shows at the same time and has up to 200 hours of HD recording capacity. The company settled on NG-PON2 to deliver future 10 Gbps FTTH services. Looking beyond the COVID-19 crisis, Verizon is increasing its capital investment guidance from $17 to $18 billion to $17.5 to $18.5 billion in 2020. To address consumers' diverse consumption habits, Verizon introduced its Mix & Match Fios pricing plan in January, allowing customers to mix internet and TV plans. In 2019, Fios revenue was $12.4 million, up from $11.9 million in 2018. At the end of 2019, Verizon had 4.1 million Fios video and 5.9 million Fios internet subscribers. Verizon Enhanced Communities works with property owners, property managers and businesses to serve multifamily residential, multi-tenant commercial, and mixed-use communities with high-bandwidth internet, TV and phone services. A Dow 30 company with $131.9 billion in 2019 revenues, Verizon employed 135,000 people worldwide at the end of 2019.

NETWORK PLANNING AND DESIGN SOLUTIONS

These companies provide software used to plan and design FTTH networks.

COMPANY NAME	WEB ADDRESS
3-GIS	www.3-gis.com
Biarri Networks	www.biarrinetworks.com
Comsof	www.comsof.com
COS Systems	www.cossystems.com
ETI Software Solutions	www.etisoftware.com
GEOGRAPH	www.geograph.tech
Mapcom Systems	www.mapcom.com
OSPInsight	www.ospinsight.com
Render Networks	www.rendernetworks.com
VETRO FiberMap	www.vetrofibermap.com

Vermeer Corporation

www.vermeer.com
641-628-3141; 888-837-6337

Key Products: Horizontal directional drilling equipment, utility and pedestrian trenchers and plows

Summary: Headquartered in Pella, Iowa, privately owned Vermeer manufactures underground installation equipment.

The company got its start in fiber optic installation in 1991, when it launched the Navigator horizontal directional drill (HDD) product line. Vermeer HDD products can install communications lines underground without excavating or trenching, minimizing environmental disruption and helping reduce fiber deployment labor costs. The company offers a microtrenching system that allows installation of fiber lines into a roadway in one quick pass. Vermeer's D23x30DR S3 Navigator horizontal directional drill, introduced last year, weighs 8 tons but integrates dual rod technology into a compact machine designed to maneuver through rock in congested cities, busy neighborhoods or tight jobsites. Recent introductions include the SPX25 remote-controlled vibratory plow, used for installing small pipes and cables at depths up to 12 inches and for boring underneath driveways and sidewalks using an optional attachment. Vermeer has also expanded its line of vacuum excavators, including models for urban deployments. The RTX1250 ride-on tractor, widely used for microtrenching, has been updated with easier tool changing, optional remote control and eco-friendly features.

VETRO FiberMap
www.vetrofibermap.com
207-221-6627

Key Products: Fiber mapping software and services

Summary: VETRO FiberMap provides a cloud-based fiber management GIS platform purpose-built for broadband providers, municipalities and telco engineers that design and build next-generation internet infrastructure. Launched in 2016, VETRO FiberMap serves clients across the United States and in 17 countries. Delivered through a web browser, the platform is engineered for rapid integration, driven by open APIs and managed in the cloud. It enables users to access network data from anywhere and design, deploy and document networks – all from a single platform. Portland, Maine–based Pioneer Broadband completed several rural FTTH network build projects using the VETRO FiberMap platform as a core technology. Pioneer completed FTTH projects in Houlton and Sherman as well as network design for Downeast Broadband Utility covering Calais and Baileyville. Other providers, such as OTELCO, use the platform to help potential business customers determine whether fiber-based internet service is available in their areas. In 2019, the company launched its Geospatial Wrecking Crew (GWC), an in-house concierge GIS services group handling mapping data conversion jobs for network design engineers and fiber management platform users. VETRO FiberMap is a privately owned firm based in Portland, Maine.

VIAVI Solutions

www.viavisolutions.com
408-404-3600

Key Products: Field and lab broadband test equipment, network monitoring systems, network performance monitoring, diagnostic solutions

Summary: VIAVI Solutions has nearly 100 years of experience in network testing and quality assurance. The company provides construction/installation, testing, assurance, monitoring and optimization solutions for broadband communications service providers, cable operators, mobile-service providers, network equipment manufacturers, contractors, governments, data centers and enterprises. It offers test and measurement solutions for all gigabit internet technologies, including GPON, DOCSIS 3.1, G.fast and Wi-Fi. VIAVI claims numerous firsts, such as the industry's first 400 Gbps test platform, the industry's first PON power meter solution for NG-PON2 deployments, and the first complete Open-Radio Access Network (O-RAN) test suite for 5G, introduced in March 2020. It continues to enhance its product line, announcing in 2019 new solutions for 5G, fiber and cable networks and the first field instrument combining PON, Ethernet and Wi-Fi test capabilities with automated testing. For fiscal year 2019, which ended June 30, 2019, VIAVI reported net revenue of more than $1.1 billion, up almost 30 percent over the previous year after several key acquisitions. VIAVI is based in San Jose, California.

Walker and Associates

www.walkerfirst.com
800-925-5371

Key Products: Products and services for deploying communications networks; kitting and integration; product selection consulting

Summary: Walker and Associates is a national distributor of networking products for broadband providers, including wireline, wireless, and CATV, as well as for government and enterprise network operators. The company sources products from more than 300 suppliers, facilitating carriers' delivery of high-speed internet, video, data and voice services to residential, business and mobile users. Walker supports technology solutions such as switching, routing, Wi-Fi, microwave, network functions virtualization (NFV), Carrier Ethernet, VoIP, wavelength division multiplexing, reconfigurable optical add-drop multiplexing, packet optical networking, software-defined networking, GPON, active Ethernet, fixed wireless and DSL. Walker's certified product engineering, kitting, testing, installation, systems integration

and managed services simplify network deployment. Products include fiber and copper connectivity, power systems, indoor and outdoor enclosures and outside-plant products. Walker also offers marketing, sales, logistical and technical support services for manufacturers, reaching 10 telecommunications submarkets and more than 1,200 domestic customers. To keep pace with the markets it serves, Walker has invested in additional technical resources and tripled its NFV lab capacity. To meet customer requirements for bulk fiber, the company enlarged its fiber cable supply yard and increased its capacity for custom-cut cable. Based in Welcome, North Carolina, with 155 employees, Walker is ISO 9001/2015 quality certified and is a certified women-owned corporation.

Zyxel Communications

www.zyxel.com
714-632-0882; 800-255-4101

Key Products: Gigabit home gateways and other customer-premises equipment, mesh Wi-Fi systems, Ethernet switches, security

Summary: Zyxel provides a portfolio of multiservice LTE, fiber and DSL broadband gateways; home connectivity solutions; smart-home devices; enterprise-class Ethernet switches and security and Wi-Fi equipment for small to midsize businesses. Recent Zyxel solutions for FTTH and FTTN include an advanced security gateway for service message blocks, a high-performance gateway for ISPs, an enhanced Nebula cloud management solution, and the CBRS and multiband outdoor routers for fixed wireless access. Zyxel has also been working with Affinegy, a vendor of hardware-independent, standards-based device management software recently acquired by NISC, to provide an automated, turnkey reporting service that broadband operators can use to satisfy Connect America Fund reporting requirements. In February 2020, Zyxel announced its family of solutions for service providers based upon IEEE 802.11ax (Wi-Fi 6), the latest Wi-Fi specifications standard. The new Wi-Fi 6 solutions will enable service providers to provide subscribers with multigig WAN connectivity to the home through fiber, 5G and G.fast networks. Zyxel is headquartered in Hsinchu, Taiwan, with U.S. headquarters in Anaheim, California. It posted $379 million in revenue in 2019, up from $375 million in 2018. ❖

To nominate a company for next year's FTTH Top 100, email sean@bbcmag.com.