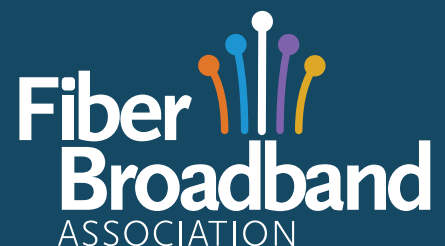




# Strategies to Mitigate Bottlenecks

in the Current Fiber Broadband Supply Chain  
UPDATE



March 2023

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# Executive Summary

Since the initial publication of this white paper, improvements in lead times have been recognized as well as other aspects of state of the supply chain. This iteration reflects updates in the market since summer 2022.

The COVID-19 pandemic has dramatically accelerated America's transition to fiber broadband.

With customers demanding faster and more reliable connections for their increased needs when working and schooling from home, and the US government continuing to pour funds into the construction of new networks to connect rural and underserved areas, the demand for new fiber broadband has never been higher.

However, the pandemic also had negative impacts on the operation of the global supply chain, restricting access to and raising costs for all facets of a fiber broadband build. Raw materials, finished components, transportation of goods, supply storage, and skilled labor are all dramatically more expensive than pre-pandemic, and often in short or uncertain supply. In addition, many government programs supporting these fiber broadband builds are time-sensitive and must be completed on schedule to receive funding.

It is imperative that companies working in this industry institute a broad range of mitigation strategies to ensure project success. The Fiber Broadband Association has collected vital statistics regarding the ongoing changes in the market and interviewed representatives from each sector of the fiber broadband industry to learn how they are protecting their fiber related projects from the negative effects of supply chain stressors.

We detail here various mitigation strategies to assist companies in successful and timely deployment of new fiber networks. Those strategies range from stronger partnerships with vendors, extended planning times, high level design optimization, and changes in how companies recruit and train their labor force to AI-based and smarter technology options to plan and manage stock levels.

With careful planning, companies can overcome the current supply chain challenges and build more robust systems and processes to buffer them from future challenges.

# Introduction

The national transition to fiber broadband is well underway and progressing rapidly, with over 60.5 million households currently being served by fiber, an increase of 12% in 2021.

This increased adoption of fiber optics for broadband will offer multiple benefits in speed, security and long-term cost, particularly for formerly underserved and rural communities.

Recognizing the vital nature of high-speed internet to ensure equal access to employment and educational opportunities, the US government has [committed billions in federal funding](#) to support this transition, with multiple funding opportunities existing to create new installations in both urban and rural markets.

Customer demand is high and governmental funding and support is currently being put into place, with additional funds forthcoming. So why are fiber deployments across the country not happening at a more rapid pace?

Unfortunately, the COVID-19 pandemic created a perfect storm of challenges for the companies working to make fiber broadband the standard in more markets. While the U.S. had a 10% excess cable supply in early 2019, world-wide we are now dealing not only with raw material and skilled labor shortages, but also significant complications and delays in the supply chain for even those materials and services that are in abundant supply. While we have seen improvements in lead times, this shortage of resources, combined with a significant uptick in build activity, has placed tremendous strain on suppliers.

## THE SUPPLY CHAIN CHALLENGES:



Companies working in this space need to adopt long-term planning and procurement strategies for dealing with ongoing material and labor needs, and work to develop strategic partnerships with vendors and distributors in order to ensure continued feasibility of their buildouts.

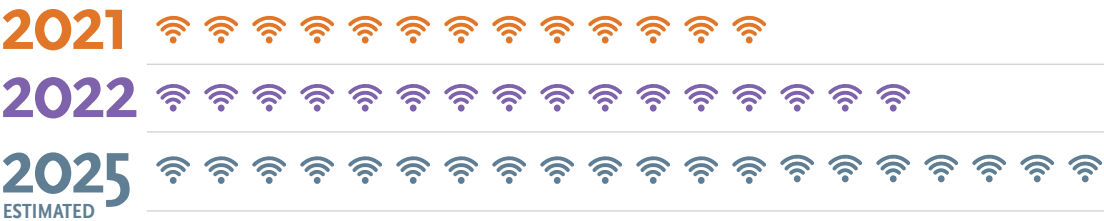
# A Unique Time for the FTTx Market

There has never been more demand for fast, reliable and secure access to broadband in the United States. A movement to broaden high-speed, low-latency, symmetrical internet access, specifically fiber access, was already underway pre-pandemic, but the sudden onset of COVID-19 threw that movement into overdrive.

Overnight we were all working and learning from home, and — with external activities curtailed — also seeking options for entertainment, fitness and social interaction at home. All of these activities require reliable high-speed bandwidth.

In the United States in 2022, the average home has 16 connected devices, an increase from 13 such devices in 2021. It's anticipated that this number will [grow to 20 by 2025](#). Globally, many users spend almost a third of their lives online, not only for work and school related activities, but also to stream music and video, participate in online gaming, and post to social media.

### CONNECTED DEVICES PER U.S. HOUSEHOLD



The need for secure, reliable, high-speed internet access — combined with an influx of federal funding to extend fiber broadband reach to rural and other underserved parts of the country —has led to historic levels of demand for new fiber deployments into more areas, but the supply chain issues exacerbated by the pandemic have also halted or slowed many planned projects.

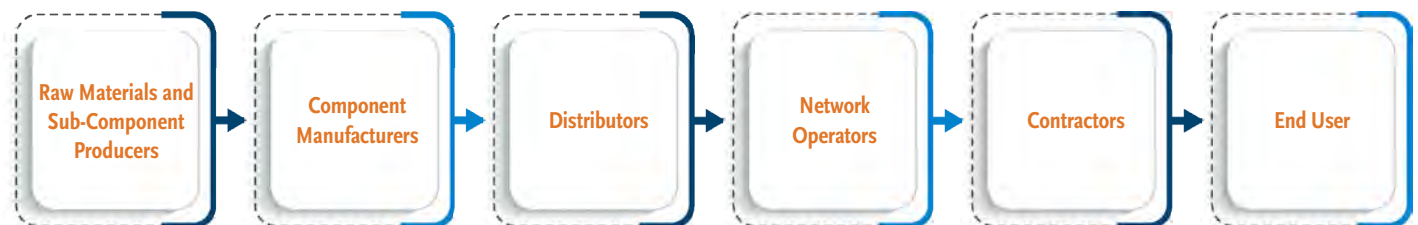
Pandemic-related shutdowns, extreme weather and military conflicts in other countries have halted or slowed production for both necessary raw materials and assembled components, while complications in the shipping process have led to [price increases of anywhere from 40-100%](#) as well as substantial delivery delays.

Lead times for required supplies are currently ranging anywhere from 4 - 14 weeks. Additionally, a country-wide labor shortage means that there is a lack of workers necessary to transport, deliver and unload supplies. There is also a shortage of the skilled workers needed for install projects, while at the same time the training programs that would upskill these workers were put on hiatus due to COVID restrictions.

In short, there has been an unfortunate combination of events that have increased the demand for high-speed fiber internet access, while simultaneously decreasing networks operators' ability to complete installation and expansion projects related to its implementation in a timely or cost-effective way.

# Mapping the FTTx Supply Chain

The provision of fiber broadband to end users requires many raw materials, component products and service operators to be completed successfully. Many players must work together – from global raw materials suppliers and equipment manufacturers to shipping, storage and distribution services, as well as local governments, network operators and contractors.



*The FTTx supply chain: manufacturers source raw materials from multiple tiers of suppliers; make a finished product to sell to distributors and/or directly to network operators/sometimes contractors; network operators perform and/or contract out part or all of the build*

## 1 STEP

**Raw Materials and Sub-Component Producers:** These companies produce and distribute the raw materials necessary for component products. This can be anything from gasses like helium, methane and neon to polymers and resins used to make jacketed cables and optical components. Steel, copper, and other alloys are also necessary. Sub-components include fiberglass yarns and rods, wooden or composite reels and packaging material.

## 2 STEP

**Component Manufacturers:** These companies manufacture, assemble and test the finished components necessary for a fiber broadband deployment. These components include fiber optic cabling, fiber connectivity, semiconductors, optical network gear, electronic assemblies, routers and other customer connection materials.

## 3 STEP

**Distributors:** Distributors are responsible for getting network operators the supplies they need, exactly when they need them. To do this they maintain relationships with multiple manufacturers in order to secure necessary materials at the best prices. They also handle logistical issues with multiple lead times, managing all issues related to shipping, warehousing and local delivery.

## 4 STEP

**Network operators:** Network operators build out and service fiber networks for business and home end-users in a particular geographic market. They may complete a buildout with in-house or contracted teams, and they need to arrange not only timely supply availability, but also handle all local issues related to permitting for the build and managing their contract or in-house labor needs.

Network operators can be classified by tier.

**Tier One:** Includes nationally known names like AT&T, Verizon, and Lumen. These larger providers and the top five cable multi service operators (MSOs) are responsible for [about 72% of overall fiber broadband access](#) nationally. They usually have larger budgets and, as they are continuously building networks, many will have established contractual positions with large suppliers.

**Tier Two:** Larger regional providers such as C-Spire, TDS Telecom and Frontier are responsible [for about 10% of fiber broadband growth](#). These entities are more established than the Tier Three providers but may not have the budget or buying power of Tier One.

**Tier Three:** In the U.S. there are also currently over 1200 hyper-local providers who can address unserved areas that are often not profitable for the larger telecom companies. These projects, which usually span 1-4 U.S. states, compose the remaining 17-18% of fiber builds. These deployments are currently being supported by the influx of federal funding targeted to these types of projects. Operators in this tier include independent telephone companies and cooperatives. This tier also includes electric utility cooperatives, municipal electric companies, and individual municipalities. With current funding opportunities and government initiatives, they will soon be joined by tribal nations, deploying and managing their own networks.

**Middle-mile operators:** This group is composed of carriers that specialize in middle mile and/or long haul routes and frequently lease connectivity to access or enterprise customers. Most network operators will utilize a mix of owned and leased middle-mile circuits.

## 5 STEP

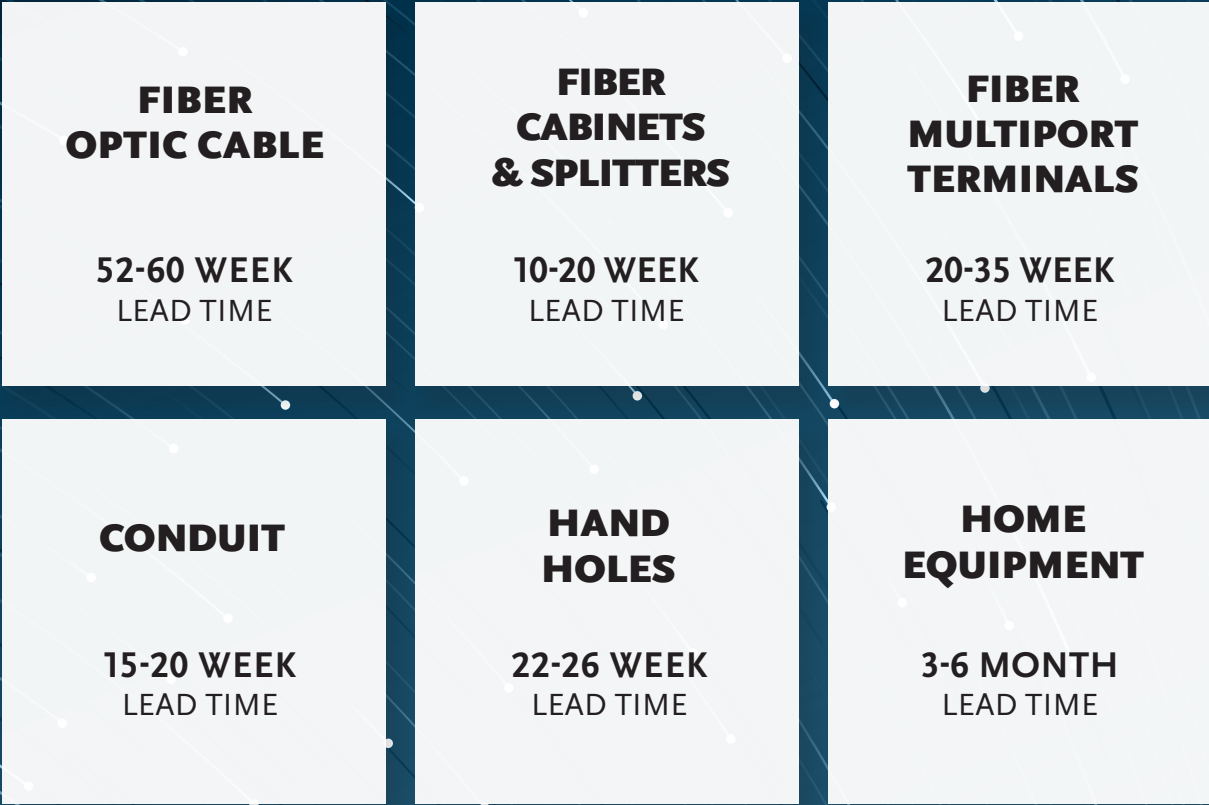
**Contractors:** Network operators may not have all in-house construction and installation teams. They frequently hire contractors who handle specialty tasks associated with a buildout. This can include anything from digging trenches and hanging aerial cable to last-mile installation and customer connection services. Due to current labor shortages, these contractors have their pick of available projects, and can move to whatever geographic area has the most work available or best wages. To ensure labor availability, many network operators may want to bring these crews in-house, but there are budget and training implications to having permanent crews in place, rather than contracting them as needed.

# Bottlenecks in the Fiber Broadband Supply Chain - Summer 2022

A perfect storm of issues has affected global supply chains in the last several years. Bottlenecks are occurring at every stage of the process, from raw materials production to component manufacturing, and these issues have also impacted every facet of the shipping, delivery and installation processes.

Here are some of the most common build products required, with estimated lead times as of summer 2022.

## Supply Chain - Lead Times



*Lead times for various critical components with no contractual commitments (September 2022 Fiber Broadband Association)*

*Suppliers began adding cable capacity as quickly as possible with lead times expected to come down as capacity ramps up.*

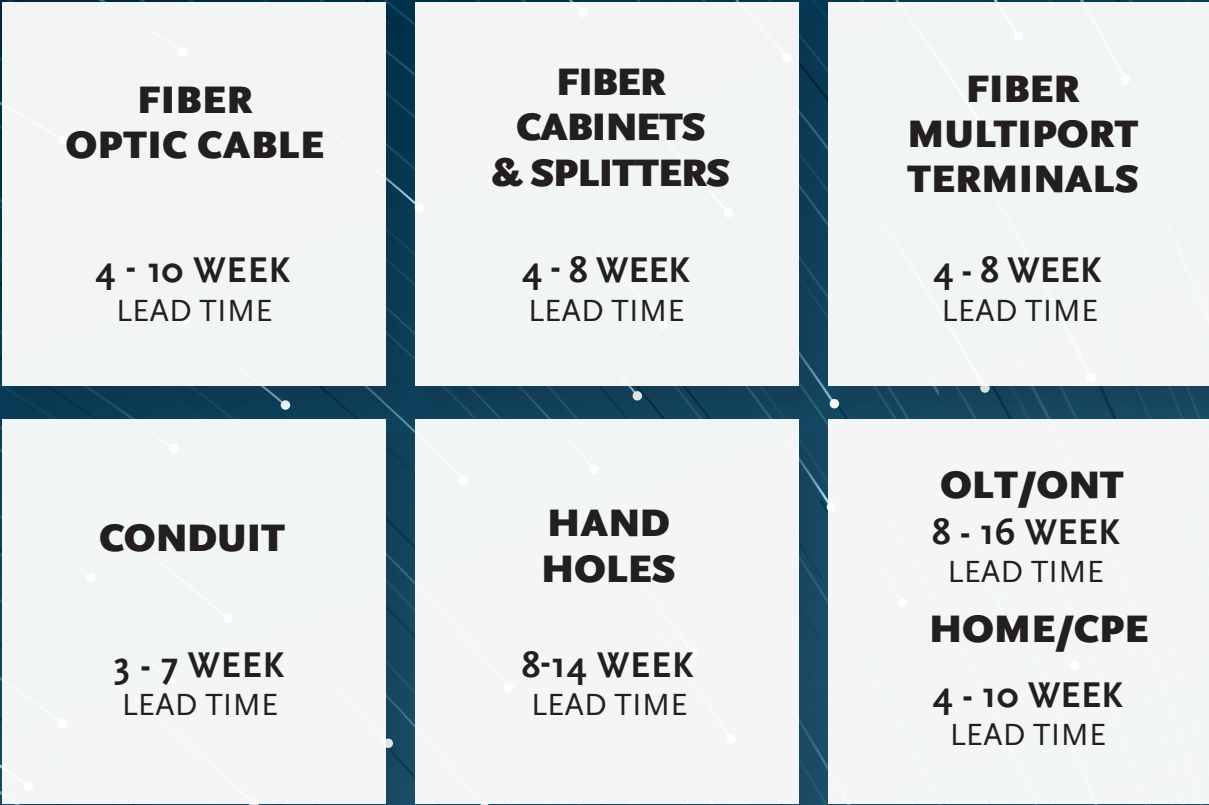


# Current Bottlenecks in the Fiber Broadband Supply Chain

As suppliers began adding capacity in the summer of 2022, lead times improved. While we have seen some relief in the supply chain in 1Q23, we expect to see an uptick in demand going forward, therefore we encourage companies to continue to put a hard focus on long range planning and providing accurate forecasts to their suppliers and to follow the FBA mitigation strategies outlined in this white paper.

Here are some of the most common build products required, with estimated lead times as of March 2023.

## Supply Chain - Lead Times



*Current lead times for various critical components with no contractual commitments (March 2023 Fiber Broadband Association)*

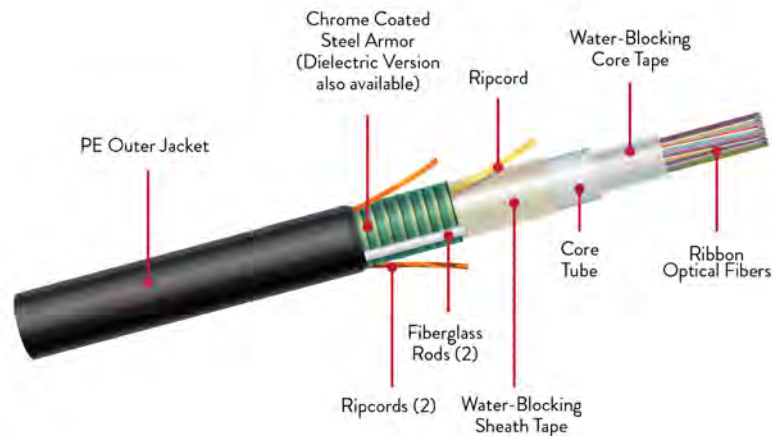
# Supply Chain Issues for Raw Materials

In a complex geopolitical environment, with global sourcing of raw materials, a variety of environmental factors and political conflicts can impact material availability. Several of the raw materials needed to make the necessary components for a fiber installation are either scarce, hard to acquire due to shipping difficulties, drastically inflated in price, or all three.

Fiber optic glass, obviously a key component of making fiber lines, is not in short supply. There is ample domestic production of fiber optic glass and manufacturers are building out capacity for even more.

However, all fiber optics need to be jacketed with cabling, which requires specialty plastics, primarily polyethylenes and polypropylenes as well as resins. These plastics and resins are strongly linked to the availability and price of petroleum.

Other components, like the steel, aluminum, and copper that are also required to produce the cabling are in shorter supply or have experienced rapid price increases.



Neon is also an essential component needed for semiconductor production. The majority of the semi-conductor grade neon needed for that process has traditionally been supplied by factories in the Ukraine. [With Ukraine production currently impacted](#) by military conflict with Russia, the price of neon has surged, and chip manufacturers have stockpiled available neon. Production can shift to other countries, but a long-term solution for the current shortage has not yet been determined.

Other products not directly related to material production and installation are also affected by shortages and price increases. For instance, with the cost of wood rising exponentially, the price for the large wooden reels needed to store fiber optic cabling has also risen.

All of these raw material issues have an impact further down the chain, where they can either slow production of needed components or inflate the price of those components. The creation of a fiber network necessitates hundreds if not thousands of individual materials, and it only takes the delay or unavailability of one of them to significantly delay a deployment. Another challenge for fiber optics cable manufacturers is the leads times for the actual equipment that makes the cabling.

# Supply Chain Issues for Components

Lack of access to raw materials and price increases for those materials have impacted production of many assembled components necessary for fiber deployment. Perhaps none of these has been more widely publicized than the current shortage of semiconductor chips, which are currently experiencing 26 -52 week lead times.

## **Semiconductors**

Lack of semiconductor availability has affected almost every industry in the United States. This shortage has been driven by several factors – including an increased demand for consumer electronics. The United States personal computer market [grew at its highest rate in 20 years](#) during the COVID-19 pandemic.

The automotive industry is another huge driver of demand for semiconductors, and at the start of the pandemic many auto makers canceled or delayed orders for semiconductors, as they projected the demand for new cars would decrease. When demand stayed strong, there was a rush to fulfill these orders, which has increased the current shortage.

Expanding production capacity for semiconductors is both expensive and slow, as they require billion dollar facilities for production. With semiconductor technology changing, factories also want to focus on the more lucrative, next generation technologies such as 10G PON rather than continuing to produce more mature technologies like 1G PON which are expected to have lower demand forecasts in the future.

Other assembled components experiencing shortages are:

- Cabling and connectivity supplies
- Vaults
- Optical network gear
- Chipsets
- Various other components needed for installation at customer locations, including routers, and cabinets
- Splice cases
- Conduit
- Couplers and other underground materials

# Supply Chain Issues for Shipping and Logistics

The combination of COVID shutdowns and labor shortages have led to increased lead times and inflated costs for all shipping methods, marine, air and terrestrial. Additionally, the erratic nature of the market and the difficulty of planning for anticipated needs means that some customers are overbuying supplies, leading to both long and short-term storage issues. In a total-system build, the shortage of one key component prevents the usage of the other, on-hand components.

In the maritime markets some shipping ports closed completely or limited operations to minimal crews for COVID mitigation, leading to backups. COVID restrictions and quarantining have also led to crew shortages and an inability to fully staff ships.

Appropriate staffing of container ships is also a challenge. The International Chamber of Shipping estimated that in August 2020, over 250,000 seafarers were working on extended contracts and were overdue to return home, in addition to those needing to join their ships in order to work and keep the supply chain moving. Unfavorable working conditions have left many seafarers eager to leave the field entirely.

COVID shutdowns continue in waves around the globe, with Chinese ports particularly hard hit in 2022. In April 2022, up to 20% of the 9,000 globally active container ships were stuck outside backed-up ports in various parts of the world. [Almost a full 30%](#) of that backlog was created by shutdowns in Chinese ports alone.

Dockworkers and longshoremen are required to unload and move freight on and off ships, and there is new potential for complications in that process on the West Coast of the U.S., as the contracts for International Longshore and Warehouse Union are negotiated. A strike that has the potential to shut down overburdened ports in Long Beach and Los Angeles would have dire consequences for an already stressed supply chain.

Even for domestically produced goods, or goods that have successfully reached the United States, an ongoing shortage of truck drivers further delays delivery. According to the American Trucking Association [USA estimates there is a shortage of 50,000 truck drivers which is expected to increase to 174,000 by 2026](#). As trucks are the way that 72% of American freight is transported, this shortage — which predates the COVID crisis — has an ongoing impact.

All of these issues have combined to contribute to dramatically increased costs for moving freight into or around the country, as well as unexpected market distortions, in which the cost of airfreight is lower than the cost for maritime or terrestrial transport.



## Labor and Training Issues

After the spike in unemployment for the initial COVID shutdowns in spring and summer 2020, the American labor market rebounded relatively quickly. Most of the country is now facing labor shortages, with unemployment nationally holding at 3.6%. Network operators report issues with hiring and retaining both internal employees and contractors to complete required work.

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*Nebraska has had an historically low unemployment rate of 1.7%. One of the counties we're building in had an 0.8% unemployment rate. So it's an extremely tight labor market. And the manufacturers we rely on are dealing with similar labor shortages. So just getting people hired and trained, that's all part of the challenge.*

Todd Heyne, Chief Construction Officer, ALLO

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Even in areas without high unemployment, COVID is still impacting every facet of the supply chain.

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*Wherever people are involved, the virus affects people so there can be an impact. Whether it's logistics, manufacturing, shipping the end product, or installation.*

John George, Senior Director Solutions and Professional Services, OFS Optics

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Contracted crews needed to handle specific parts of an installation may have the ability to pick and choose when, where and how they work, and they may move around to various areas of the country depending on available jobs and wages.

Companies must now make decisions about how and whether to upskill or cross train their current employees, which requires both time and financial investment. Wages are increasing countrywide, further impacting budgets.

## Second-Order Challenges

Network Operators also face a host of second-order challenges, sometimes unrelated to the supply chain. Each install area requires careful analysis and planning to determine the required construction method and best ways to deal with local geographic conditions and challenges. Second-order challenges include:

- **Permitting**—local municipalities may not work effectively to expedite permitting, and/or understand the nature of the fiber install process.
- **Ancillary equipment**—the shortage of semiconductors also affects the availability of job site equipment such as bucket trucks and other vehicles that are needed for construction projects.
- **Storage and warehousing**—if transitioning from a “Just in Time” supply strategy to stockpiling 36 months of supplies, material storage is a concern. Not only is storage space at a premium in some areas, but network operators must then incur further expense to ensure that supplies are secured against both the elements and inventory shrinkage.

In general, the relative inexperience of smaller regional operators can be a challenge.



Figure 1 Space required for OSP materials storage



*If it's a brand-new entity trying to get in the business of building fiber to the home, first they've got to build their own team. Then they need to plan, decide what type of architecture they're going to use, what type of products will feed those architectures. A lot of these newer providers have to function like a startup – and they can gain an edge if they work with trusted, experienced partners.*

Joe Jensen, Director of Market Development, Corning



The supply chain bottlenecks may also affect tier three operators disproportionately, as [nearly 70%](#) of rural ISPs reported an increase in the price of their supplies, which affect their capital budgets and will eventually translate directly to the cost of services for customers.

Though there is ample money available via federal grants, loans and subsidies, delays caused by supply chain issues could impact these smaller entities' ability to meet timely deployment obligations under the terms of those programs.

# Mitigation Strategies

So, facing this perfect storm of challenges with the supply chain, network operators need to adopt multi-faceted, long-term strategies to protect themselves from the impact of shortages. We spoke to a variety of product suppliers, distributors, and network operators to see what mitigation strategies they were employing to work around supply chain issues, and which of these was most effective.

These mitigation strategies cover both short-term and longer-term considerations and can range from changes in high-level design and build planning to maintaining expanded inventory levels.

## **THESE STRATEGIES ARE:**

- Relationship Building and Communication
- Capacity Build Out and Nearshoring
- Product Substitution
- Training Programs
- Supplier Diversification
- High Level Design
- Scheduling Management and Forecasting
- Smarter Technology
- Move from Just In Time and Expanding Storage Solutions

# Relationship Building and Communication

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*Building fiber is definitely a high-tech field, but in the end it still comes down to people. Good planning, open communication, and long-term relationship building are the best ways to insulate yourself from most of these supply-chain issues in the long term.*

Scott Jackson, Graybar Electric

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Relationship-building was mentioned by almost all of our contacts as a key mitigating factor for supply chain issues. Developing good relationships with suppliers and sharing long-term plans with them will be critical to protecting companies from future supply chain shocks.

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*I think it's that honest and open communication is the key. Communicating the good things that are happening and the hurdles that are coming up. We don't need somebody just to sell us stuff – that's easy. It's someone that's looking out for us and offering the information we need to forecast more accurately.*

Matt Tillinghast, Supply Chain & Purchasing Supervisor, ALLO

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Internally or externally, getting a variety of people in the same room to discuss a deployment is now a necessity. Where engineers could previously work on a high-level build and assume that the requisite materials would be available, now more people need to be involved at every step from design to last mile, so that potential problems can be averted as early as possible.

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*Our construction teams and engineering teams are much more focused on supply chain issues now. It's not just the warehouse managers worrying about supply, everyone is keeping this issue in mind when they make planning decisions.*

Jeff Manning, Shentel

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## Capacity Build Out and Nearshoring

One obvious solution to a shortage in domestic supplies is to build out production capacity in the United States, and some suppliers are investing in this.

Mike Bell, senior vice president and general manager of Corning Optical Communications, said at a recent FBA event, “I’ve been in this business for 30 years, and I’ve never seen demand on the scale we’re seeing now. And I’ve never seen us invest in capacity as broadly as we’re doing right now, and frankly as the industry is doing right now.” Corning is currently building a new plant in North Carolina which will focus on optical cable manufacturing.

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*We have been and continue to increase domestic optical cable production. Compared to 2019 our investments in fiber and cable are expected to increase OFS U.S. based optical cable output by 80% by 2024*

John George, OFS Optics

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These projects are certainly beneficial investments in long-term availability, but they are both expensive and time consuming. Additionally, some raw materials cannot be sourced domestically and will need to be imported for the long term.

Nearshoring, which refers to transferring business operations to a country nearby rather than a more distant one, is also a more attractive alternative, given the rising cost of transporting freight. Many suppliers already nearshore production of many of the optical connectivity components and have been working to add capacity there as well.

Suppliers are also working to service both new and existing companies effectively.

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*As in any capital-intensive industry, long term supply contracts help protect buyers and suppliers in unpredictable times. Pre-pandemic, the aggregate US cable supply was running about 10% over the market demand. Since then we have seen market demand growth well north of this and as our customers partner with us to advance their growth, we’re adding capacity to support their needs. A cable manufacturing expansion we announced in 2021 in North Carolina is currently ramping up, and in August we announced a new cable facility in Arizona. All in these investments will nearly double our ability to serve the U.S. cable market since pre-pandemic levels.*

Joe Jensen, Corning

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## High Level Design and Product Substitution

One of the most impactful ways to mitigate current and future supply chain issues lies in the high-level design of the network. Networks that are designed early in the process can help to buffer operators from both price fluctuations and unexpected shortages.

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*One mitigation strategy that we suggest is that once the area to be built is identified and there's some confidence that the funding is going to be there, design it. Perform high-level design, and that's going to be 85-90% accurate to produce a bill of materials. Those materials can be ordered while the detailed engineering and other steps are taking place.*

John George, OFS Optics

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When networks are designed in advance, they can also be made flexible enough to allow for product substitution, allowing network operators to have some latitude in terms of what products they use for a build when they run into a shortage. Some products in a build are relatively easy to substitute but, some product selections are locked in place when the system is designed and can't easily be changed out mid-stream. It's best to know at the beginning where a build will have flexibility.

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*With a more detailed design further in advance, we can identify where some of the bigger challenges lie, what types of equipment are more problematic than others, and we shift design based on eliminating some of the issues with a certain widget, we avoid that widget and get some other design.*

Jeff Manning, Shentel

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## Training Programs

Labor shortages are an ongoing concern at both national and local levels and range from factors largely outside a network operator's control i.e., the availability of truck drivers, to those more within their control, such the skilled labor they need for installs.

In general, network operators we spoke with were focusing on doing more in-house training and upskilling existing employees, rather than relying on outside contractors for the majority of their labor needs. They were also focused on ways to speed the time between bringing a new-hire on board to that new hire's full productivity for their organization.

A large emphasis is now placed on rapid on-the-job training programs, with those companies who used to recruit new employees with some experience in the industry now being willing and able to train them from the ground up, even if they have no previous experience.

Of course, there are also more formal training programs as well. To address the workforce tech shortage in the industry, the Fiber Broadband Association has developed a [fiber optic technician training program](#) and has a National Registered Apprenticeship with the Department of Labor to train thousands of technicians and network specialists across the country in the skills needed to design, engineer, install and manage fiber broadband networks. Many fiber broadband association members offer training in their areas of specialization such as the Corning/AT&T joint training addition and Clearfield College.

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*The Fiber Broadband Association has developed the OptIC technician certification program to seed and enable community colleges to offer installation training. This will help us build the workforce of fiber optic installers we will need to meet the historic levels of demand that we're expecting in the next several years.*

John George, OFS Optics

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*We never want talent shortages to inconvenience our customers. So, we've taken three-pronged approach to talent development. We're upskilling existing talent, creating career pathways internally. We're also actively recruiting new talent and training new team members at the colleges in Idaho and a training facility in Texas. We've also reaffirmed commitments to our subcontracting partners and have cultivated relationships with a network of contractors across the U.S. The means we always have options when staffing projects, preventing substantial delays during the construction process.*

Duke Horan, Mears

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# Supplier Diversification

Network operators are wrestling with balancing diversification and exclusivity in all of their networks, including not just parts suppliers but also contract labor, manufacturing and distribution.

Exclusivity offers trusted products and services, potentially at a more cost-effective price due to longstanding contracts and relationships. In the past, locking in contracts has been key to securing materials at the best prices. But diversification can ensure that products and services are available when you need them.

Established suppliers discourage buying from smaller resellers that crop up to take advantage of high demand and low supply, due to their lack of long-term support. However, the natural response to product scarcity is to branch out and diversify, and smaller operators note that they may have little choice. Many Tier One operators have larger budgets and can edge out smaller players by consuming all available supplies, leaving Tier Two and Three operators to seek out other sources.

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*It may be tempting to try non-traditional vendors who don't really have any experience or track record in the US – they tend to crop up during these kinds of times. Just recognize that while they may seem like a panacea, when considering long term support, technical support and network compatibility, we think it's better to work with an established US-based vendor. These networks are going to be in place for decades, and a temporary, opportunistic supplier may not be around and available in a few years.*

John George, OFS Optics

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*We try to make sure that we have multiple vendors for anything that we're putting in. So our fiber optic cables, all the equipment that we use to provide service, all the way down to our third party services and contract resources. You never want to be in a position where there's one challenge that disrupts everything. It's okay to have a disruption as long as you're not completely stopping production. A complete production halt because you're relying on one vendor is very hard to overcome.*

Jeff Manning, Shentel

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# Scheduling Management and Forecasting

Everyone we spoke to along the supply chain described extended scheduling and forecasting processes, with many operators now working on five-year plans.

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*Given lead time, I want to know what my customers are thinking of doing in eighteen months, I don't need to know what they're doing in the next two months, because if I didn't know that six months ago, I'm in trouble. We have to collaborate on what you're planning on doing far in advance, so I can make sure that my design team, my supply chain team, my semiconductor manufacturers, my contract manufacturers know what kind of capacity they need.*

Jerry Cederlund, Calix

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*The suddenness of the pandemic forced us as a company to fine tune our forecasting and plan out a lot further than we had in the past. Previously it was at Q3, Q2 of the year, planning for that next year. We've moved from less than 10 months of planning ahead, to 24-36 months down the road looking at needing material lined up and having those conversations with our vendors and manufacturers to make sure that they will have the capacity to meet our needs.*

Matt Tillinghast, ALLO

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## Smarter Technology

Given the complexity of global supply chain issues, many companies are relying more heavily on advanced technology solutions, including smarter and more automated stock tracking options, as well as AI-based supply chain monitoring. These types of technology alert them far in advance about issues not only within their own organization, but also issues outside the company that could impact the availability of required raw materials and components. AI can help companies make short term, reactive decisions about how to source components, and it can also help them make longer-term planning decisions about where they will manufacture their goods.

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*We utilize an AI platform that gathers news and sources information every day on what's going on in the world – for example we have an update on neon suppliers in Ukraine in a “war room” created by platform. Another example would be, it's raining in Thailand and I'm getting flood warnings – I meet with the supplier virtually to decide what to do — can they go ahead and ship before the rain gets bad?*

*The program also puts all suppliers on a “heat map” in terms of potential for issues. “This supplier is in region with volcanic activity, we recommend a 6-month buffer of supply.” This drives our choice of suppliers in a more strategic way and can even impact our planning processes and where we decide to build our products.*

Jerry Cederlund, Calix

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Given that supply chains will continue to be stressed, what companies must do now is work to deploy a real-time visibility platform to monitor in-transit shipments, track stock on site, and of course, train all employees to make optimum use of these tools.

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*Fiber deployments require handling of large, bulky products as well as a multitude of smaller critical components. Our customers need managed supply services that give them real-time visibility into stock levels and delivery schedules. We utilize a software that can take minimums & maximums of product and then calculate multi-manufacturer lead-times, ensuring product deliveries occur well in advance of the deployment schedule. This software can also keep track of material check in and check out on site, which lessens the impact of theft or loss.*

Scott Jackson, Graybar Electric

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*You definitely need to use technology to get better analytics internally, and you also have to add discipline to your internal process and procedures to make sure you're capturing everything, because even with the best technology in the world you won't have useful data if you're not checking things in and out properly.*

Todd Heyne, ALLO

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## A Move Away From “Just in Time” and Increasing Storage Options

In the past, a JIT strategy was key to keeping costs low, but operators working with a lean inventory model have found that it’s only feasible under optimal market conditions. Many of them do not see that model coming back any time soon.

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*In the past we had more of a just-in-time approach, but now we really like to have a month or two of material on the ground. Because if we run out, we could stop 12 crews from working. So we like to have a little cushion – and that’s extremely difficult to maintain right now.*

Todd Heyne, ALLO

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*Order all your material up front. With the funding available for these projects, the upfront cost isn’t as big of an issue. Having crews sitting idle waiting on material in the middle of the project is a bigger cost.*

Dwayne Roberts, Graybar Electric

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But what’s the difference between building a reasonable security buffer and hoarding supplies? As much as suppliers encourage planning and placing orders in advance instead, contractors still want to physically hold onto inventory to make sure they have what they need. This can be detrimental at scale. For smaller operators in particular, working with a distributor can offer the ability to shift inventory from one site to another.

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*There’s always a concern about hoarding. Just like with toilet paper ... that’s not good for anybody, including the person that ends up with more than they need and trying to figure out what to do with it later. Plan to buy what’s needed and recognize that maybe this escalating demand is not perpetual – it never has been in the past – and it’s probably not a wise thing to order way more than you need because all that’s going to do is constrain the overall deployment.*

John George, OFS Optics

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*It’s important to keep the supply chain running effectively – instead of hoarding around component shortages. Let the supply chain do its work. The problem with hoarding is it hurts everyone in the long term. I have some safety buffer in place, but it’s aligned to how accurate my processes are, I don’t double or triple that. So I definitely have a safety buffer built into the supply chain, but it’s scientific. It’s based on lead time, it’s based on how accurate our forecasts are, and it’s based on certain statistical variances that I use. It’s textbook stuff, but we’re very scientific about our planning process*

Jerry Cederlund, Calix

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# The View from 2023: Challenges and Opportunities at Each Link in the Supply Chain

While the challenges of the last few years have been unprecedented in modern human history, the lessons learned from them will help us all to design better systems moving forward.

While pandemic-related short-term material and labor constraints have eased, demand for fiber broadband installation and maintenance will not decrease, and new challenges will be sure to present themselves.

In a globally connected world, where adverse conditions in one geographic area can impact supply chains for years into the future, the most important strategy for successful companies will be to plan and build as much resilience as possible into their supply chain, while establishing strong collaborative relationships with suppliers and designing flexible systems that allow for some changes based on product availability. These strategies will offer them the flexibility to pivot quickly, adapting when circumstances and materials availability changes.



