

See the Light with Fiber-Based Telecom

Fiber-Based Last-Mile Delivery is Changing the Telecom Industry

The concept of huge quantities of voice and data traveling vast distances almost instantaneously over a beam of light is still awe-inspiring, even for those who understand the depths of fiber optic technology. For the rest of us, fiber-based telecom is an incredible opportunity to increase capabilities, enhance security and improve cost-effectiveness. It has many benefits over copper, from bandwidth capacity and signal reliability to security and longevity. With dropping prices, the value advantage is clear. Copper has served us well over the past century plus, and it still has a role today, but there is little question that fiber is changing our industry and lighting the future of telecom and IT.

WHY FIBER-BASED TELECOM MATTERS TO YOU

Fiber offers many advantages over copper that enhance IT and communications capabilities, while reducing long-term costs. The most significant issues for many businesses are in the “last mile” of their service. Running fiber cable in the local loop – the connection between the carrier’s central office and your business – provides extensive scalability of your data connection that can be achieved much faster and far more cost-effectively than with copper.

If a business with a traditional copper-based T1 Internet connection of 1.5 mbps wants to increase its speed to 4.5 mbps, new T1s will have to be engineered and delivered to the location. Besides being costly, such an installation can easily take 60 business days or

more. In addition, new hardware may be necessary to bond the additional T1s and hand them off to the company’s equipment.

If a fiber-based Ethernet had been installed in the last mile, the situation would have been much better. Fiber has vastly greater capacity than copper. While only a very small part of that capacity would have been used to deliver the original 1.5 mbps, the speed could very easily be scaled up to 10 mbps just by making a request to the carrier – and the cost would have been about the same as the traditional 4.5 mbps example above. The carrier would simply “turn up the port” remotely, without scheduling a service call, running new cable or installing new equipment. This would typically happen in 2-3 days at a very low cost. There would still be ample capacity for future expansions – to 20 mbps, 50 mbps or even 100 mbps, also within just a few days.

While fiber may be more expensive to initially install, the long-term cost saving, scalability and other advantages will deliver a much better return on investment.

THE FACTS: FIBER VS. COPPER

The fundamental difference between fiber and copper is how they physically transmit signals from one place to another. Copper wires make up traditional phone cables, which carry modulated streams of electrons to transmit voice and data signals. The utility lines that bring electricity to your office are very similar, but they carry much higher voltage and power. Fiber cables have very small strands of special glass – thinner than a human hair – that carry light of specific wave lengths. Transmitters and receivers at either end of the fiber-



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optic cable convert voice and data into light pulses and back again. The properties of light make it far more reliable, less susceptible to interference and capable of transmitting much larger amounts of voice and data over smaller cables. Following are key differences:

Metric	Copper	Fiber
Speed/Bandwidth	Up to 1G	Up to 100G
Scalability	Low	High
Interference	High	Very Low
Security	Significant Risks	Very High
Durability	Limited	High
Lifespan	Limited	Very Long
In-Line Power	Yes	No
Installation Cost	Lower	Higher
Lifetime Cost	Higher	Lower

Speed/Bandwidth – This is the most impactful difference for many businesses and for the telecom/IT industry. The enormous speed advantage of fiber makes it practical for many critical applications that copper just cannot reasonably handle. With fiber, multimedia streaming, comprehensive voice over IP (VoIP), real-time data access and other activities that require big bandwidth are viable. That means companies can centralize critical functions, share information across remote locations and do business in real time. While the ultimate bandwidth of fiber can be 40G or more, the immediate value is in making a 50-100mbps connection economical and practical. To realize the power of a 100 megabit per second connection, consider the example on the next page.

Download times are in hours, minutes and seconds, based on bandwidth/speed. Examples assume 30% overhead to provide a realistic value for normal Internet usage in an office environment

Type of File	File Size	Copper		Fiber		
		1.5 Meg T1	4.5 Meg NxT1	10 Meg Ethernet	50 Meg Ethernet	100 Meg Ethernet
Typical Web Page	1 MB	00:00:06	00:00:02	00:00:01	>00:00:01	>00:00:01
Digital Photo	5 MB	00:00:33	00:00:11	00:00:03	00:00:01	>00:00:01
You Tube Video	10 MB	00:01:07	00:00:22	00:00:10	00:00:02	00:00:01
Adobe Acrobat Reader	50 MB	00:05:36	00:01:50	00:00:52	00:00:10	00:00:05
Quickbooks Update	400 MB	00:44:54	00:14:39	00:06:56	00:01:21	00:00:41
Upload Pictures to Shutterfly	1 GB	01:52:15	00:37:23	00:17:20	00:03:23	00:01:24
Data Back-up to Offsite Server	5 GB	09:21:54	03:07:18	01:26:40	00:16:59	00:08:40



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Scalability – Copper wire’s bulk limits the number of pairs and bandwidth that are practical for a cable running into your business. Fiber is extremely fine, so many more strands can be bundled. It also has much larger bandwidth per strand, so adding capacity is far easier and more cost effective.

Interference – Copper is susceptible to electromagnetic interference from many different sources. It can also pick up cross talk, radio frequency noise, lightning crackling and other forms of interference. Fiber uses light, which is virtually unaffected by such factors.

Security – Copper cable can be easily cut and tapped, putting your information at risk. It is also more prone to interruption, so vital links for backup, security systems and other critical functions are less reliable. Fiber is very difficult to tap and offers a more dependable connection.

Reliability & Uptime – Fiber connections offer an overall uptime of 99.999%. That is significantly higher than copper cable, which has many times the downtime of fiber on average. In addition, the MTTR (mean time to repair) is typically less for fiber, due to carrier priorities and other factors.

Durability – Fiber cable lasts much longer than copper because it is not vulnerable to the weather and does not deteriorate or break the way metal-based cable can. As copper gets older, it also deteriorates faster, becomes less reliable, and the uptime/downtime discrepancy between copper and fiber becomes greater.

Lifespan – Since fiber is more durable, scalable and capable of accommodating new technologies, it has a longer useful life than copper.

In-Line Power – Copper can carry electric current in addition to voice and data, so it can power devices (like a telephone) without an external source. Fiber cannot transmit electric power.

Costs – While fiber cable installation is still higher cost than copper in the short run, the long-term cost is actually less, when you consider longevity, bandwidth scalability and other factors. Fiber is continuing to come down in price.

WHAT DELAYED THE FIBER REVOLUTION?

Fiber optics has been around since the mid-1970s. Fiber cable has been used in telecommunications for decades at the carrier backbone level. So why has it taken so long for it to become affordable and widely available to businesses on a local level – and even residences? The primary reasons are:

Economics – The telecom companies have a massive capital investment in the far-reaching network of copper cables they have installed over the last half century and before. Maximizing the use of those cables while they are still functioning acceptably has been critical to their financial performance. Installing new, higher-cost fiber would come right off the bottom line.

Bandwidth – Until recently, bandwidths large enough to power data-intensive telecom/IT



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activities and applications were not available at an affordable cost. The expense of bandwidths that would call for fiber cable was simply not practical, except for specialized businesses and organizations, like universities. Most companies could make due with copper, so they did not create a demand for fiber.

Technology – Customers had not yet embraced newer technologies and opportunities that require fiber, such as cloud-based services.

All that has changed in the past few years. Telecom carriers' copper cable has been depreciated and is deteriorating as it reaches the end of its useful life. Much higher bandwidths are now available at affordable prices, motivating companies to adopt new processes and applications that require fiber. Businesses are embracing the value and opportunities of cloud-based service and real-time connections with centralized resources and capabilities. Plus, market competition has fueled a rapidly increasing build-out of fiber networks:

Deregulation – In addition to the major carriers, local companies are entering the fray, taking advantage of service gaps left by big players and undercutting them where their prices are still artificially high.

Cable Companies – Cable TV providers realized that they were underutilizing their massive fiber networks by using them just for television programming. Why not offer Internet service, too?

They immediately became a serious threat to the traditional carriers if they did not build out their own fiber to offer higher bandwidths more economically.

Government Funding – to stimulate the expansion of high-speed Internet connections in the United States – particularly in rural areas – the FCC enacted its broadband initiatives, which funds fiber build-out.

Wireless – dramatic increases in wireless data usage have required carriers to run fiber to cellular towers to handle the demand. The popularity of smartphones, the growth of mobile broadband for businesses and the introduction of 4G have had major impacts. In addition, cellular broadband has brought wireless connections into competition with copper-based landline services for many applications. Traditional carriers saw the opportunity to utilize these fiber cables to serve adjacent businesses and others, which offered a competitive advantage.

The combination of all these factors made the time right for carriers to move from copper to fiber and invest in a major, national build-out.

IS FIBER RIGHT FOR YOU?

Like most questions of this type, it depends on your situation. There are many factors that can impact your decision. Start with these:

- How much bandwidth do you currently use?
- Will you be increasing your bandwidth usage soon?



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- Will fiber installation cost provide a reasonable ROI?
- How scalable is your current service?
- How close are you to existing fiber lines?
- Will a carrier absorb some of the cost to get into your area?

SUMMARY

Fiber cable for telecom/IT is an idea whose has come. In fact, it is overdue. The benefits of fiber cable over copper are overwhelming – from service

quality and dependability to security and cost-effectiveness. Perhaps the most important reason to make the transition is the increased capabilities it will make available to your business. Real-time applications, processes and information sharing can give you a competitive advantage, increase your efficiency and lower your costs. Check it out. You'll see the light.

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