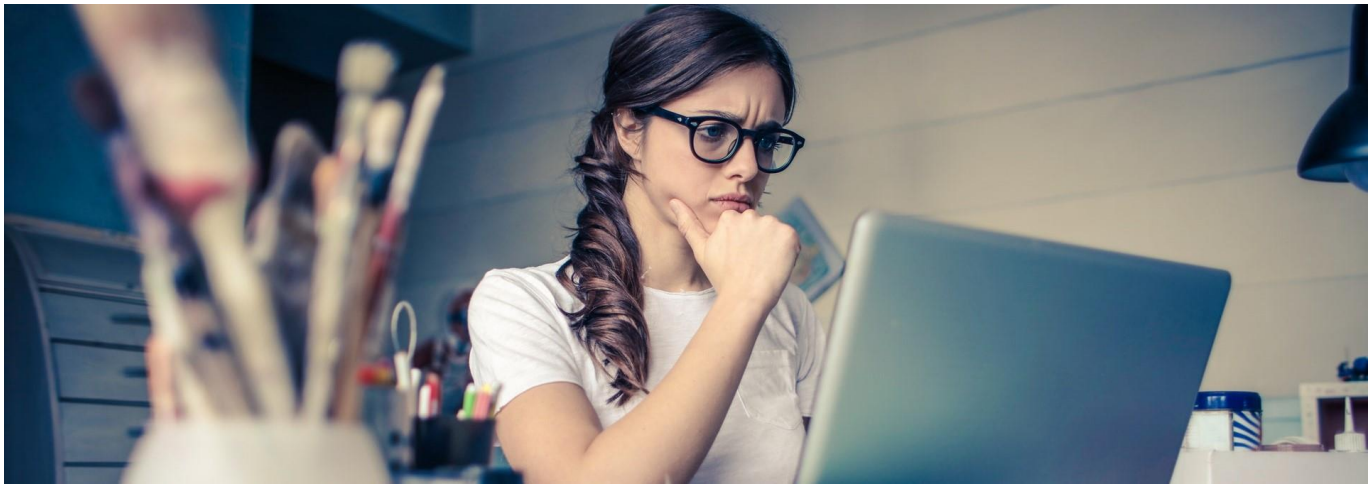


Photo by Andrea Piacquadio from Pexels

# We Need Our Internet Access Networks to Be Something They Are Not

The Covid-19 pandemic is shining a light on our dependence on the internet and the systemic problems with the dominant model for internet access. The wholesale emptying of schools, offices, air travel, sporting events, vacations and restaurants and the migration to virtual everything has made it obvious that we need our networks to be something they are not.

The gaps in network capacity, reliability and availability are a product of the structure of the Internet Service Provider (ISP) industry and a misalignment between the incentives and interests of the industry and the needs and interests of consumers.

As the internet emerged and moved from science experiment to commercial system, it was not obvious that this new global network would become a foundational system for society. The leaders of the Telephone and Cable TV industries recognized an opportunity and few people understood the magnitude of their first mover advantage. By leveraging existing infrastructure and consolidating their respective industries, the now dominant telephone and cable companies took control of the onramp to the internet. These incumbent operators did not organize their strategy around building the most reliable networks or optimizing for customers interests. Rather, they were organized to make a profit. This is not a criticism of the profit motive. It is an acknowledgement that the large ISPs became exactly what they were structured to become. Now, the key question for national, state and local leaders is whether the importance of broadband networks to society merits a rethinking of our internet access model.

## Network Reliability

As the Pandemic forced everyone to their homes, we learned that YouTube shifted video quality from HD to standard definition in order to “minimize stress on the system.” [1] This does not reflect an inherent flaw with the capacity of networking technology.  Rather, it reflects the way these specific networks have been designed and managed.

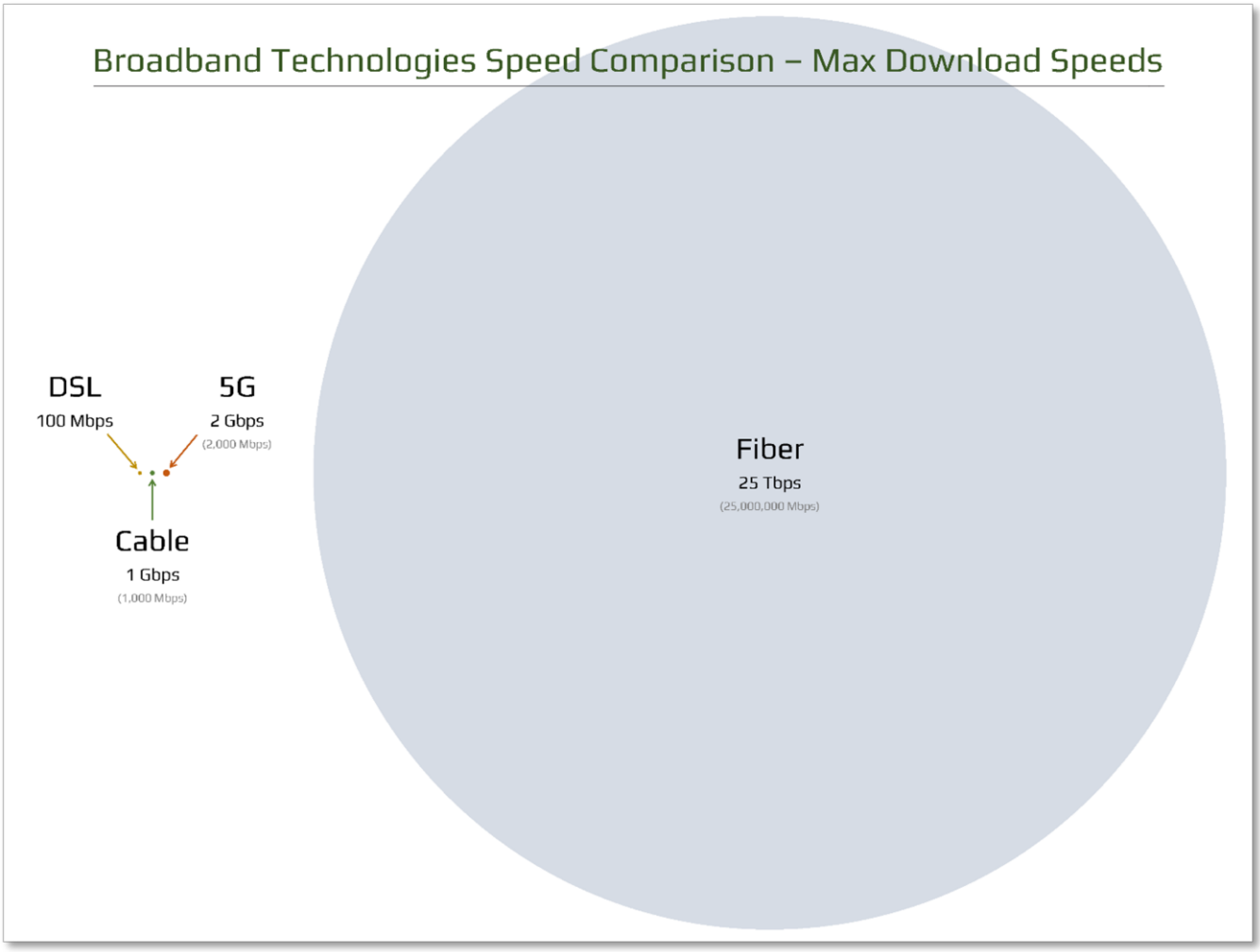
In the midst of the Covid-19 crisis, President Trump had a phone call with the CEO’s at the biggest Internet Service Providers to thank them for increasing capacity and eliminating data caps during the crisis. Why does it take a crisis for them to do this? Why do large ISP’s still cling to a model of bandwidth scarcity and why are there data caps in the first place? Further, why are there students and employees who can’t do their work from home and doctors who can't do reliable telemedicine sessions? It is not because the leaders at large ISPs have miscarried their responsibilities. No, the systems they manage are doing exactly what they were designed to do.

Covid-19 has forced us to define more precisely what essential services are. For communications, we have to determine whether internet infrastructure is essential like other utility infrastructure. Grocery stores are not utilities, but they are essential. Utilities are unique in that natural gas, electricity, water, sewer and even roads and airports are systems where it would be cost prohibitive to have duplicate instances of infrastructure rather than one instance and one organization as the steward of this infrastructure. Prior to the emergence of Fiber Optic Cable, it is questionable whether the various media used for internet infrastructure had the capacity to operate as a single reliable system. Fiber optic infrastructure can be a utility because the capacity is so expansive that one network is sufficient, and it is cost prohibitive to build multiple instances. If we only need one robust fiber network, what organizations can we trust to be a good steward of that network?

# Fiber Optics

Fiber Optic networks are made up of hair-size strands of glass which can transport information from computers as a series of light pulses. This technology is capable of symmetrical speeds that are somewhere between 10,000 – 25,000 times greater than the infrastructure connecting most homes in the U.S. today.

Further, the capacity that can be achieved using fiber optics is expanding. Researchers have successfully demonstrated a transmission experiment over 1,045 km with a data-rate of 159 Tbps.[2]




The graphic above illustrates the magnitude of the difference between fiber and alternative media.

Knowing that fiber has exponentially greater capacity than alternatives, why are the majority of homes and businesses still connected to coaxial cable and DSL rather than fiber optics? Because incumbents make more money by squeezing capacity out of existing infrastructure that has been paid off.

# Network Architecture

Another important network reliability concern is that nearly every home in the U.S. is sharing bandwidth between 30 - 60 neighboring homes. During times of heavy network use, sharing bandwidth leads to network congestion and packet loss. A switched ethernet network allows for tuning and resource allocation in a way that yields a much more robust customer experience during times of network congestion. Switched ethernet technology is used everywhere in networking except in last-mile (residential) internet infrastructure. Widespread deployment in data centers and commercial networks and the advent of white box commodity hardware makes switched ethernet very cost effective and a more reliable approach.

# Upload vs Download Speeds

An additional important difference between fiber optic networks and other media is that fiber offers the ability to deliver symmetrical speeds. In an asymmetrical connection, the upload speeds are much slower than download speeds. Upload speed is the amount of data a person can send and download speed is the amount of data a person can receive in one second. Upload speeds can be very important for businesses, including home-based businesses and people who work from home. Applications that depend on good upload speeds include sending large files, cloud applications like Google Docs and Dropbox, VoIP, FaceTime, Zoom, Skype, hard drive backups and In-house web hosting.

If Fiber Optics were the standard infrastructure rather than the exception, if we gave every home and business a dedicated connection, and if networks offered symmetrical upload and download speeds, then YouTube wouldn't have to reduce video quality during an event where network utilization spikes.

# Access & Choice

Ogilvy Creative Director, Rory Sutherland has argued that wealth is a function of the number of rewarding choices an individual has the power to make. Technologies and business models become valuable as they increase the number of rewarding choices for consumers. Under the dominant internet access model, customers have a poverty of choices.

Rural America and economically distressed urban neighborhoods are impacted the most by network infrastructure models that are built around generating profits rather than delivering an essential service. The increased capital costs and lack of density in rural towns make these areas unattractive to ISPs. Residents in economically disadvantaged neighborhoods cannot afford the cost of connectivity - even when good infrastructure is available. These realities have led to headlines in the last month that read: "Pandemic telecommuting proves difficult – or impossible – for millions in 'digital divide." [3]

The digital divide is exacerbated when much of the country turns to working and doing school from home. The misalignment between what customers want and need and the capacity and flexibility of networks lead us to this moment when we must ask whether the importance of internet infrastructure has reached a point where we should classify it as essential and create incentives for reliable fiber optic networks to become ubiquitous.

# Cost

For internet access, the average American is effectively paying the cost of a luxury vehicle but driving a sub-compact. We are paying too much because the infrastructure is controlled by a few companies and the lack of competition allows for premium pricing and mediocre service. To fix this, we need to separate the infrastructure and services. We need one robust fiber optic road, organized as a utility, preferably under local control. Services, including the ISP, should be moved to the cloud. Moving the ISP to the cloud will radically lower the barriers to entry, invite dynamic competition and drive down the cost of internet access. In the current model, incumbent ISPs are protected from both competition and outside innovation because they control the infrastructure.

In a Wired Magazine article in December 2018, Susan Crawford described the current industry position of dominant cable companies this way:

*"Charter, which sells connectivity under the Spectrum Cable moniker, made about $11 billion during the third quarter of 2018, a period when it added more than 300,000 new subscribers to its roster, and Wall Street is pleased with its pricing power. The company can raise its prices whenever it wants, because it faces little or no competition in the cities where it operates. Margins are growing, the company is buying back its stock, and its capital expenses are going down. Charter is in a milking phase, as is Comcast, which just had one of its best quarters in years. As analyst Craig Moffett puts it, cable companies are "infrastructure providers." And their infrastructure is essentially unchallenged, either by competition or oversight."* [4]

There is compelling evidence that organizing network infrastructure as a utility and separating the infrastructure from services significantly improves the value consumers receive. A dozen cities including Chattanooga, TN, Longmont, CO, Huntsville, AL, Fort Collins, CO, Sandy, OR, the Utopia network in Utah, and Ammon, ID have built fiber optic infrastructure organized as a utility. Each of these cities offer Gig services in the range of $47.00 - $70.00 per month. Ammon, Idaho is the lowest cost of these because Ammon has moved the ISP to the cloud and consumers can switch their ISP on demand.[5]

# Conclusion

As the Covid-19 medical crisis is contained and Congress does what it can to recharge the economy, an important economic recovery question will be whether our political leaders will push huge stimulus dollars to Big Cable and Big Telecom companies under the premise that we need better networks and they are the logical choice for solving that problem. Giving big checks to the seven companies that control most of our internet infrastructure will mean we are doubling down on a system that should be overhauled. The Boards at the large incumbent ISP's have their fingers crossed that Covid-19 doesn't lead to a re-thinking of the current arrangement. To make sure the $500 Billion annual ISP annuity continues, an army of lobbyists is likely tasked with making sure the pandemic is not an inflection point for internet access and infrastructure.

If Congress wants to stimulate the deployment of very reliable, low cost networks that are designed to favor consumers, it should provide low interest loans that allow municipalities, electric co-ops, and entrepreneurs to create non-profit, open access, fiber optic networks where the subscribers to the network own the infrastructure. If Congress made inexpensive capital available to build this infrastructure, the entire country would get reliable and robust networks over the next ten years and the next time we're all forced to live life at a distance, we won't have to worry if our networks will have the capacity and flexibility to meet the demands we place on them.

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