THE ROAD TO 5G

Is Paved with Fiber

Fiber Broadband Association

Accelerating the Connected Future

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KEY POINTS

"5G," or 5th Generation, refers to the next iteration of mobile networks which are expected to provide gigabit speeds, ultra high capacity, and ultra low latency. But even without 5G, existing mobile networks are being upgraded with the deployment of additional antennae or "cells," also known as cell densification.

5G will use a range of spectrum, including very high frequencies. Because 5G will rely in large part on high radio frequencies—which carry commensurately large amounts of data but have limited range—large numbers of small 5G radios, or "cells," will be required, and those small cells will require a substantial amount of fiber.

We estimate that **1,390,816 MILES OF FIBER CABLE** would be required to provide full 5G service to just the **TOP 25** metropolitan land areas in the United States, assuming all of those 5G cells were served by fiber connections.

The most demanding 5G applications will require fiber to each small cell, but the exact fiber cable requirements for each deployment will differ based on local geography and expected demand.

While **5G WILL TRANSFORM MOBILE CONNECTIVITY**, it is not an easy replacement for wired connections to homes and businesses because common building materials substantially block high-frequency 5G signals.

Using 5G technologies to reach building interiors can be achieved using antennas on the outside of the building and a wire to carry the signal inside the building, incurring additional costs and energy usage. Direct fiber connections will always be superior, except where fiber installation is not feasible.

EXECUTIVE SUMMARY

Since the 1990s, four generations of cellular network technologies have propelled us from "bag phones" using slow 1G voice networks to sleek devices using 4G LTE. Today we can watch seemingly limitless video content on mobile devices, monitor our fitness using a wristband, and answer the front door after seeing who is standing outside using a smartphone app.

5G is the next step in this evolution. Connected devices of the future will include large numbers of autonomous vehicles, augmented/virtual reality (AR/VR) devices, infrastructure sensors for smart transportation and public safety applications, and airborne drones. 5G will enable these kinds of technologies at exceptional scales, data rates, and low latencies. To support all of this, 5G is expected to provide gigabit speeds, sub one-millisecond latency, and the capacity to connect an astonishing 2.5 million devices per square mile.[1]

But 5G will also place enormous demands on fixed-wireline networks. 5G will use much higher radio frequencies than today's cellular networks do. While these higher frequencies carry larger amounts of data, they also have very short ranges. For 5G to work well, many additional small radios or "cells" must be installed close together—as close as 200 feet apart. To provide multi-gigabit service to many users and applications, these small cells will need to be connected to hundreds of thousands—perhaps millions—of miles of new fiber optic cable.

Even without 5G, we are experiencing a huge boom in mobile connectivity. By 2021, the world will have 27.1 billion networked devices, up 58.47 percent from 17.1 billion in 2016. Forty-three percent of these devices will be mobile-connected, and they will consume far more data; a smartphone in 2021 will consume an average of 14.9 GB of data monthly, four times the 2016 level.[2] A variety of wireless technologies will connect most of these devices over a short distance and require networks of small cells that do not exist today. The fundamental infrastructure requirement will be the same: fiber.

At the most basic level, wireless technologies free people from the constraints of place and enable them to lead fuller lives, but these technologies are limited in range and bandwidth. Fiber technologies offer virtually unlimited bandwidth over very long distances between fixed locations. Billions of wireless devices generate performance demands on networks. These demands can only be satisfied with the prodigious amounts of bandwidth made available by fiber networks.

Policymakers can help make sure these networks actually get built. 5G and fiber providers will need access—on a reasonable and non-discriminatory basis—to public and private rights-of-way; poles, ducts, and conduits; and commercial and residential buildings. Over much of the past two decades, the Fiber Broadband Association has recommended policy measures to make such access possible. The emergence of 5G makes these policy steps more important than ever.

[1] https://www.itu.int/md/R15-SG05-C-0040/en

[2] http://www.cisco.com/c/dam/m/en_us/solutions/service-provider/vni-forecast-highlights/pdf/Global_Device_Growth_Traffic_Profiles.pdf

5G REQUIRES DENSE FIBER NETWORKS
and Won't Replace Fiber to Building Interiors

I: Why 5G Fundamentally Differs from Existing Cellular Networks

The United States' original cellular networks were designed to carry voice calls, and consisted of "macro cell" sites roughly 0.5-25 miles (1-40 kilometers) apart.[3] However, delivered bandwidth dropped off as users moved away from the small cell site. The user experience suffered, especially with high bandwidth applications such as video.

And in recent years, the cellular industry developed a range of smaller cells (often called micro, pico, or femto cells). These small cells "filled in" spots in the network to boost bandwidth in low-throughput areas or handle areas of concentrated demand, such as train stations or concert venues.

Carriers increasingly installed such small cells to keep up with surging demand. Mobile data traffic has grown 4,000-fold over the past 10 years and almost 400 million-fold over the past 15 years. In 2015 alone, 563 million mobile devices and connections were added to networks.[4] The explosion in data traveling over networks, and devices connecting to them, both drives and is driven by emerging applications and services.

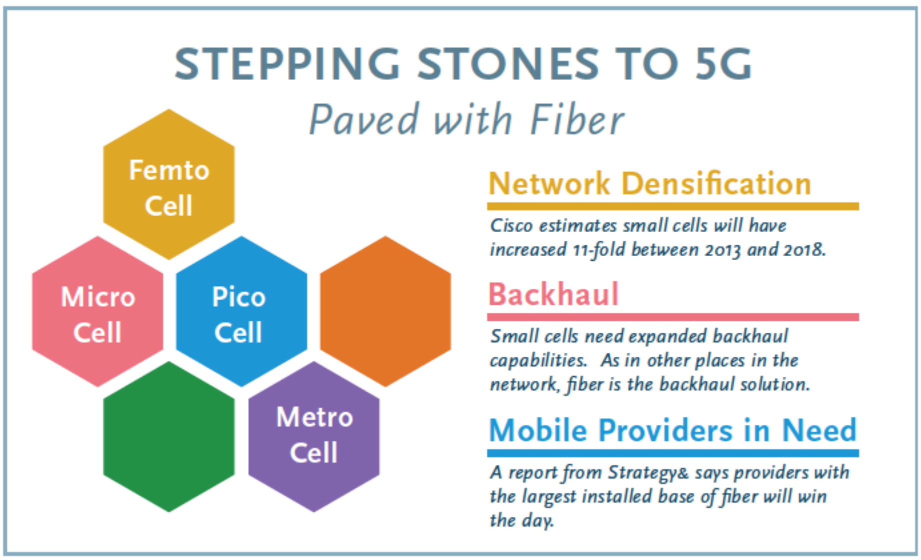

Figure A – Fiber Supports Small Cells, Including 5G Cells

Small cells provide a preview of what 5G networks will look like. 5G is expected to use much higher frequencies—known as millimeter wave—because these frequencies have the inherent ability to carry much larger amounts of data. But achieving these higher data rates is only possible at a range of one-tenth to one-fifteenth the distance covered by 4G LTE.

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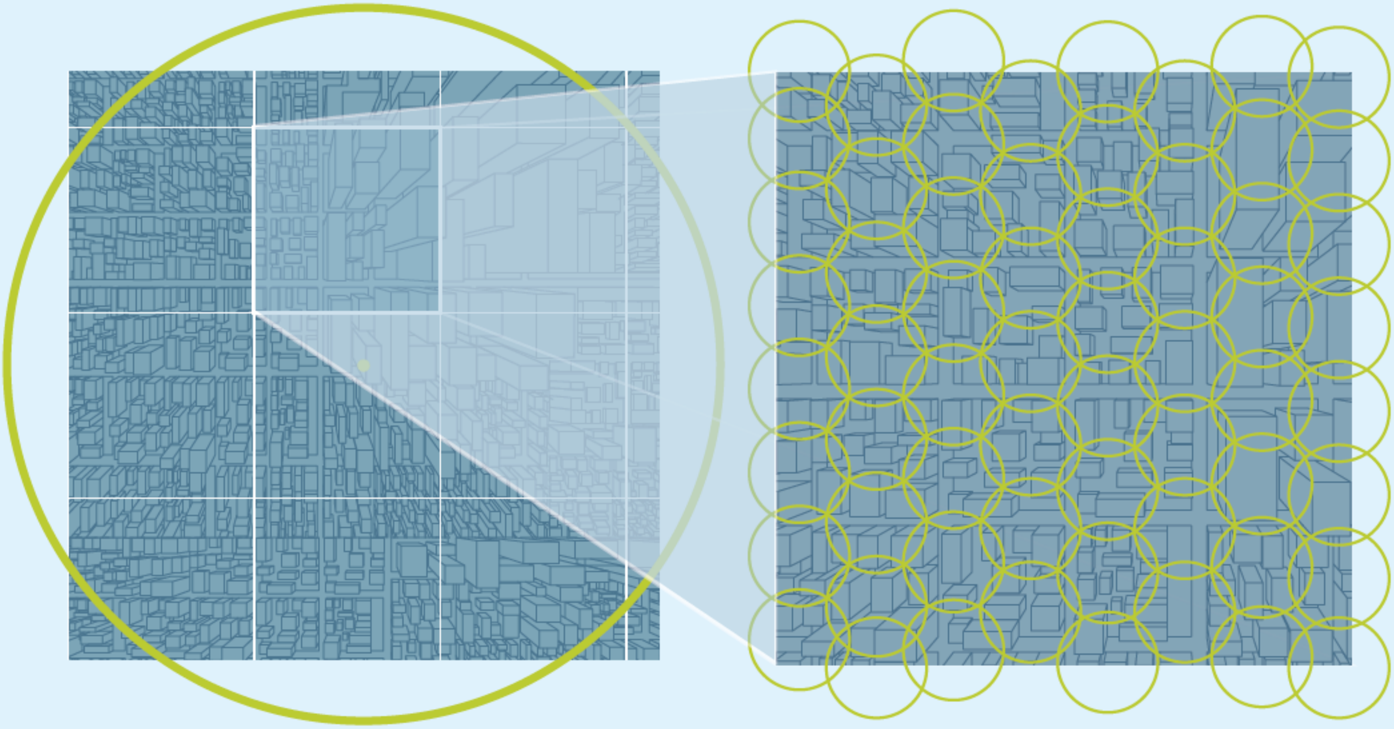
[3] http://www.pitt.edu/~dtipper/2720/2720_Slides5.pdf

[4] http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html



TODAY'S 4G NETWORK

This sketch (which does not depict an actual city) shows the range of a single 4G macro cell at the center of the circle. Such a small cell, served by fiber, can potentially serve 10 square miles. The white square shows one square mile.

FUTURE 5G NETWORK

This sketch, showing one square mile, provides one estimate of how many 5G cells would be needed: 60, each covering a 750-foot diameter area. These small cells could require about eight miles of fiber.

The sketch is conceptual. Actual deployments would be customized for local conditions and demand, and might need additional or fewer 5G cells.[5]

Figure B – 4G vs. 5G Cellular Deployments: Estimates of Cell and Fiber Requirements

5G will require both "macro cells" and small cells that need connections of some sort to wired high capacity networks. Both "macro cells" and small cells need connections of some sort to wired networks. And for 5G in particular, this connection will ideally be made with fiber. Copper will not work for 5G due to copper's limited bandwidth. Microwave can help in areas where laying fiber is not practical for geographic reasons or where access is not permitted, but ultimately is not a scalable solution to meet the potentially vast scope of 5G. Therefore, fiber is the best choice for serving the increased number of wireless serving points that 5G small cells will create, at the required transport bandwidth the new technologies will demand.

II: Calculating How Much Fiber Is Needed for 5G in Metropolitan Areas

For 5G to meet its potential, the distance between small cells must be between 200 and 1,000 feet. Also, to deliver at least 1 Gbps peak speed to each user, the minimum downlink speed to each small cell will need to be 20 Gbps, and the uplink peak data rate will need to be 10 Gbps.[6] Fiber is the ideal choice for supporting such heavy demand. Connecting these small cells to fiber will require ABOUT eight miles of fiber per square mile.

5 These figures reflect what the Fiber Broadband Association technology committee believes is a credible average for 5G. The estimate of eight miles of fiber is the result of multiplying 60 small cells times a 750-foot spacing, which comes out to 8.5 miles. Members of the committee have seen estimates of 5G cell spacing as little as 300 feet and as much as 1,500 feet. The committee is aware that in some situations, small cells might be served by wireless tethering for backhaul, reducing the need for fiber. But in other situations, small cells might need to be closer than 750 feet apart. And the most demanding network applications will require fiber.

6 https://www.itu.int/md/R15-SG05-C-0040/en

The numbers add up quickly. The United States' top 25 metropolitan areas cover 173,852 square miles.[7] We estimate that fully serving those areas with 5G—and also providing fiber to each 5G cell—would require 1,390,816 miles of fiber cable. While the cell numbers and fiber cable requirements would differ for each deployment, this number gives a sense of how much fiber will be needed to fully support 5G. And if multiple carriers wanted to build competing networks, even more fiber would be required. Right now more than 93 percent of Americans have access to four different carriers.[8]

5G will not be the only driver of increased fiber demand. Recently, Deloitte Consulting LLP estimated that the United States requires between $130 billion and $150 billion in fiber investment over the next five to seven years to adequately support broadband competition and rural coverage, as well as improved wireless deployments.[9]

It's likely that metropolitan areas, with their large populations which drive heavy demand, will have access to 5G first, followed by other areas, including major transportation corridors. Then, other areas, including major traffic corridors, will be filled in. The full build will take a long time. By one estimate, operators will roll out 5G at a rate that will cover 34 percent of the global population—2.6 billion people—by 2025.[10] And without fiber infrastructure, some areas may never see 5G service, further increasing the digital divide that exists today between metropolitan/suburban and rural areas.

5G: DEFINITIONS, CAPABILITIES, AND LIMITATIONS

For further information on 5G—what it is, when it might come, and what it can and cannot do—the following three reports serve as useful references.

UNDERSTANDING 5G: Perspectives on Future Technological Advances in Mobile.

THE 5G ERA: Age of Boundless Connectivity and Intelligent Information.
These 2014 and 2017 reports by GSMA Intelligence, which represents hundreds of mobile operators worldwide, summarize proposals, definitions, deployment estimates, and possible economic benefits of 5G.

Emerging Trends in 5G.
This 2016 presentation by the International Telecommunications Union (ITU) outlines capabilities for 5G, as well as timelines and procedural steps toward implementing it as a global standard.

Mobile Broadband Service Is Not an Adequate Substitute for Wireline.
This 2017 report by CTC Technology & Energy, a U.S. firm serving the public and nonprofit sectors, details the business and engineering arguments for why 5G and other wireless technologies will not obviate the need for wireline (fiber) connections.

7 https://www.census.gov/dataviz/visualizations/026/508.php
8 https://www.ctia.org/industry-data/wireless-quick-facts
9 https://www2.deloitte.com/us/en/pages/consulting/articles/communications-infrastructure-upgrade-deep-fiber-imperative.html
10 https://www.gsmaintelligence.com/research/

III: Applications that Could Be Aided by 5G

We need high bandwidth, low latency connections to stream the newest shows, livestream via social media networks, and video chat with loved ones. To explore augmented and virtual reality (AR/VR), wire our homes with sensors, automate factories and farms, and make a fully autonomous transportation system, the architecture of our current wireless network must be transformed. Today's wireless networks were not built to handle the necessary bandwidth or low latency needed to enable these applications.

With peak speeds over 1 Gbps to the individual user and latency less than 1 millisecond,[11] 5G would enable broader adoption of many technologies, notably including autonomous vehicles and AR/VR. High latencies may affect the perceived quality of some interactive services such as phone calls over the internet, video chat, or online multiplayer games and other applications, especially ones that give tactile feedback to users.

To understand why these technologies will place such enormous demands on cellular networks, it helps to start with some frames of reference for speeds and latency. On speeds: watching a movie on Netflix uses about 1 GB of data per hour for each stream of standard definition (SD) video, and up to 3 GB per hour for each stream of high definition (HD) video.[12] On latency: blinking your eye takes 100-400 milliseconds.[13]

AUTONOMOUS CARS

Autonomous vehicles are already possible, but 5G technologies could potentially help scale their implementation. For autonomous vehicles to become a reality, low network latency is imperative. A car or truck traveling 70 miles per hour moves 103 feet (31 meters) per second; in just 100 milliseconds, the car travels more than 10 feet. Even a few tens of milliseconds of latency in the network—when combined with the time required for computations in a vehicle to execute braking or steering—could mean the difference between a safe ride and an accident.[14]

Additionally, large amounts of bandwidth will be needed. A single autonomous vehicle with always-on sensors and cameras is expected to produce enormous amounts of data. Intel CEO Brian Krzanich predicts that around 40 terabytes (40,000 GB) of data might be generated and consumed by an autonomous car during eight hours of driving,[15] and much of this data may need to be transmitted somewhere. This is the equivalent of streaming Netflix HD Video 24 hours a day for about 541 days.[16] Transmitted data will travel over a very short distance wirelessly to a small cell, and then over a fiber optic network to a control center.

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11 http://ieeexplore.ieee.org/document/7169508/all-figures

12 https://help netflix com/en/node/87

13 http://bionumbers.hms.harvard.edu/search.aspx?task=searchbypop&rpp=100

14 At the time of this writing, it is not clear whether autonomous vehicles will use 5G, dedicated short range communications (DSRC), or some combination of the two.

15 https://www.networkworld.com/article/3147892/internet/one-autonomous-car-will-use-4000-gb-of-datada y html

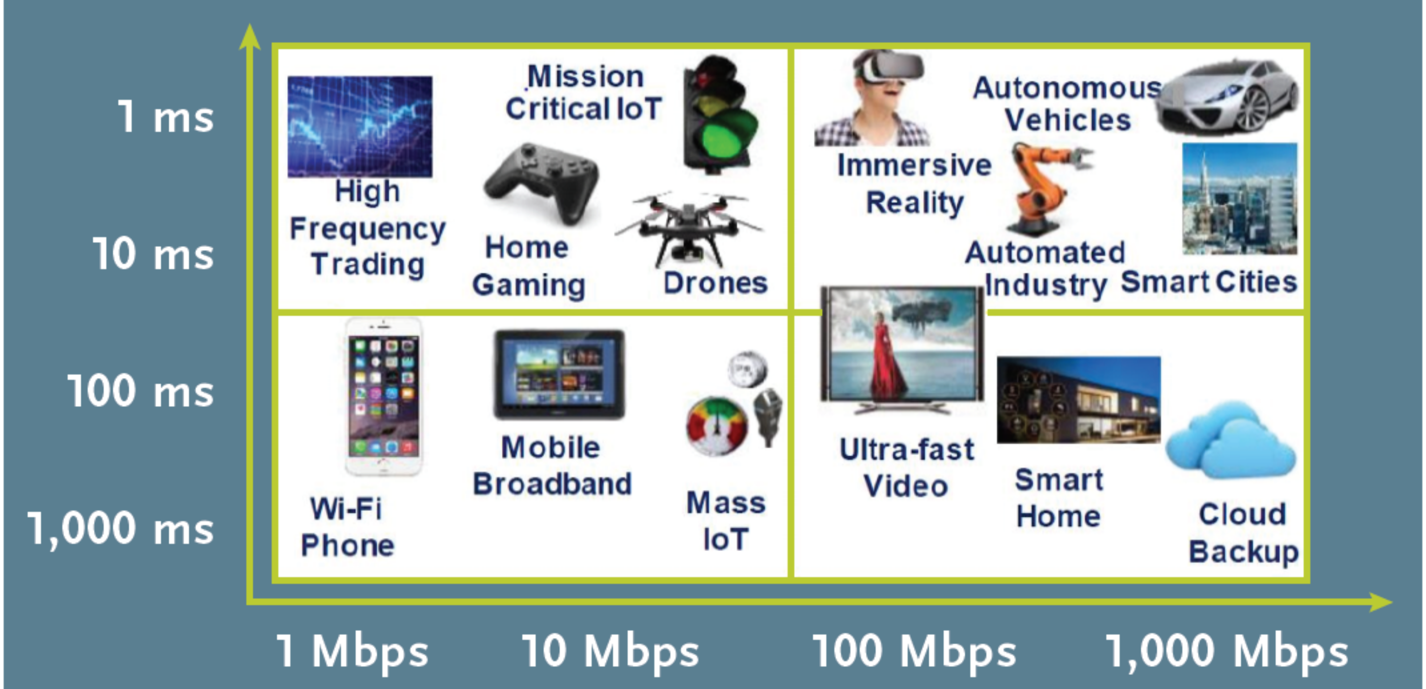
16 https://help.netflix.com/en/node/87

When a fiber network is constructed and available to support autonomous vehicles, one can imagine the world with fewer stoplights and reduced traffic congestion. People with disabilities will have much more freedom to travel. Finally, and most importantly, digital drivers supported by a reliable fiber network will be much safer than human drivers, greatly reducing auto accidents and fatalities.

VR/AR

Fully realized networked VR and AR require ultra-low latency and ultra-high bandwidth. With VR and AR, it becomes possible to have a "virtual" front row seat at any concert, sporting event, or other event or location anywhere in the world. Beyond entertainment and virtual tourism, VR holds great promise as a training tool for a wide variety of industries, enabling simulation of complex tasks. Also, remote surgery and other telemedicine procedures can become more available than they are today. However, without ultra-low latency (roughly less than 20 milliseconds),[17] users are more likely to experience motion sickness; without adequate bandwidth, the virtual world doesn't replicate the real world. Estimates of the bandwidth requirements of fully networked VR range from 500 Mbps to 4 Gbps per user.[18]

Figure C – Fiber-Enabled 5G Applications and Associated Network Requirements



Source: Verizon, Fiber is Sexy Again, Kyle Malady, SVP & Chief Network Officer, Fiber Connect Conference 2017

17 https://www.qualcomm.com/documents/whitepaper-making-immersive-virtual-reality-possible-mobile
18 http://about.att.com/content/dam/innovationblogdocs/Enabling%20Mobile%20Augmented%20and%20Virtual%20Reality%20with%205G%20Networks.pdf

IV: Why 5G Won't Replace Fiber Connections to Buildings

While many may question whether the capabilities of 5G mean that 5G could eventually replace fiber, that's simply not the case. Rather, fiber is actually a necessary element of 5G.

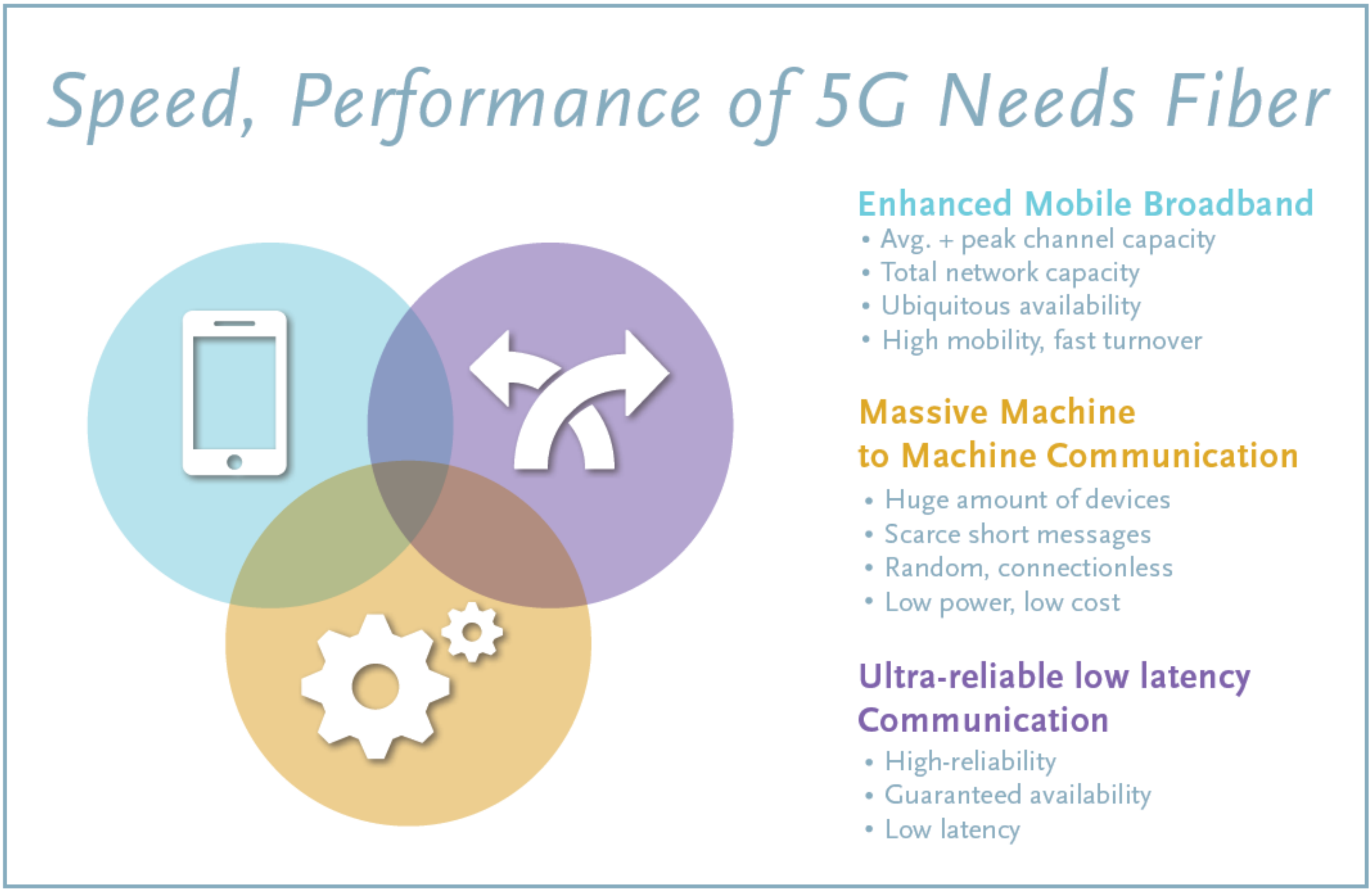


Figure D – Fiber Is the Engine of 5G

Likewise, it is often speculated that 5G might replace fiber connections to homes. Because of all of the applications for bandwidth that are either firmly entrenched in our lives or are on the verge of being a major part, the Fiber Broadband Association believes that a fiber connection to the home will still be needed as the best way to meet long-term demand.

The reason 5G won't replace fiber connections to homes is rooted in the spectrum bands themselves. Carriers will likely deploy 5G on all spectrum bands, including millimeter wave bands, which are not currently used for broadband. Some additional unlicensed spectrum may also become available. Even if available spectrum below 5 GHz remains limited, carriers can continue the practice of repurposing spectrum as older technologies are phased out.[19]

19 https://www.youtube.com/watch?v=GEx_doSjvSo

These bands provide much more bandwidth than LTE (hundreds of MHz versus tens of MHz). Unfortunately, this gain in bandwidth, required for both increased speeds and lower latency, comes at the expense of a much more limited range. Millimeter band frequencies are very easily weakened or blocked. Ultra-high data rates require a very high signal-to-noise ratio for the data to be properly received and interpreted, and any significant attenuation reduces the delivered bandwidth.

In addition, unlike 4G LTE, there are barriers to millimeter wave signals reaching inside homes because it can't penetrate exterior walls. This is why 5G cells may be limited to a diameter of 750 feet or less. It is likely that FTTH networks deployed to reach an optical network terminal (ONT) located within the home will continue to predominate, with WiFi providing the final connections to devices in the home. For 5G to reach inside a home or office, a receiver attached to an exterior wall would likely be needed, requiring additional hardware costs and additional ongoing energy and maintenance costs.

Although the Fiber Broadband Association can envision scenarios where 5G may provide a fixed connection to homes, this may only happen where the economics of reaching a small percentage of existing homes with fiber is prohibitive. We do not believe fixed 5G to the home—as the only connection to the home—will become the norm. To the contrary, we believe that even with very large investments in fronthaul and backhaul network capacity and small cells, bandwidth demand will continue to outstrip supply as it has done in the past. Mobile traffic will represent 20 percent of all IP traffic by 2021, compared with 8 percent in 2016.[20] However, even after 5G is deployed, home network connections, which may need to support multiple 4K and soon 8K video streams, hundreds of in-home internet-connected things, and multiple AR and VR users, will require much higher bandwidths than can be delivered by 5G under current development standards.

Investments in FTTH are increasing. Based on research conducted by RVA LLC for the Fiber to the Home Council Americas (now Fiber Broadband Association) in 2016, 13.7 million homes are connected directly to fiber, and 34 million have access to FTTH. There are well over 1,000 fiber-to-the-home deployments in the U.S. of varying sizes and architectures. That's a good start, but there are 100 million homes that aren't connected with fiber, and as highlighted earlier in this paper, much more fiber is needed for 5G. Fiber will enable 5G deployment. 5G will enable next-generation mobile communications. The technologies are complementary.

V: Case Study: Barry Electric Cooperative

Some forward-thinking leaders are already positioning their communities for 5G and the associated benefits that will come with it. In many cases, these leaders come from unexpected places. One such leader is the Barry Electric Cooperative (BEC), in Cassville, Missouri.

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20 http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html

BEC wanted to update its utility infrastructure by transforming it into a smart grid with smart meters on all premises in Cassville. This required a small amount of fiber. But because placement costs weren't substantially different whether 12 fibers or 288 fibers were being installed by a contractor, Barry decided to add more fiber.

During the process, Barry formed a telecom entity called GoBEC to realize the fiber future its members were demanding. With 6,700 potential subscribers, Barry Electric is deploying more than 1,100 miles of fiber cable in phases to support fiber service to homes and businesses. The network is also being used by the local school system and for consumer, business, telemedicine, and telecommuting applications.

JR Smith, the general manager of the GoBEC network, is also planning for a 5G future. "I am excited about the potential of 5G and am confident that our investment in fiber deployment for the delivery of high bandwidth FTTH services today will put us in position in the future to leverage our deep fiber network to support 5G when the larger carriers are ready to offer it here in Cassville," he says.

The plan is for GoBEC to finish its fiber deployment by the end of 2020. Smith says it is "important to provide a trusted, dedicated, true fiber connection" to each premises in his community to ensure that his community is afforded every opportunity for today's and next-generation services. The lesson: build smart grids and FTTH today, upsize the fiber count to plan for the future, and potentially enjoy the later benefits of 5G.

VI: 5G Network Computing Tasks Will Require More Fiber

Additionally, the network architecture of 5G itself will require additional fiber to support 5G. Traditional networks have had computing and processing power co-located at the small cell site with the wireless antenna and transmission equipment. By contrast, the 5G rollout will be accompanied by a different network architecture called Cloud (or Centralized) Radio Access Networks, otherwise known as C-RAN. The C-RAN architecture places the main processing power away from the local small cell site deeper in the network and aggregates the processing of many small cells into one location. The benefit of C-RAN is that the extremely complex radio signals required for 5G can be much more efficiently (and inexpensively) processed in a central location instead of at each small cell site.

In short, 5G will have relatively dumb cell transmission equipment at the edge of the network but will require very high-speed and low-latency connections to the processing power at the centralized locations. This is another reason much more fiber will be required for 5G to meet its promise. The capacity required for this function is called "fronthaul." Compared with the backhaul connections for 4G LTE, fronthaul to the 5G cell site will require data rates that are up to 10 times higher. The concept can be loosely compared to cloud computing which has revolutionized so many activities. Cloud-based applications accounted for 86 percent of mobile data traffic at the end of 2016.[21,22]

From the CRAN processing location, all of that information will then need to be transmitted to its

[21] http://www.ctcnet.us/publications/mobile-broadband-service-is-not-an-adequate-substitute-for-wireline/
[22] http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html

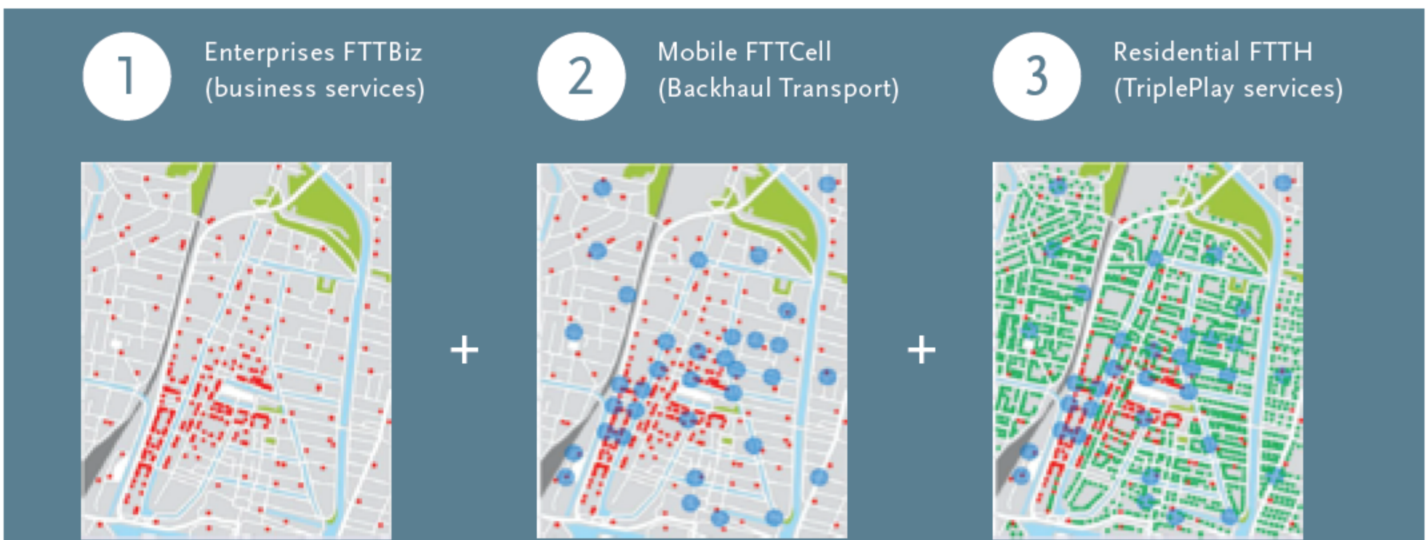
final location through the core of the network. The term used to describe the network capacity needed on the backside from the processing hardware through the core of the system is called backhaul capacity. Both fronthaul and backhaul will need to be increased dramatically to handle the projected demand of 5G networks.

VII: Converged Fiber Networks Are a Springboard to 5G

Converged wireless/wireline operators today typically run three separate networks (residential, business, and mobile). Building and operating three separate networks is neither efficient nor practical at scale. When the number of mobile and business endpoints was relatively small, this was a viable solution since the endpoints were often in different locations. However, 5G densification requires 10 to 100 times more small cell sites than exist today. Building and operating three separate networks is not extremely efficient and is not practical at scale. When possible, the value of a converged physical infrastructure increases with the number of connected endpoints.

The way these different endpoints could coexist and be connected with either passive optical networks (PON) or point-to-point (P2P) networks is conceptually shown in Figure F (red: business, blue: 5G, green: FTTH residential).

Figure E – Connect the Dots



Courtesy of Nokia

The way fiber fronthaul or backhaul networks for 5G are being constructed may significantly vary between operators and by target topology and geographical region. It is certain that wireless operators will try to leverage existing fiber assets as much as possible, but they will also need to deploy additional fiber.

As we see in today's 4G environment, there are a multitude of different design approaches being used to provide connectivity to the ever-increasing number of small cell sites. Fiber-based approaches may include dark fiber, P2P fiber connections, coarse wavelength division multiplexing (CWDM), dense wavelength division multiplexing (DWDM), and PON connections. Other methods in 4G include microwave or copper-based technologies. As discussed earlier in this paper, it is widely expected that aside from limited microwave backhaul, the main connectivity method will be fiber for 5G. This is necessary to satisfy the stringent bandwidth and latency requirements.

In some areas where PON networks for residential services have already been constructed, the possibility exists to leverage the fiber already in the ground and mix existing residential and small business rollouts with 5G feeders in the same network. Some PON technologies have been developed and standardized over the last 15 years. Speeds have evolved from 155 Mbps APON in 2000 to 100 Gbps PON, currently in the standardization process with IEEE. All of the "flavors" of PON use the same outside plant architecture that has been deployed en masse since the early 2000s, and multiple newer generations of PON can be operated across a single fiber, courtesy of the forethought of standardization committees. Where fiber exists, this can enable fiber networks to carry 5G traffic simultaneously with existing traffic of other types.

The backhaul for 4G may have been for "slow" connections like GPON, but 5G will need up to 10 times higher data rates to support fronthaul or mid-haul. Possible available technology choices today are XGS PON (10 Gbps upstream and downstream) followed by NGPON2 (40 Gbps upstream and downstream, with potentially 80 Gbps on the near-term horizon) and WDM PON. Even higher-rate PON solutions can be expected in the future. Although the newer protocols have had limited-scale rollouts in the U.S., it is widely expected that when 5G standards are finalized in 2020, a service provider will have a choice of various protocols to provide fronthaul and backhaul capacity for 5G networks around the world in conjunction with its existing and newly deployed fiber network architecture.

Regardless of the type of protocols used over fiber, service providers and community stakeholders of all kinds should begin planning now to include extra capacity in their networks for 5G. Having fiber in an area is likely one of the best ways to pre-position a community to be early on the list for the rollout. Conversely, the more barriers in place to deploying fiber, the later a community is likely to be served.

As discussed in this paper, the evolution to 5G wireless service will require the construction and operation of dense fiber networks throughout the United States. To achieve these aims most efficiently, 5G and all-fiber providers will need access on a reasonable and non-discriminatory basis to public and private rights-of-way, to poles, ducts, and conduits, and to commercial and residential buildings. These providers also should be able to provision facilities and services with, at most, minimal regulation. Over the past almost 20 years, the Fiber Broadband Association ("the Association") has developed public policy positions to facilitate all-fiber deployments that are applicable to fiber builds for 5G.

CONCLUSION

While 5G will not replace fiber to the home, 5G is the current view of the future of wireless technology development—and its enormous potential is matched only by the scale of the demands 5G will place on fixed-wireline networks. 5G will depend on densification: a significant number of small cells must be installed close together and be connected by hundreds of thousands, if not millions, of miles of new fiber optic cabling. Fiber infrastructure, with its ability to offer nearly limitless bandwidth between fixed locations, will be the key to unlocking 5G's potential. Policymakers can help put the required fiber infrastructure in place by making it easier for fiber providers to get much-needed public and private rights of way—poles, ducts, and conduits—and to access commercial and residential buildings. Ultimately, the road to 5G is truly paved with fiber; if we want to start transitioning towards 5G, we have to be able to lay down the fiber necessary to get there.

Fiber Broadband ASSOCIATION

Accelerating the Connected Future

ABOUT THE FIBER BROADBAND ASSOCIATION

The Fiber Broadband Association (formerly the Fiber to the Home Council Americas) is the largest and only trade association in the Americas dedicated to the pursuit of all fiber optic network infrastructure to the home, to the business and to everywhere. The Fiber Broadband Association helps providers make informed decisions about how, where, and why to build better broadband networks with fiber optics while counting on its members to lead the organization forward, collaborate with industry allies and propel fiber optic deployment forward. Since 2001, these companies, organizations and people have worked with our communities and consumers in mind to build a better broadband future here and around the world.

Learn more at fiberbroadband.org.

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