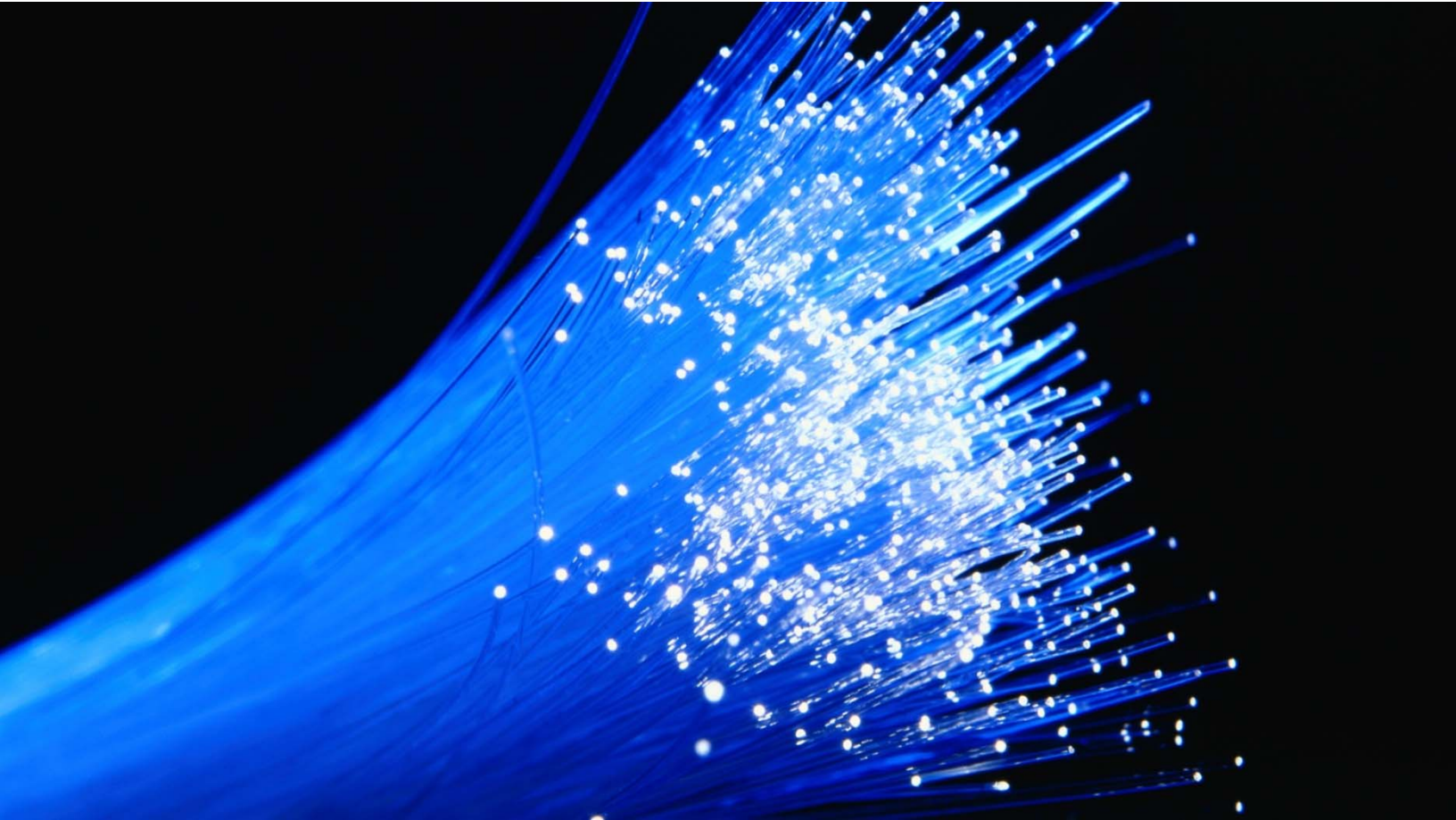


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## **Summary of Preliminary New Mexico Broadband for Business (BB4B) Study**

Prepared for  
New Mexico Office of Broadband and Geospatial Initiatives

**DRAFT** | October 2016

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## 1 Executive Summary

Advanced communications networks rank among the most important infrastructure assets of our time—for purposes of economic development and competitiveness, innovation, workforce preparedness, healthcare, education, and environmental sustainability. In the brief two decades since the advent of the commercial Internet, broadband access has become a necessity in the daily lives of Americans and fundamental to the American economy.

The New Mexico Office of Broadband and Geospatial Initiatives (OBGI, part of the Department of Information Technology) and the New Mexico Legislative Jobs Council (Jobs Council), as well as other stakeholders, are considering how to facilitate development of the advanced networks that will enable the next generation of broadband services in the state. Since its formation, the OBGI has worked alongside local communities and other key stakeholders to better understand the broadband challenges that communities face and to identify opportunities to ameliorate those challenges.

This preliminary report discusses opportunities for New Mexico to gain a competitive edge in broadband deployment by simulating and facilitating next-generation broadband investment, including tools and recommendations for both state and local government policymakers regarding how to expand and enable networks capable of gigabit (1 Gbps, or “Gig”) speeds and beyond—with a particular goal of expanding gigabit broadband facilities to businesses.

Specifically, the report recommends levers for enabling and incenting investment—including low- and modest-cost strategies that are focused on creating an environment in which private capital is attracted to broadband deployment opportunities in the state.

Our focus is on increasing deployment of optical fiber to increase the availability of ultra-high-speed, gigabit or higher broadband services. Fiber all the way to the home and business is not yet available anywhere in the country on a comprehensive, statewide basis, but is unevenly emerging in major metropolitan areas where Google Fiber, AT&T, or CenturyLink are active—just as it did in many major Verizon markets a decade ago. Fiber is increasingly recognized as the ultimate platform for communications networks because it is a highly scalable (in theory, infinitely scalable) and adaptable medium that enables development and use of the communications applications of today and the future.

Fiber networks to the business market in particular have the potential to advance access to the digital economy because fiber enables high speed, reliable services, including multi-Gig and 100 Gig+ services that currently are in demand by sectors such as the oil and gas, health care, and film industries in New Mexico. This demand is only growing.

This preliminary report was prepared by CTC Technology & Energy in late 2016 in its capacity as the OBGi's independent broadband consultant. This report will be followed by further deliverables that expand on the insights and recommendations herein on the basis of engineering work, cost analysis, field review, and stakeholder engagement.

## **2 Why New Mexico and Its Localities Should Address Broadband Needs**

### **2.1 Next-Generation Broadband Represents a Critical, Necessary Element of Competitiveness for Which Business Demand Is Present and Increasing**

Advanced broadband capabilities are at the core of many technological advances. As a result, the common perception of robust broadband capabilities has shifted from a luxury to an essential service. Today, the average single-family home no longer has one or two connected devices but six or seven;<sup>1</sup> companies are increasingly relying on bandwidth-rich applications to conduct business; and most industries have already been disrupted by technological innovations—and those that have not are ripe for disruption. This does not even account for the trillions of dollars that high-technology industries are predicted to add to the global economy in the next 10 years.<sup>2</sup> As a result, economic competitiveness, both now and especially in the future, will increasingly be dependent on access to robust, affordable, high-speed Internet connections.

High-speed communications are not only an engine for commerce, but also for integration of the many, diverse areas of the U.S. into an increasingly global economy. High-bandwidth broadband is widely recognized as a key driver of a state's future economic competitiveness because it:

- Enables small business creation and growth.
- Enables job creation and the enhanced, multiplied economic activity that accompanies it.
- Supports businesses with very high bandwidth needs, such as digital media and software.
- Attracts and helps retains businesses of all sizes.
- Enables workforce education.

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<sup>1</sup> See "2015 Broadband Progress Report and Notice of Inquiry on Immediate Action to Accelerate Deployment" GN Docket No. 14-126, FCC, ¶ 29, February 4, 2015, [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-15-10A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-10A1_Rcd.pdf) (accessed October 2016); Verizon, "Sharing Speed with Multiple Connected Devices" at 1 <http://www.verizon.com/cs/groups/public/documents/adacct/bandwith-and-multiple-device.pdf> (accessed October 2016).

<sup>2</sup> James Manyika, et al., "Disruptive Technologies: Advances That Will Transform Life, Business, and the Global Economy" McKinsey and Company, May 2013, <http://www.mckinsey.com/business-functions/business-technology/our-insights/disruptive-technologies> (accessed October 2016).

- Enables telework and distributed work.
- Promotes major development initiatives such as revitalization zones or event bids.

There is a sound economic basis for states and regions to continue to upgrade their broadband capabilities. For example, small and medium businesses are dependent on affordable, high-speed access to compete—and large businesses increasingly look to locate in areas with very high-speed access. Home-based businesses may emerge or fail based on the Internet speeds available to them. Affordable access to very high-speed broadband also incents development of the collaborative, distributed work that is a hallmark of the emerging global economy.

High-bandwidth broadband is also regarded as a facilitator of political discourse and activity—the most important medium for communication and expression of political ideas since the advent of television.

## **2.2 Fiber Optics to the Home, Business, and Institution Represent the Best, Most Future-Proof Communications Infrastructure**

Fiber optics all the way to the home and business offer current and future speeds that are several orders of magnitude higher than the other technologies that are considered to compete with it today. As a technical matter and as a matter of physics, those other technologies cannot deliver the same capacity and scalability as fiber-to-the-premises (FTTP). For example:

- Copper networks, operated by the phone companies, have fiber in the backbone of the network, but much of the “last mile” copper dates back many decades and, in some cases, a century. Copper networks cannot keep up with today’s requirements and are in many cases already at or near obsolescence.
- Coaxial networks, operated by the cable companies, also have fiber in the core of the network, but with coaxial cable in the last mile that was deployed in the 1970s and 1980s. These networks can be engineered to offer higher speeds that will be quite competitive in the short term, particularly for residential applications, but cannot keep pace in the long-run with fiber’s ability to scale to dramatically higher speeds that are needed to attract and retain data-driven businesses.
- Wireless networks, which offer tremendous benefits with respect to mobility and convenience, are limited in speeds and therefore serve as complements—not alternatives—to high-bandwidth wired connections like fiber.

A service or product that meets even the FCC’s minimum broadband definition (25 megabits per second downstream) will deliver a fraction of the speed that fiber can deliver using existing, affordable, off-the-shelf technologies (i.e., Gigabit Ethernet, 1,000 times one megabit). These

speeds will grow dramatically as new equipment become available. The speeds possible over copper, coaxial cable, and wireless networks will also grow, but as a matter of physics, cannot keep up with fiber's ability to scale.

As a result, fiber all the way to the home or business represents the Holy Grail of communications infrastructure—a future-proof investment that can be easily, inexpensively upgraded to new speeds as more advanced electronics are developed.

In planning for the future, it is clear that FTTP will be the standard, and if the state or its local governments is going to invest time or resources into advancing digital infrastructure deployment, we recommend that it be future-proof fiber technology.

Fiber also represents the new standard for world-class markets. This is the infrastructure that already exists in New York City and its suburbs, and that is emerging in Silicon Valley; Salt Lake City; Charlotte; Raleigh/Durham; Atlanta; Chicago; Louisville; Los Angeles; San Diego; Austin; and nearly 100 other cities selected either by Google Fiber, AT&T, or CenturyLink.

The following graphics illustrate the capacity of different communications technologies.

Figure 1 illustrates the comparative upload (sending data up to the Internet) and download (pulling data down from the Internet) speeds of various technologies. Note that the faster speeds all require fiber optics all the way to the home or business, as are under construction by Google Fiber, AT&T, and CenturyLink.

Figure 1: Comparative Speeds of Various Technologies

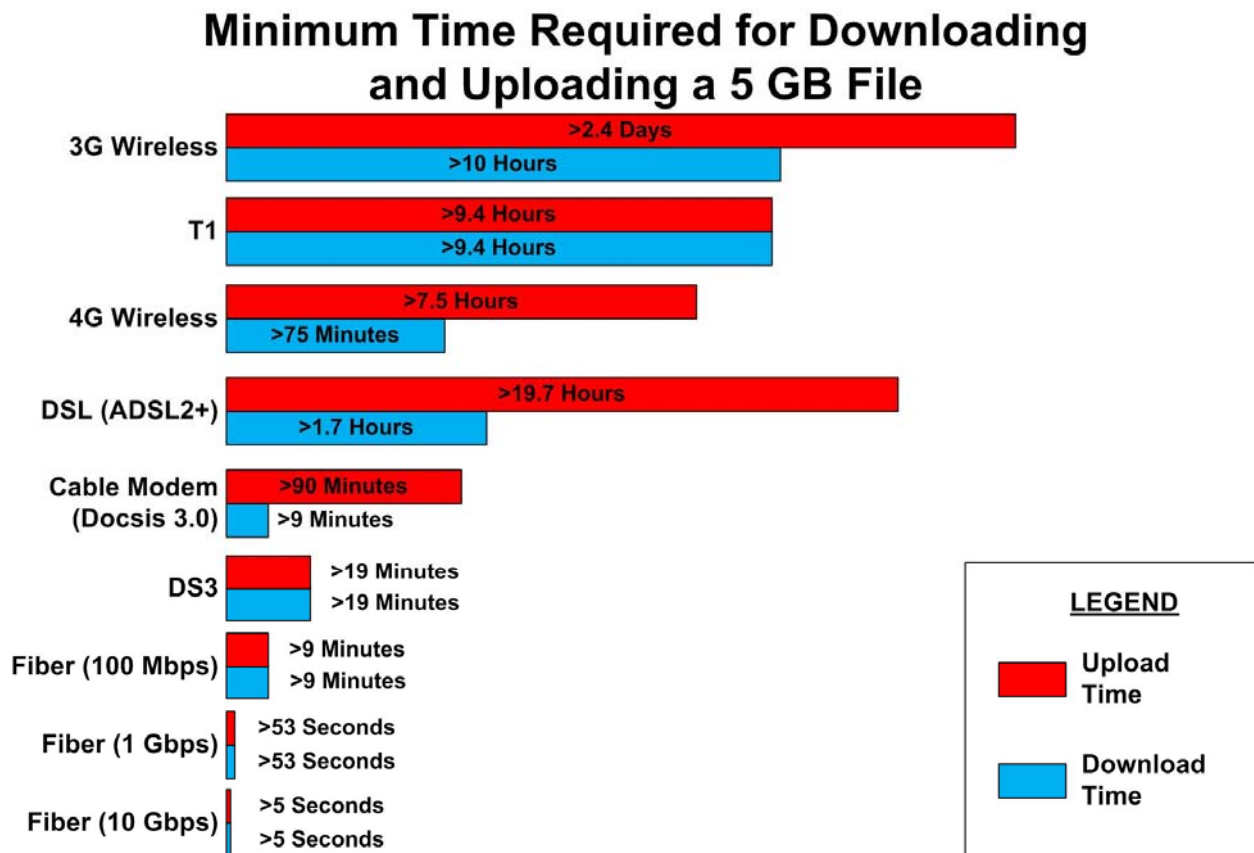
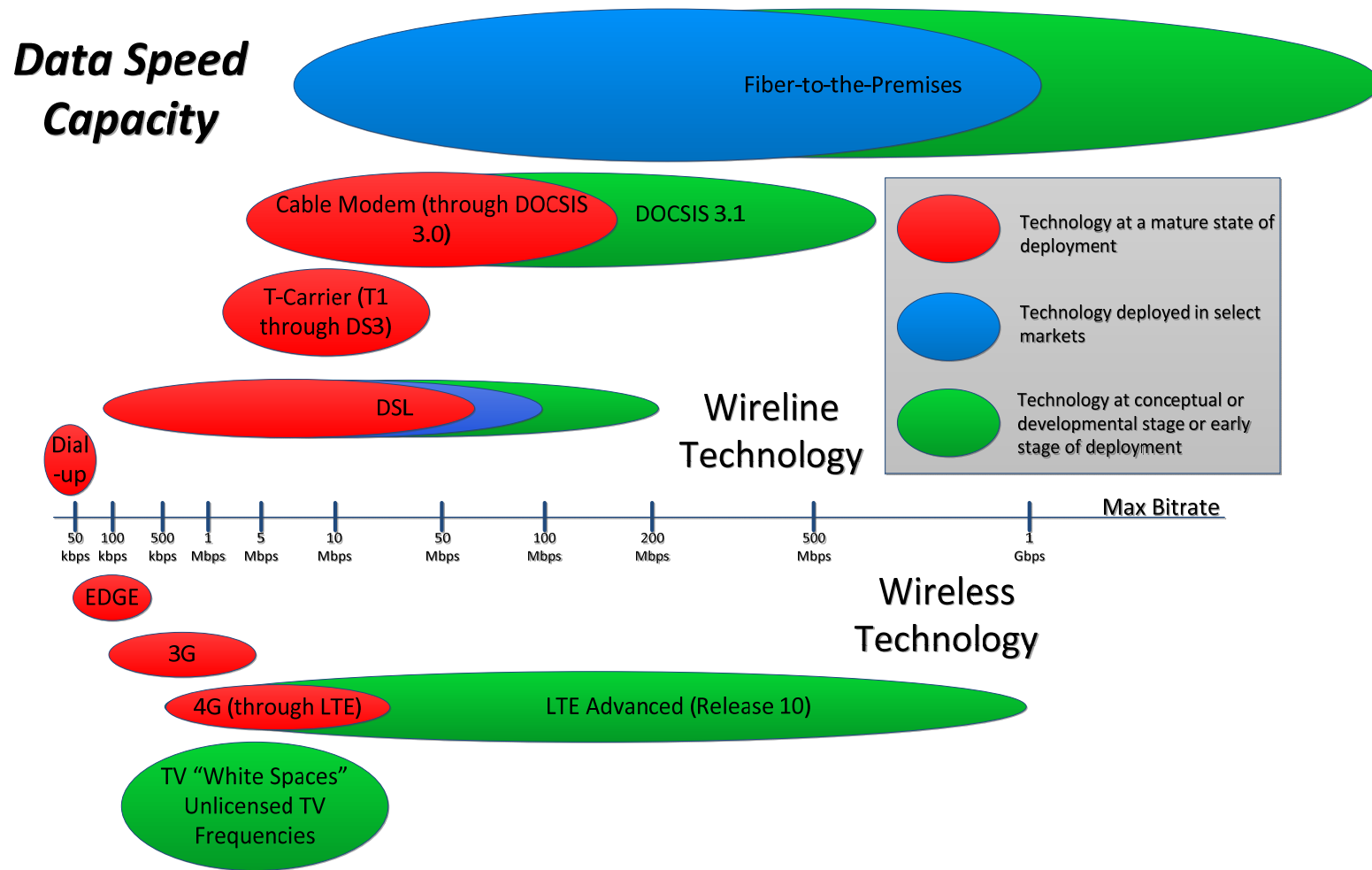


Figure 2, below, illustrates the current and likely future capacity of various technologies, including the new DOCSIS 3.1 technology that Comcast plans to implement at some point in the coming years. Note that the wireless technologies depicted below the line in the graphic generally cannot match in speed the wireline technologies (above the line) and thus serve as a mobile complement to wireline rather than as an alternative.

In the figure, LTE Advanced specifies the capability of 1 Gbps download speeds for users. We note that this relies on a development path of LTE that provides premium quality of service to high-bandwidth users, as well as the deployment of smart antenna technology and sufficient fiber and base station deployment to make all of this available. (Advanced wireless technologies require fiber optics very close to the wireless radios to offer the capacity illustrated here.) We also note that in the same period that this type of speed becomes available for LTE, typical fiber speeds to the premises will be in the 10 to 100 Gbps range.



Figure 2: Wireline and Wireless Capacity





## **2.3 Though Many New Mexico Consumers Currently Are Well-Served by Existing Networks, State and Local Leaders Should Further Enable the Deployment of Next-Generation Broadband**

New Mexico and its cities have not yet experienced extensive private sector investment in the most robust, most future-proof communications infrastructure.

The very high speeds that are enabled over fiber optics are increasingly viewed as the emerging international standard. Google Fiber's announced FTTP deployments in a dozen or so cities, for example, will deliver gigabit (1,000 megabits) speeds at a price of \$70 per month. That is an order-of-magnitude higher speed than is affordably available to most consumers in the United States, including in New Mexico.

While there are many parts of New Mexico that are reasonably well-served today by current providers, some parts of the state are unable to access high-speed Internet at affordable prices. In our visits to the state, we documented cases where businesses only have access to lower-speed DSL; we understand that this situation persists in some commercial areas and in certain rural towns.

## **2.4 Affordability of Service Is as Important as Availability**

Affordability is obviously a crucial aspect of enabling New Mexico citizens and businesses to enjoy broadband speeds enabled by fiber networks. In some pockets where FTTP is technically available, the installation costs can be prohibitively expensive.