

Frequently Asked Questions

About the Broadband Committee

Moffat County communities including Craig, Dinosaur, Hamilton, and Maybell, along with local funding partners Tri-State Generation and Transmission, Colorado Northwestern Community College, The Memorial Hospital, Yampa Valley Electric Association, and Danner Communications, have come together to study the current broadband services available in Moffat County and to study ways to improve broadband services. The intention of the study is not to diminish the hard work, the investments and the efforts that many of the communities have done to improve broadband services, but rather, to enhance and expand the efforts that are already underway.

What is “Broadband?”

Broadband is the pathway to fast Internet service. In February of 2015, the FCC defined the minimum target for broadband as having the ability to download 25 Mbps and upload 3 Mbps. This is the minimum amount of speed needed to connect to the Internet and many cities and communities have or are working to put in place “next generation” broadband services. Next generation broadband services offer 1,000 Mbps or 1 Gigabit per second service delivery. This is 10 to 100 times faster than almost all commercially available services.

What is “Bandwidth?”

Bandwidth refers to the capacity, or speed of the networks to carry traffic. It is often defined in Megabits per second (Mbps) or Gigabits per second (Gbps). 1 Gigabit is 1,000 Mbps.

Why is broadband so important to us? What’s the real advantage?

Next generation broadband services offer many advantages. Having access to affordable, abundant, high capacity Internet is no longer a luxury. It is a necessity, like water and electricity. Having access to abundant broadband is critical for:

- creating more jobs,
- creating vibrant communities that are economically stable,
- providing for new opportunities,
- fostering an entrepreneurial-friendly environment,
- improving technology advancement,
- providing better access to educational opportunities and online learning applications,
- providing for better and less expensive healthcare,
- improving public safety and emergency management services
- better access to e-government services,

- facilitating more telework and telecommuting, and
- attracting the New Knowledge economy.

Advanced broadband networks are creating enormous shifts in local, state, national and global societies, as well as markets, business and in institutions around the world. Therefore, it is critical to have this infrastructure available to all citizens.

We need advanced or next generation broadband if we, as a community and county, want to remain competitive.

Why does this Matter?

Global Internet network traffic has quadrupled from 2009 to 2014 and both commercial and residential Internet bandwidth consumption have doubled every year since then. In the early days of the Internet, we primarily used text messaging and email. The applications that use the Internet today are much more bandwidth intensive. Movies, pictures, interactive videos, MRIs, X-rays and cloud-based applications take much more bandwidth than email. For example, one video download is the equivalent of downloading 30,000 web pages. The applications we use on the Internet are becoming much more feature-rich and bandwidth intensive and our existing networks cannot keep up with the demand for networks that support these applications.

Can the City or County put pressure on the existing providers through better negotiations of the cable franchise?

Unfortunately, no. The cable franchises that the City has with Charter govern broadcast TV services, not broadband. Broadband services are not regulated and therefore, the City does not have the authority to govern existing broadband providers.

Why is the committee involved in the study?

The members of the committee see the importance of having next generation broadband services to manage their respective operations, and perhaps more importantly, see the need for next generation broadband as a way to spur economic development. Other communities that have improved broadband services and have already seen the tremendous economic impact of building broadband infrastructure. These communities have fostered an environment of innovation, economic development and growth, collaboration, and creative activities. Because access to advanced broadband services is a priority for businesses and entrepreneurs, the communities that have built advanced broadband networks have already benefited economically by attracting businesses and industries, in areas like manufacturing and technology, to re-locate to their communities. For example, Kansas City has already seen an uptake in new high-tech start-ups due mostly to Google's FTTH efforts. Through Homes for

Hackers and the Kansas City Startup Village, entrepreneurs have built a community of innovators enticed by the possibilities presented by the Google Fiber network.

What are the activities of the study?

There are several activities underway that will help inform the broadband committee of the best possible approaches. First of all, we are conducting two surveys – one for residences and homeowners and one designed for businesses, to get feedback from the community on their concerns, what is important, what is needed, and input from the community on the role of government in solving broadband challenges. There is also a speed test link provided within the survey to obtain actual speed test results. We can then map areas within the County that have the biggest needs for improvement.

Secondly, we will be issuing a Request for Information for a Public Private Partnership or Recommendations from the Private Sector on Collaboration. We want to receive input from the existing service providers that are already serving Moffat County and the neighboring counties. We also want to see what other potential partners may want to participate in this process.

From there, we will meet with key stakeholders within the community and look at options for key investments, partners, and strategies for improving broadband services.

Craig & Moffat County, Residential Survey

Thank you for your input!

Moffat County communities including Craig, Dinosaur, Hamilton, and Maybell, along with local funding partners Tri-State Generation and Transmission, Colorado Northwestern Community College, The Memorial Hospital, Yampa Valley Electric Association, and Danner Communications, are conducting this survey to receive feedback regarding your broadband service at home. The purpose of the survey is to determine the level of service you currently have at home, how you use the Internet, what you currently pay, what your current download and upload speeds are, and what is most important to you in regards to high speed Internet service.

The survey shouldn't take more than 10 minutes for you to complete.

The survey does NOT collect personally identifying information. The speed test does gather location information from where the speed test was collected. You may complete the survey questions only or the speed test only, or both. Either way, we greatly appreciate your feedback and input.

1. To which age group do you belong?

- Under 21
- 22 - 39
- 40 - 54
- 55 - 70
- Over 71

2. How much do you currently pay for your Internet each month?

- Between \$20 - \$35
- Between \$36 - \$55
- Between \$56 - \$100
- More than \$100

3. Does this cost include other bundled services? (Check all that apply.)

- Yes, it includes my telephone service.
- Yes, it includes my TV service
- Yes, it includes my cell phone service
- No, the costs just include my Internet service.

4. How important is it to you to receive one invoice for Internet, cable TV and/or phone service?

- It is extremely important.
- It is somewhat important.
- It is not important.

5. How reliable do you find your current Internet connection?

	Never	Sometimes	Most of the time.	Always
The <u>download</u> speed is too slow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The <u>upload</u> speed is too slow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The connection interrupts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. In order to measure your current service levels, please take an Internet speed test - please go to <http://maps.co.gov/publicspeed/> and click begin test and enter the results. If you are using an Apple or Android device, please use <http://openspeedtest.com/> for the speed test.

Download Speed

Upload Speed

7. How would you rate the download speed of your Internet?

- Very Slow
- Slow
- Acceptable
- Good
- Excellent

8. How would you rate the upload speed of your Internet?

- Very Slow
- Slow
- Acceptable
- Good
- Excellent

9. When did you complete the speed test?

Date/Time MM / DD / YYYY hh : mm AM/PM

10. What device did you use when you conducted the speed test?

- A cell phone A laptop or a computer An ipad or tablet

11. Does the speed of your Internet connection vary during or throughout the day?

- The speed stays the same throughout the day
 The speed varies dramatically throughout the day
 The speed varies somewhat throughout the day

Tell us more

12. Are there times when you cannot get on the Internet?

- All of the time
 Some of the time
 Hardly ever
 Never

13. How fast do you think your Internet service should be? What service level do you expect or need?

1 Mbps 100 Mbps 1000 Mbps or 1 Gbps

14. As a follow-up question to #13 above, if you are unsure of the service level or speed that you need, which of the following best suits your needs?

- I don't know how fast I need, but I know that I need more UPLOAD speed than what I have.
 I don't know how fast I need, but I know that I need more DOWNLOAD speed than what I have.
 I don't know how fast I need, it seems to be working fine with what I have now.
 I don't know how fast I need, but I would like it MUCH faster than what I have.

Other (please specify)

15. What would you be willing to pay for the service at this level? Enter a number only.

16. What is most important to you regarding your Internet service? (Please rank the following choices, with 1 being the most important.)

<input type="text"/>	Fast, I want speed and availability of abundant broadband
<input type="text"/>	Reliability, I do not want my Internet service to be interrupted.
<input type="text"/>	Price, I want to pay a competitive price.
<input type="text"/>	Customer Service, I want a friendly voice and good customer support.
<input type="text"/>	Bundled invoice, I want one invoice for Internet, cable TV and/or phone service.

17. How many people use the Internet in your household?

18. Does anyone in your household work from home?

- Yes, 1 person does
- Yes, 2 people do
- Yes, more than 2 people do
- No

19. How many school-aged children live at your home?

20. Which of the following devices do you have and how many of these devices do you have in your household?

	None	1	2	3	more than 3
Tablet	<input type="radio"/>				
Desktop computer	<input type="radio"/>				
Laptop computer	<input type="radio"/>				
Smart phone	<input type="radio"/>				
Smart TV	<input type="radio"/>				
DVD/DVR or Blue Ray Player	<input type="radio"/>				
Game Console	<input type="radio"/>				
Streaming TV (Apple TV, Google Chromecast, Amazon Fire, etc.)	<input type="radio"/>				

21. Which of the following Internet Service Providers do you use in your home? If you have more than one Internet Service Provider or more than one home, please select your primary provider at your primary residence.

- Charter
- CenturyLink
- Zirkel Wireless
- Unite Fiber Networks
- Strata Networks
- Mammoth
- Level 3
- Satellite Company (Hughes, Wild Blue)
- I do not use any of these internet service providers

22. For your home, what type of Internet service do you currently have?

- DSL (usually provided by the phone company)
- Dial-up (requires you to use a modem and your regular phone line)
- Cable (usually provided as part of your cable TV package)
- Satellite (usually provided as part of your Satellite TV package)
- Wireless (usually provided by an independent service provider using an antenna on the roof pointed to another ground antenna.)
- Mobile Phone Wireless, Cellular (typically is part of your cell phone plan)
- T-1 Service (a special kind of service often available from the phone company rated at a fixed 1.5 Mbps)
- Fiber connection (uses fiber optics to provide the signal. May be provided by the phone company or other providers. Typically used for higher speeds)
- I don't have Internet service at my home.
- I do not know what type of connection I have at my home.

23. If the private sector (phone, cable, wireless or other company) does not provide adequate and affordable broadband service to your home, who would you want to step in to ensure that better services are available?

- The local municipality
- The county
- The electric company
- A consortium
- I am not sure
- Other (please specify)

24. Ranking the Government's Role in Broadband. What do you think the primary role for the City of Craig/Moffat County government should be with respect to broadband access? (Please rank your choices with "1" being your first choice.)

<input type="text"/>	Install state-of-the-art network and offer services to the public, including homes and businesses, and government offices
<input type="text"/>	Install state-of-the-art network for businesses, schools, government offices and the medical community only.
<input type="text"/>	Install state-of-the-art services and enter into agreements with private companies to offer services to the public.
<input type="text"/>	Partner with a private firm to build a state-of-the-art network.
<input type="text"/>	Partner with current providers to improve the speed and reliability of their services.
<input type="text"/>	Do Nothing. Let private providers decide what services they are willing to provide.

25. If you could choose only one option, what do you think the primary role for the City of Craig/Moffat County government should be with respect to broadband access? (Please choose only one)

- Install state-of-the-art network and offer services to the public, including homes and businesses, and government offices
- Install state-of-the-art network for businesses, schools, government offices and the medical community only.
- Install state-of-the-art services and enter into agreements with private companies to offer services to the public.
- Partner with a private firm to build a state-of-the-art network.
- Partner with current providers to improve the speed and reliability of their services.
- Do Nothing. Let private providers decide what services they are willing to provide.

26. Do you think broadband service is a utility?

- Yes
- No
- I don't know.

27. How would you characterize your relation to your Internet service?

	Strongly Agree	Agree	Neutral/Not Sure	Disagree	Strongly Disagree
Our household mostly just uses the Internet for "basics" like email, browsing/research, etc.	<input type="radio"/>				
More and more, our household is relying on streaming video over the Internet for in-home entertainment	<input type="radio"/>				
Household members interact with local businesses (reservations, tickets, etc.) over the Internet	<input type="radio"/>				
Our household buys things online (Craig's list, eBay, etc.)	<input type="radio"/>				
Our household sells things online (Craig's list, eBay, etc.)	<input type="radio"/>				
Our household's demands on Internet bandwidth and speed is consistently increasing	<input type="radio"/>				
If we had better home Internet service, one or more of us would work from home more often	<input type="radio"/>				
The current Internet speed available is holding back our household's income potential	<input type="radio"/>				
The current Internet speed available is holding back our household's entertainment options	<input type="radio"/>				

28. Would you consider leaving the community because it doesn't have adequate broadband?

- Possibly yes, I have thought about it.
- Definitely yes, I will be forced to relocate because of inadequate broadband service.
- No, it's not a consideration for me. I have adequate broadband service.
- No, it's not a consideration for me. Broadband services need to be better here, but I am not planning to move.

29. If you have any other comments regarding your current Internet service or a community broadband service please tell us below:



THE IMPORTANCE OF BROADBAND

Why this Matters

Advanced Broadband Service is no longer a luxury. It is a utility that is as important as water or electricity. This paper discusses why we should care about broadband infrastructure for our communities.

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The Importance of Broadband

Technology is impacting every part and parcel of our lives in our rapidly changing world – from where and how we conduct work, to whether or not we thrive economically and socially. Technology and broadband can, when available, improve and enhance the way we work and live. With the introduction and accelerated advancement of technologies, having access to affordable, redundant and abundant broadband is quickly becoming the most critical infrastructure of our time, just like electricity, transportation, and roadways were early last century.

To address the possibilities and potential of broadband, both the private and public entities are building networks all over the globe to support the Internet needs of both today and the foreseeable future.

We do not yet know the far-reaching impacts that the Internet will have on our lives and on generations to come. However, it is certain that NOT having access to advanced broadband networks would be equivalent to being in the dark without electricity.

Many communities in Colorado find they are lacking adequate Internet service or do not have access at all, creating a “digital divide” among those with access and those without. The digital divide¹ typically exists between those in cities and those in rural areas. Rural areas are costlier and difficult to provide advanced broadband networks. However, even in Colorado’s metropolitan areas, many citizens lack access to abundant, affordable and reliable advanced broadband services.

For **businesses**, robust bandwidth is the foundation for innovation as well as the key infrastructure needed to succeed and capitalize on the Internet’s applications and benefits. Research demonstrates a direct correlation between businesses’ use of Internet applications and revenue growth and productivity.

With today’s economy more dependent on innovation and connectivity to survive and thrive, providing businesses with high speed Internet is critical to keep businesses competitive.

The Benefits of Broadband

For **households**, better broadband delivers opportunities beyond an enriched lifestyle and entertainment.

Enriched Education – In addition to providing a stronger link to their own teachers and school resources, high speed broadband brings with it the ability to video-link students to anywhere in the world. Video-conferencing breaks down the walls of the traditional educational system and takes students inside operating rooms, to engineering labs, or across the globe to speak with their peers in another country. These experiences will strengthen a region’s workforce of tomorrow.

¹ whatis.techtarget.com/definition/digital-divide

World-Class Healthcare – A robust broadband network helps medical professionals collaborate with the world’s top medical doctors, in real time. Only through high speeds can medical images be shared in real time to enable telemedicine to work “side-by-side” with global specialists and deliver citizens the best care available.

Improved Public Services and Safety – The power of high speed broadband can help make streets safer and government services more efficient. Deploying Internet services in police cruisers, fire and safety vehicles provide professionals with the resources they need to better serve and protect citizens.

Internet of Things – You may have heard of this increasing trend as homes and appliances become “smart.” Beyond smart-phones, tablets, watches, and computers, every day more and more connectivity is being developed into smart home electronics, applications and appliances.

Telework – Digital connectivity empowers rural professionals to telework, providing the opportunity to work for urban organizations anywhere in the world from a rural residence. Additionally individual and small and home-based businesses can be established and grown with high-speed Internet connectivity.

What Exactly is “Broadband?” In 2015, the Federal Communications Commission (“FCC”) revised its definition of Broadband) as having the ability to download at 25 Mbps and upload speeds of 3 Mbps. Having access to “advanced broadband,” means, at a minimum, having broadband speeds that at least meet the FCC definition. There are many types of broadband connections:

DSL (Digital Subscriber Line) uses existing copper phone lines to deliver download and upload broadband speeds typically of 1.5 Mbps to 7 Mbps. DSL speeds diminishes as distance increases from the telephone company’s central office. Homes or businesses located more than three miles from the central office will not receive as fast of speeds. There have been many improvements to DSL technologies to improve the speed available. In general, most forms of DSL service improvements support up to 10 Mbps. VDSL (Very High Bit Rate Digital Subscriber Line) can support up to 30 Mbps, but most Internet service providers do not support this type of service, including providers in Moffat County.

Cable modem service uses coaxial cables already installed by the cable TV operators to provide broadband service. Most cable networks support speeds comparable to DSL. Cable operators are upgrading their cable networks by installing fiber optic cable closer to neighborhoods. These network improvements allow cable modem service to be able to support up to 30 Mbps. This connection type is a shared service, meaning, as more people are on the network within a neighborhood, the speed available to each customer diminishes.

Fiber optic technology converts electrical signals carrying data to light and sends the light through glass fibers about the diameter of a human hair. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps.

Fiber is the best way to provide abundant broadband, but it often is the most capital-intensive to build.

Wireless broadband connects a home or business to the Internet using a radio link between the customer's location and the service provider's facility. Wireless technologies using longer-range directional equipment provide broadband service in remote or sparsely populated areas where DSL or cable modem service would be costly to provide or fiber network installations may be too capital intensive.

Wireless broadband can be mobile or fixed. Wireless speeds are generally comparable to DSL and cable modem. Wireless services can be offered using both licensed spectrum and unlicensed devices. Wi-Fi networks typically use unlicensed spectrum. Wi-Fi networks use wireless technology from a fixed point and often require direct line-of-sight between the wireless transmitter and receiver. Wi-Fi networks can be designed for private access within a home or business, or be used for public Internet access at "hot spots" such as restaurants, coffee shops, hotels, airports, convention centers, and city parks. Using licensed spectrum, greater amounts of bandwidth can be delivered and often do not require direct line-of-sight.

In some communities, especially sparse, geographically diverse rural communities, small providers build out a wireless solution since wireless infrastructure is not as capital-intensive as building out a fiber optic infrastructure. While wireless technology does have its limitations, needing to be designed to get around "line of sight" requirements as well as to support "shared" bandwidth on the network, smart engineering can deliver good connectivity.

Wireless Local Area Networks (WLANs) provide wireless broadband access over shorter distances and are often used to extend the reach of a "last-mile" wireline or fixed wireless broadband connection within a home, building, or campus environment. An in-home Wi-Fi network is a WLAN – it does not use spectrum, rather it sends radio waves at a limited range. Mobile wireless broadband services are also becoming available from mobile telephone service providers. These services are generally appropriate for highly-mobile customers and require a special wireless card with a built-in antenna that plugs into a user's laptop computer. Generally, they provide lower speeds, in the range of several hundred Kbps.

Satellite broadband is another form of wireless broadband, and is also useful for serving remote or sparsely populated areas. Typically, a consumer can expect to receive (download) at a speed of about 500 Kbps and send (upload) at a speed of about 80 Kbps. These speeds are slower than DSL and cable modem, but they are about 10 times faster than the download speed with dial-up Internet access. Service can be disrupted in extreme weather conditions and are typically oversubscribed.

Advanced Broadband is Critical Infrastructure. Advanced broadband infrastructure has the potential to create more jobs, increase the community's competitive ability globally, create new technologies, increase opportunities for our community's companies, enhance public safety, provide better and less expensive healthcare, and provide greater educational opportunities throughout our communities.

Advanced broadband networks are creating seismic changes in local, state, national and global societies, as well as markets, business and in institutions around the world. Access to social media and the Internet has shifted governments, threatened political boundaries and changed us culturally. Advanced broadband networks are fundamentally changing our world in ways that were not expected or anticipated. Much like electricity, advanced broadband networks are the enabling technology in which all things are impacted. Electricity was invented to turn on the lights, but empowered – literally, the transformation to an industrial society.

Just as it was impossible to predict the impact that electricity would have to power modern appliances, computers, health monitoring systems, manufacturing facilities, computers, radio and television, and financial markets; so too, is it impossible to predict the impact and reach of advanced broadband networks.

Speed Matters. Global network traffic has quadrupled from 2009 to 2015. Both commercial and residential Internet bandwidth consumption are doubling every year.

In the early days of the Internet, text messaging, email and web sites were not data-rich or bandwidth intensive and the average consumer did not need more than 7 Mbps of bandwidth (upload or download) to accomplish most, if not all tasks. Universities, financial institutions and business enterprises were the key drivers for higher amounts of bandwidth.

FIGURE 1: EARLY INTERNET CONSUMPTION

Early Internet Consumption	
Application	Rate
Personal communications	300 to 9,600 bits/second or higher
E-mail transmissions	2,400 to 9,600 bits/second or higher
Remote control programs	9,600 bits/second to 56 kbits/second
Digitized voice phone calls	64,000 bits/second
Database text query	Up to 1 Mbps
Digital audio	1 to 2 Mbps
Access images	1 to 8 Mbps
Compressed video	2 to 10 Mbps
Medical transmissions	Up to 50 Mbps
Document imaging	10 to 100 Mbps
Scientific imaging	Up to 1 Gbps
Full-motion video	1 to 2 Gbps

When YouTube burst upon the scene in 2005, this dramatically changed things. Consumers, small businesses and residential users started to also drive Internet bandwidth demand. One video download was the equivalent of downloading 30,000 web pages. Since that time, videos

and picture-rich content have been downloaded and uploaded on a regular basis by the masses. The sum of all forms of Internet Protocol (IP) video (Internet video, video on demand, video files exchanged through file sharing, video-streamed gaming, and videoconferencing) was 64% in 2014 and is predicted to be 80 percent by 2019.² In the coming years, the sum of all forms of IP video will reach 86 percent of the total Internet traffic. The applications we use on the Internet are becoming much more feature-rich and bandwidth intensive and existing networks cannot keep up with the demand for networks that support these applications.

FIGURE 2: AVERAGE RESIDENTIAL BANDWIDTH

Average Residential Bandwidth Needed, Applications 2015				
Service	Bandwidth	Number of Devices	Bandwidth Home Area Network	Bandwidth Residential Gateway to Network
TV	2 to 20 Mbps	3.5	2 to 70 Mbps	2 to 70 Mbps
DVR	2 to 20 Mbps	2	2 to 40 Mbps	0
Home Theater	1 to 6 Mbps	1	1 to 6 Mbps	0
Internet Browsing	1 to 20	1 to 5	1 to 100 Mbps	1 to 10 Mbps
Printer	.5 to 1 Mbps	1 to 5	.5 to 5 Mbps	0
Digital imaging	1 to 20 Mbps	1 to 3	1 to 60 Mbps	0
On-line Gamine	.5 to 1 Mbps	1 to 3	.2 to 3 Mbps	.2 to 1 Mbps
Video Capture	.1 to 1 Mbps	1 to 10	.1 to 10 Mbps	.2 to 3 Mbps
Portable Audio	1 to 20 Mbps	1 to 3	1 to 60 Mbps	0
Video Steaming	10 to 1000 Mbps	3.5	35 to 3500 Mbps	35 to 3500 Mbps
Smart TV	35 Mbps	1	35 Mbps	35 Mbps
Total	54 to 1,163 Mbps		79 to 3,339 Mbps	74 to 3,619 Mbps

The Fiber to the Home Council (FTTH) stated its position clearly in a brief to the FCC. “Even today, with most users still operating on last-generation broadband technologies, the capabilities of advanced video, cloud-based services, and other bandwidth-intensive applications are growing at a pace beyond what our existing networks are capable. Cisco and other scientific companies talk about the network in terms of “terabytes” of capacity in the network center, or “core.”³

Commercial and residential Internet bandwidth consumption are doubling every year, as video, cloud computing, advanced storage solutions, telemedicine, and telecommuting are becoming more accessible and available to end users. Applications today are more bandwidth intensive with more devices being used both in the home and for business purposes. The driver of this is not only smart-phones, tablets and computers, but even more so, the “Internet of Things” – things such as wearables (clothing with Internet connections) and smart home applications and appliances. In addition, Internet-connected televisions, radios, cameras and picture frames, have created the demand for reliable, consistent Internet. The number of hours spent viewing entertainment applications online (i.e. movies and TV) have surpassed the number of hours spent viewing entertainment from traditional broadcast TV. As of 2013, the number of Internet-

² <http://www.digitaltrends.com/home-theater/online-video-will-dominate-internet-traffic-by-2019/>

³ Fiber to the Home Council, “America’s Petition to the Federal Communications Commission for Rulemaking to Establish a Gigabit Communities Race-to-the-Top Program,” July 23, 2013.

enabled devices outnumbered the number of people in the world. Applications supported by cloud-based services through multiple devices have created the need for always-on connectivity and advanced broadband network bandwidth.

There have been tremendous improvements in wireless communications, and in technologies that beef-up existing cable networks, to help deliver broadband and address unserved- or under-served regions. At the same time, fiber optic network technologies are being extended where it is financially feasible further and deeper into neighborhoods, business parks and industrial centers. As more devices are connected to the Internet and applications are more bandwidth rich, there is momentum pushing for the highest bandwidth possible, which can favor fiber connections to homes and businesses while wireless serves as an excellent supplement/solution for harder to reach geographies. The “gold standard” for bandwidth capability today is quickly becoming offering Gigabit services (1000 Mbps). Many cities are either investigating or have already seen gigabit service come to their metro areas, but for rural areas where building an all-fiber optic network is cost-prohibitive, a combination of wireless and fiber optic cable may be the most economical and feasible solution.

While Internet bandwidth use is doubling, cellular networks are also greatly overextended.

In addition to explosive growth in Internet consumption from homes and businesses, mobile Internet use has also advanced dramatically. Smartphone applications are spurring higher consumption of multimedia services. With tablet computers and smartphones having easy access to games, e-books, TV programs, email, shopping, banking and social media sites, wireless service providers have been scrambling to upgrade their networks and support the growing need to connect mobile and portable users.

The need for advanced broadband connectivity must include both a consideration for fiber, connecting our businesses, homes and offices; as well as wireless and cellular, allowing for mobile and portable access as we travel, move about and commute.

Communities are Investing in Broadband Infrastructure to Enable Economic Development and Vitality

Communities deploying the gold standard of 1 gigabit are already realizing great rewards for being early adopters. Communities including Chattanooga, TN; Lafayette, LA; and Kansas City are seeing great benefit and advancements in terms of social and economic advancement. And the numbers of gigabit cities is rapidly growing as each week sees announcements of gigabit networks to be available in a community within the US.

States, municipalities, communities and regions that have deployed higher-speed, next century broadband have already seen the tremendous economic impact of building networks. These communities have fostered an environment of innovation, economic development, collaboration, and creative activities. *According to a 2012 survey of economic development professionals, 60 percent said that 1 Gigabit of service had a "definite impact" on new businesses that moved to an area.* Communities understand that advanced broadband networks are

essential for economic development and innovation. City and local government officials the importance of having better broadband infrastructure – whether it is fiber-based or wireless, to retain businesses and employees and to provide critical infrastructure to visitors, part-time homeowners, and permanent residents.

The chart below breaks out the impact various speed options have had on economic success factors, such as attracting new businesses, helping local businesses grow, increasing home-based businesses and reviving depressed business districts or communities.

FIGURE 3: BROADBAND'S IMPACT ON ECONOMIC OUTCOMES FROM THE PERSPECTIVE OF SPEED⁴

Broadband's Impact on Economic Outcomes							
	2-4 Mbps	10-12 Mbps	20-25 Mbps	100-120 Mbps	500 Mbps	1 Gigabit	Total
Attract new businesses to your area	3.10% 7	4.87% 11	9.73% 22	26.55% 60	13.27% 30	42.48% 96	226
Help local companies grow	4.87% 11	7.52% 17	20.35% 46	29.20% 66	9.29% 21	28.76% 65	226
Increase home-based businesses	5.80% 13	13.84% 31	26.79% 60	25.89% 58	12.95% 29	14.73% 33	224
Individuals' income earning increases	8.64% 19	1682.00% 37	23.18% 51	25.91% 57	11.36% 25	14.09% 31	220
Revive depressed business districts	6.31% 14	11.71% 26	18.92% 42	27.48% 61	12.61% 28	22.97% 53	222
Revive depressed communities	7.14% 16	16.52% 37	1786.00% 40	27.23% 61	12.95% 29	18.30% 41	224

According to The Tennessean, an online publication, Chattanooga’s mayor, Andy Berke attributes the city’s Gigabit network as a significant source of the community’s new vibrancy. In the past three years, the city’s unemployment rate has dropped to 4.1% from 7.8% and the wage rate has also been increasing. Gigtank, a startup accelerator, emerged, and startup and tech events popped up as the city began taking advantage of its high-speed access. Berke described a Chattanooga company that developed during an entrepreneurial event and was eventually bought by OpenTable. Now, OpenTable has an office in the city’s Innovation District and it has doubled its local presence, part of the city’s downtown revitalization efforts.

Downtown has doubled its residents and landlords often advertise gigabit speeds that are included in monthly rents. “It’s an explosion of growth in our technology sector,” he said. “That

⁴ Settles, *Building the Gigabit City*.

has sparked not only this (downtown) living but restaurants and bars and music and the quality of life that truly makes a city interesting, cool, hip, vibrant and energetic."⁵

In Summary. For Colorado communities, having access to affordable, abundant, high capacity Internet is no longer a luxury, it is essential. Access to abundant broadband:

- provides equality and reduces the digital divide
- creates more jobs,
- creates vibrant communities that are economically stable,
- provides for new opportunities,
- fosters an entrepreneurial-friendly environment,
- improves technology advancement,
- provides for better and less expensive healthcare,
- creates educational opportunities,
- improves public safety and better access to e-government services,
- incentives telework and telecommuting
- provides flexibility for affordable housing for the workforce
- attracts the New Knowledge economy to our community.

Advanced broadband networks are creating enormous shifts in local, state, national and global societies, as well as markets, business and in institutions around the world. It is critical for our communities to develop the infrastructure that provides equitable access to advanced broadband services for its citizens, its workforce and its visitors.

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⁵ The Tennessean, "Chattanooga Mayor: Gigabit speed Internet Revives City," Jamie McGee, June 14, 2016.



POLICIES AND ORDINANCES THAT FACILITATE BROADBAND DEPLOYMENT

There are many policies and ordinances that can be put in place to reduce the capital costs of broadband deployment.

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Implement Policies and Ordinances that are Broadband Friendly

Municipalities have the power to significantly reduce the capital costs of broadband infrastructure deployment. Whenever possible, cities and counties can put in place policies and ordinances to help encourage broadband investment. These policies can be implemented to facilitate investment from the private sector and can also be used to gain substantial assets that can be leveraged for broadband deployment.

Sixty to eighty percent of a fiber optic network's capital costs are in opening a trench or in burying conduit that will house fiber optic cable. Policies that encourage placement of conduit or fiber optic cable when a trench is open eliminate much of the capital costs for network deployment. By coordinating with other City, County or State capital projects such as sidewalk improvements, establishment of trails, implementation of street lighting, road construction and road widening projects, additional conduit can be placed within the trench when other work is being performed in the right of way. Coordination with other utility projects can substantially decrease the costs of broadband infrastructure.

A **Dig Once Policy** typically has the following components:

- All public works or installation of other telecom, cable or utility infrastructure allows for conduit to be placed on behalf of the local or State government and any other entities that want to participate. If there is an open trench, the policy provides for coordination of street cuts and excavations with utilities, public works, developers and other interested parties. This maximizes the opportunity for broadband-specific conduit installation, while minimizing cost, community disruption and damage to existing infrastructure.
- A notice period informing other entities that an open trench will be available for placement of their conduit and/or fiber optic facilities.
- Allows for shadow conduit to be placed on behalf of the local and/or State government. The installation of empty and/or spare conduit by a public agency when excavations occur in the public right of way, with the local government agency's costs limited to the incremental costs of the conduit only.

A standard, conduit-specification document can be developed that addresses capacity, separation of facilities, proper sizing and placement. The specification document also addresses access to the conduit with detailed provisions for vaults and all access points. Cost sharing or cost recovery stipulations can be put in place for materials and labor assignment. Engineering specifications and drawings that address conduit sweeps, bend radius and physical placement requirements can be provided with the standard conduit specification.

Additionally, various government agencies can establish **Joint Trench Agreements** and **Joint Build Agreements** with other telecommunications, cable or utility providers. Cost for placement of conduit or fiber will be shared amongst all entities, allowing each to take advantage of the other's trenching. Standardization of these agreements across all potential owners of underground infrastructure can be established to ensure all parties are aware of the joint trenching opportunities as they become available.

Streamlined Permitting Processes and Abandoned Fiber and Conduit Policies

A slow permitting process can add uncertainty in the construction timeline as well as significant costs. Crews can sit idle while waiting for permitting approvals and this adds to the overall cost of construction. A **Streamlined Permitting Process** can be implemented placing the responsibility for approval of broadband infrastructure projects solely in the public works department via an encroachment permit processes. Limiting this process to one department can reduce delays in the approval process. Additionally, a bulk permitting process can enable a single approval for multiple sections, further streamlining the overall process.

Create an **Abandoned Fiber and Conduit Policy** to regain control of abandoned facilities. Any abandoned fiber and/or conduit that is left vacant, and is not claimed by the owner within a designated time period, would revert to the local government agency.

One-touch Make Ready Processes

One of the most unpredictable and costly components of fiber optic construction is the “make-ready” process. “Make-Ready” refers to the inspections, engineering, and rearrangements necessary to accommodate the installation of multiple cables on a utility pole. Make-ready engineering for placement of fiber optic cables needs to comply with the National Electric Safety Code (NESC). Compliance may include moving existing fiber optic cable, increasing the load bearing ability of poles and/or the transfer or replacement of existing poles required to accommodate the attachment of new fiber optic cable. At times, the make-ready process can require multiple companies to dispatch crews with specialized equipment and bucket trucks to move their physical attachments on the communications portion of utility poles, causing slowdowns and duplicate expense for deployments.

In order to better streamline this time consuming and high-cost element, a **One-touch Make-Ready Process** or **One Truck-Roll Procedure** can be established to enable and encourage all of this work to be done by one company rather than by many.

Encourage standards for placement of conduit and/or fiber in new developments.

The integration of broadband “utility” codes into land development policies and city ordinances ensures uniform and standardized placement of conduit and/or fiber optic facilities. These land development codes would require all new commercial and residential developments to install fiber optic infrastructure. New building codes could describe the specific and compatible communications components and architectures of all new construction. Further, these codes could describe the development and use of City/County right-of-ways for communications connectivity, and could specify standardized wiring requirements for new buildings.

Standardize Pole Attachment Rates for Placement of Aerial Fiber, Reducing the Operational Costs for Pole Rental Rates.

Pole attachment rates vary dramatically across various jurisdictions and utility companies for attaching aerial fiber on existing utility poles. Rates are typically charged per pole per year and can range from \$4 per pole up to \$26 per pole. Standardizing the pole attachment rates to a reasonable annual fee per pole per year will reduce the operating expenses for placement of fiber optic cable. Deploying fiber using existing utility poles is less expensive than placement of fiber in a conduit where a trench would need to be opened. Standardizing and minimizing the pole attachment rates can eliminate uncertainty and operational expenses.

Set up funding mechanisms or Set-asides to allow for adoption of these policies.

Conduit is not expensive. However, if the funding mechanism does not exist to place conduit, often opportunities to take advantage of open trenches or joint builds do not occur. A funding set-aside or budget process must be put in place to allow for implementation of these policies. The funding mechanism will allocate monies to build broadband infrastructure when opportunities arise and the fund would maintain a reserve or set-aside for unanticipated projects.

Keep a GIS database of all infrastructure, and provide for a process to submit plans.

Develop a policy that all construction permits issued would require the submission of final as-built drawings. This policy would define all planning and construction documentation requirements for utilities, developers, contractors and others in an appropriate GIS format.

Conclusion

The good news for municipalities looking to provide their constituents with next-century broadband is that they have the power to mitigate costs. By implementing dig once policies, streamlined permitting processes, and creating “make-ready” and conduit standards, your community can lay the groundwork literally - for a fiber-optic, robust broadband network. Legislative and procedural foresight in your community will empower your community’s broadband future.

Moffat County Business Survey, Internet Services

Thank you for your input!

Moffat County communities including Craig, Dinosaur, Hamilton, and Maybell, along with local funding partners Tri-State Generation and Transmission, Colorado Northwestern Community College, The Memorial Hospital, Yampa Valley Electric Association, and Danner Communications, are conducting this survey to receive feedback regarding your broadband or Internet service at your place of work. The purpose of the survey is to determine the level of service you currently have at your work, how you use the Internet, what you currently pay, what your current download and upload speeds are, and what is most important to you in regards to high speed Internet service.

The survey shouldn't take more than 10 minutes for you to complete.

The survey does NOT collect personally identifying information. The speed test does gather location information from where the speed test was collected. You may complete the survey questions only or the speed test only, or both. Either way, we greatly appreciate your feedback and input.

1. What type of business are you in?

- Retail
- Restaurant, Food
- Manufacturing
- Professional services (consulting, legal, engineering, accounting, banking, etc.)
- High tech
- Healthcare
- Education
- Other (please specify)

2. Do you operate your business from your home as the primary place of business?

- Yes
- No

3. About your employees

	Less than 3	3 to 6	6 to 10	10 to 20	20 to 50	More than 50
How many employees work for the company?	<input type="radio"/>					
How many employees does your company have located in Moffat County?	<input type="radio"/>					
How many of your employees in Moffat County work primarily from home?	<input type="radio"/>					

4. If you have Moffat County-based employees that work from home, how often do they work from home on average? (Select the answer that describes a "typical" week.)

- One day per week
- Two days per week
- Three days per week
- Four days per week
- Five days per week
- The company's Moffat County-based employees do not work from home.

5. Which of the following Internet Service Providers do you use at your business? If you have more than one Internet Service Provider, please select your primary provider at your business.

- Charter
- CenturyLink
- Zirkel Wireless
- Unite Fiber Networks
- Strata Networks
- Mammoth
- Level 3
- Satellite Company (Hughes, Wild Blue)
- I do not use any of these internet service providers

6. For your home, what type of Internet service do you currently have?

- DSL (usually provided by the phone company)
- Dial-up (requires you to use a modem and your regular phone line)
- Cable (usually provided as part of your cable TV package)
- Satellite (usually provided as part of your Satellite TV package)
- Wireless (usually provided by an independent service provider using an antenna on the roof pointed to another ground antenna.)
- Mobile Phone Wireless, Cellular (typically is part of your cell phone plan)
- T-1 Service (a special kind of service often available from the phone company rated at a fixed 1.5 Mbps)
- Fiber connection (uses fiber optics to provide the signal. May be provided by the phone company or other providers. Typically used for higher speeds)
- I don't have Internet service at my home.
- I do not know what type of connection I have at my home.

7. How much do you currently pay for your Internet each month?

- Less than \$50 per month
- Between \$50 - \$100 per month
- Between \$100 - \$250 per month
- Between \$250 - \$500 per month
- Between \$500 - \$1,000 per month
- More than \$1,000 per month

8. Does this cost include other bundled services? (Check all that apply.)

- Yes, it includes my telephone service.
- Yes, it includes my TV service
- Yes, it includes my cell phone service
- No, the costs just include my Internet service.

9. How important is it to you to receive one invoice for Internet, cable TV and/or phone service?

- It is extremely important.
- It is somewhat important.
- It is not important.

10. How often do you experience the following with your current business Internet Service?

	Never	Sometimes	Almost all of the time	Always
The <u>download</u> speed is too slow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The <u>upload</u> speed is too slow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The connection interrupts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. In order to measure your current service levels, please take an Internet speed test - please go to <http://maps.co.gov/publicspeed/> and click begin test and enter the results. If you are using an Apple or Android device, please use <http://openspeedtest.com/> for the speed test.

Download Speed

Upload Speed

12. How would you rate the download speed of your Internet?

- Very Slow
- Slow
- Acceptable
- Good
- Excellent

13. How would you rate the upload speed of your Internet?

- Very Slow
- Slow
- Acceptable
- Good
- Excellent

14. When did you complete the speed test?

Date/Time / / : : -

21. What impact would extremely fast Internet service have on your business? (Check all that apply.)

- No impact.
- We would hire more employees.
- We could provide/attend more webinars and online training.
- We could reach more markets, more territories, more locations.
- We would be more efficient.
- We would save money through Internet applications
- We could provide more products and services to our customers.
- We would move activities and more business functions/applications to the cloud.
- We could collaborate with customers and partners we currently have difficulty connecting with now.

22. What is most important to you regarding your Internet service? (Please rank the following choices, with 1 being the most important.)

⋮	<input type="text"/>	Fast, I want speed and availability of abundant broadband
⋮	<input type="text"/>	Reliability, I do not want my Internet service to be interrupted.
⋮	<input type="text"/>	Price, I want to pay a competitive price.
⋮	<input type="text"/>	Customer Service, I want a friendly voice and good customer support.
⋮	<input type="text"/>	Bundled invoice, I want one invoice for Internet, cable TV and/or phone service.

23. If the private sector (phone, cable, wireless or other company) does not provide adequate and affordable broadband service for your business, who would you want to step in to ensure that better services are available?

- The local municipality
- The county
- The electric company
- A consortium
- I am not sure
- Other (please specify)

24. Ranking the Government's Role in Broadband. What do you think the primary role for the City of Craig/Moffat County government should be with respect to broadband access? (Please rank your choices with "1" being your first choice.)

<input type="text"/>	Install state-of-the-art network and offer services to the public, including homes and businesses, and government offices
<input type="text"/>	Install state-of-the-art network for businesses, schools, government offices and the medical community only.
<input type="text"/>	Install state-of-the-art services and enter into agreements with private companies to offer services to the public.
<input type="text"/>	Partner with a private firm to build a state-of-the-art network.
<input type="text"/>	Partner with current providers to improve the speed and reliability of their services.
<input type="text"/>	Do Nothing. Let private providers decide what services they are willing to provide.

25. If you could choose only one option, what do you think the primary role for the City of Craig/Moffat County government should be with respect to broadband access? (Please choose only one)

- Install state-of-the-art network and offer services to the public, including homes and businesses, and government offices
- Install state-of-the-art network for businesses, schools, government offices and the medical community only.
- Install state-of-the-art services and enter into agreements with private companies to offer services to the public.
- Partner with a private firm to build a state-of-the-art network.
- Partner with current providers to improve the speed and reliability of their services.
- Do Nothing. Let private providers decide what services they are willing to provide.

26. Do you think broadband service is a utility?

- Yes
- No
- I don't know.

27. How would you characterize your business in relation to your Internet service?

	Strongly Agree	Agree	Neutral/Not Sure	Disagree	Strongly Disagree
The Internet is important to my business, but mostly just for the "basics" like email, browsing/research, etc.	<input type="radio"/>				
We rely on the Internet to drive leads and revenues.	<input type="radio"/>				
We currently sell our products and services online.	<input type="radio"/>				
Our business operations are heavily tied to the Internet.	<input type="radio"/>				
Our demands on Internet bandwidth and speed is consistently increasing.	<input type="radio"/>				
The current Internet speed available is holding back our growth potential <u>today</u> .	<input type="radio"/>				
The current Internet speed available will eventually prevent us from our growth potential.	<input type="radio"/>				
If Internet service doesn't improve, we may have to move all or part of our operations to another community.	<input type="radio"/>				

28. If you have any other comments regarding your current Internet service or a community broadband service please tell us below:



WHY DON'T WE HAVE BETTER BROADBAND?

What's Standing in the Way?

While broadband service is increasingly seen as a utility, advanced telecommunications capability is not being deployed to all Americans in a reasonable and timely fashion.

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The Broadband Gap

Today it is so widely understood that broadband is a necessity, even the Federal Communications Commission is classifying it as a utility – and gaining support from appellate courts when carriers push against the classification.¹ Advanced broadband service is a necessity to live and thrive in today's economy much like water and electricity. Unlike water and electricity; however, broadband is a technology that has numerous levels of service. While water and electric utilities across the country provide basically the same service to all homes, the same cannot be said for broadband.

In the last six years, there have been significant improvements in broadband infrastructure investment in the United States. Broadband investment has been sparked by competition. In order to best understand this, a brief history in broadband investment is needed. Prior to 2010, Verizon was the only incumbent service provider that implemented Fiber to the Home technology with rollout of its FIOS product. In 2010, approximately 2% of U.S. households had a fiber optic connection. Meanwhile, in Japan, Korea, and Sweden, over 80% of their populations had a fiber connection.

Large, incumbent phone and cable companies had little incentive to further invest in their networks. Most cities and towns had either a near monopoly or a friendly duopoly in which the two incumbent providers—the cable TV and major telecommunications company—had limited competitive pressure to improve their network infrastructures.

Although the National Broadband Plan that was implemented by the U.S. had adequate goals and benchmarks to further broadband advancement, it fell short in terms of actual implementation plans to make these goals a reality. Additionally, state and local governments had done little to encourage further investments. On the municipal-level, many city ordinances and policies discourage further investment by any new providers with cumbersome building and permitting regulations, raising the capital costs and time to build out fiber optic infrastructure.

This changed in 2012 when Google decided to invest in Gigabit infrastructure that included an all-fiber connection to every home and business. While gigabit speeds are argued as not needed today, the goal of achieving gigabit speeds is an aspirational one, looking to fill bandwidth needs for the foreseeable future. Google issued a Request for Proposal for the "Think Big with a Gig" program to host gigabit test-beds and have Google build within their city, and over one thousand communities across the country submitted applications.² Google selected the bi-state Kansas City metropolitan region. Google's network build-out and their offering of residential Gigabit of service for \$70 per month put Kansas City in the top five of the world's most connected cities with the world's most inexpensive bandwidth.

¹ <http://www.nytimes.com/2016/06/15/technology/net-neutrality-fcc-appeals-court-ruling.html? r=2>

² *Topeka 'renames' itself 'Google, Kansas,'* CNN, March 2010, <http://www.cnn.com/2010/TECH/03/02/google.kansas.topeka>

Competition Drives Broadband Investment.

Since Google's rollout of gigabit services in Kansas City, it made plans to build Fiber to the Home in Austin and then subsequently purchased an existing system in Provo, Utah. Google then announced plans to build FTTH in 34 municipalities across the country upon cooperation and attainment of a checklist put out by Google. Perhaps one of the biggest impacts of Google jumping into the broadband infrastructure market was the impact it had on other providers investing in infrastructure. After Google's entrance into the Internet infrastructure industry, other companies such as Time Warner Cable, SuddenLink, Grande Communications, Charter and Cox Communications made announcements to also build out Gigabit-cable infrastructure. Aside from this, in large markets where incumbent providers are trying to out-build Google and their competitors, broadband speeds have increased dramatically.

This too has inspired municipalities and electric cooperatives to also build fiber optic infrastructure, knowing that a "wait for Google" approach is not shortly forthcoming. State governments have put together a number of initiatives to help spur more broadband development. This gap between need for more broadband capacity and the ability to fill this gap across the entire U.S. has not yet been filled.

While Investment Has Occurred, Progress Still Needs to be Made

While Google has helped disrupt the status quo in specific communities, in general the U.S. has yet a long way to go towards addressing bandwidth needs. According to an article recently published in December 2015 on Huffington Post which cites many sources measuring the U.S.'s progress in broadband advancement, "America's wireline or wireless broadband speeds are not even in the Top 20 in the world, much less are reasonably priced."³ According to the article, the U.S. is ranked 55th in the world in wired and wireless broadband.

Rural Markets Have the Least Capacity Available

While there are federal funding programs to build broadband services to rural areas, the rural parts of the country still have the least capacity available. Using the FCC's definition of broadband of 25 Mbps in download speeds and 3 Mbps of upload speeds, the FCC's 2016 report on broadband finds that almost 34 million Americans – 10 percent of the population – lack access to advanced broadband. More significantly, 39% of rural Americans do not have broadband access that meets this new definition. In contrast, only 4% of urban Americans lack access to 25 Mbps/3 Mbps broadband service. This is often the result of carriers lacking a "business case" to make back their investment when building in lower populated areas.

³ *America's Broadband Embarrassment*, Huffington Post, December 2015, http://www.huffingtonpost.com/bruce-kushnick/americas-broadband-embarr_b_8736488.html?mc_cid=b49548b233&mc_eid=1479b8f1cc

Rural areas lack sufficient broadband to meet the minimum standard definition of broadband. But larger cities and metropolitan areas also need investment in broadband infrastructure to compete in the global economy. The gold standard for broadband is Gigabit symmetrical bandwidth (1,000 Mbps in both download and upload speeds). Cities in urban areas need to find ways to facilitate the availability of this type of broadband availability.

What are the Primary Barriers to Better Broadband and How Can these Barriers Be Mitigated?

As it is understood that having access to abundant, affordable broadband is a necessity, then why is it that we don't have better broadband? The following provides insight into the difficulties and obstacles for better broadband and what steps can be taken to remove and mitigate these barriers.

A duopoly or monopoly stifles investment. As discussed earlier in this document, one of the primary barriers to better broadband exists when the incumbent providers have little incentive to upgrade their networks. As most cities and towns have had a comfortable duopoly or in some cases, a monopoly for Internet service delivery, the incumbent cable and telecommunications carriers have had little competitive pressure to build more fiber, a capital-intensive process.

The entrance of a competitor can disrupt this status quo. Communities that have a number of choices for Internet service, especially if these choices provide a significant transformation of service delivery (i.e. leapfrogging the incumbent provider's 5 Mbps, or 8 Mbps to 100 Mbps or 1 Gbps), the incumbent providers will be required to upgrade their infrastructure or provide comparable services in order to maintain their market share.

In some communities, a competitor has come into the market and has built out a wireless solution as building a wireless infrastructure is not as capital-intensive as building out a fiber optic infrastructure. However, wireless technology often does not disrupt the status quo because it cannot out-perform the existing service offerings available.

Capital costs are high to build fiber optic networks. Building a Gigabit-enabled network is capital intensive. Current technologies that support this type of bandwidth availability require fiber to be built to every home or business if an advanced wireless network is used, fiber must be built to most of the wireless access points. In either case, the physical placement of fiber optic cable is often too capital-rich for a small competitive provider. While some smaller carriers are able to provide fiber to an entire community, this typically needs to be a highly populated area to pay off the investment. A model to support the high costs of building fiber is harder to justify in sparsely populated, rural areas, but it is also difficult in urban areas of the country too.

In rural areas, the capital costs required to build out fiber are higher, as rural areas are remote with the population geographically dispersed. Access to Internet "supply" – locations where there is an Internet hub – is often located in larger cities or population centers. Options for

accessing Internet hubs, which is typically described as Internet backhaul or transport costs, are to either build fiber to this Internet hub location, to build a point-to-point digital microwave link, or to lease existing facilities. In any of these options, the capital costs are high and/or the monthly access charges are high.

These high monthly backhaul charges or capital costs to connect to Internet hubs are difficult to finance as rural areas do not have the population to support an adequate return on investment for any providers to upgrade their networks. This leaves rural areas with few options for improving broadband services. The Stimulus Program provided \$7.2 Billion to mostly improve backhaul or transport costs by providing funding for middle-mile networks, but there still is an overwhelming number of communities that do not have options for inexpensive costs to access Internet “supply.”

Metropolitan areas typically have abundant access to Internet “supply” and have a number of providers to choose from. The challenge in urban areas is simply in the cost to build fiber infrastructure to every home and business.

The business model to build in a rural market is challenging. Further complicating the high capital costs to build infrastructure in or to rural markets, is the challenge of making a business model work in a rural market. Population density is lacking in rural areas and the number of potential business and residential customers is relatively small, creating an undersized revenue opportunity compared to a larger market. Additionally, the challenge of finding people, technicians and a management team to operate and manage the system in rural and remote areas is sometimes difficult. The return on investment is typically lower in rural areas.

Metropolitan areas can usually justify the business case with higher density and population numbers. The challenge for urban municipalities is in managing debt, financial and potentially political risk in building fiber optic infrastructure.

What Can be Done?

Lift or Opt-Out of Regulatory Restrictions. Given all that a community has to gain, it would seem a reasonable assumption that each would take matters into their own hands and build their own next-century broadband network. Regulatory restrictions can stand in the way of local governments in many states, including Colorado where Senate Bill 152 prohibits local government from building telecommunications infrastructure except to government agencies and quasi-government agencies (schools, hospital, universities). The law can be overturned with a majority vote in a public election to opt-out of the bill.

Overcoming Challenges Through Collaboration

Leveraging what your community already has in place in terms of community assets and potential collaboration and partnerships is often a great start towards reducing costs for your network.

For instance, aggregating demand among communities and anchor institutions (schools, hospitals, libraries, etc.) creates a cost-sharing model for access to the Internet hub. Or existing connections can be used to eliminate the high cost of connecting to the hub but using fiber from already existing networks or connectivity already built. One such example where you may be able to use existing assets is using fiber previously built by electric utilities.

A close examination of your community assets can also turn up existing land, lease structures, tower locations, conduit and unused (dark) fiber that can all be used to help reduce the costs of building a new fiber network. Breaking down the silos that exist between entities – schools, other government agencies, hospitals, and the electric utilities, can facilitate a collaborative and more effective ability to improve broadband services within a community.

Finally, more and more communities are developing innovative public-private partnerships. Many models allow cost sharing to help facilitate a business model that helps investment make sense for the private sector.

Overcoming Challenges Using Programs and Policies

Beyond Colorado's Senate Bill 152, many city/county ordinances and policies create cumbersome building and permitting regulations that significantly increase time and costs required to build broadband infrastructure. Beyond making it hard on your community to build should you have to, these hurdles discourage private investment from ever happening.

Examine the programs, policies and broadband-friendly ordinances can be put in place to try to mitigate the high-costs of building fiber networks. With the right changes many local governments can promote, rather than hinder, private investment.

A majority of the capital costs (60-80%) for building fiber are in the actual opening of a trench or the labor to place conduit in an existing right of way or road. Forward-thinking, broadband-friendly ordinances such as a "dig once" policy can help mitigate this cost by allowing multiple providers to place conduit within an open trench when other utility work is being done. Other policies such as streamlined permitting, and joint-build and joint-trench agreements can also promote more broadband deployment.

Conclusion

There's no question that robust, high speed broadband has not reached "utility" status for most communities in Colorado. The needs of today, let alone tomorrow, are not being met because private carriers are not able to justify investment in next-century broadband.

Municipalities can determine the best model for investment, whether it is building infrastructure and offering Internet services themselves, or partnering with the private sector to share in the costs or incenting more private investment through collaboration and policies. Regardless of the model or approach, municipalities that have a vested interest in their economic vitality can greatly impact the availability of abundant broadband service by participating in the process.