

# The Strategic Imperative of Gigabit Broadband for 21<sup>st</sup>-century Communities

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# The Strategic Imperative of Gigabit Broadband for 21<sup>st</sup>-century Communities

*by Michael Hernon*

As our economy and society become increasingly dependent on the processing of information across disparate platforms and applications, the ability to move that information quickly and efficiently is critical to your community's competitiveness and success. Broadband access delivers that ability by transporting voice, data, imagery and video in both high volume and at high speeds. Broadband is, or hopefully will become, the lifeblood of how states, cities and counties serve and communicate with their citizens. It is also a key enabling capability for your residents' educational, vocational and entertainment activities. Lastly, broadband access is equally critical for private sector enterprises and to position your community for economic development opportunities. It is fair to say then, that today, access for all to secure, affordable broadband is not a "nice-to-have", but a "must have" for your community.



*Broadband is the indispensable  
infrastructure of our 21<sup>st</sup> century economy  
and democracy.*

- FCC Chairman Tom Wheeler

Broadband access will enable your community to do better what you already do today, and to do things tomorrow that are impossible to do today. For example, interactive, high resolution video will deliver learning anytime, anywhere; telemedicine to the home; smart robotics and a host of immersive applications for productivity and entertainment. The very presence of broadband will not only attract high-tech companies, but also companies in more traditional sectors that also need to access and move large amounts of data in order to succeed. From a societal view, equal access to broadband can eliminate the digital divide, either within your jurisdiction, or between your jurisdiction and others with better infrastructure. Broadband access will also touch all aspects of government as well, from delivering basic services more efficiently and effectively, to public safety, to even how you exercise democracy.



Many of the characteristics that define a “smart” city or county rely on the ability to quickly collect, transmit and process large amounts of data, often from sensors and other machine sources. Street lights, the electrical grid, traffic signals and other “traditional” infrastructure components are now increasingly network-enabled, and work most



efficiently and cost effectively when on a broadband network. Consider LED street lights, which many communities have installed in order to provide better lighting as well as to save significant sums on their electricity bills. When these are connected to a network and smart controls they can deliver an additional 10-20% in electricity cost savings<sup>i</sup>. Similar efficiencies can be found across the entire scope of government operations.

Given this wide range of benefits that broadband can deliver it is clear to see why so many communities are now looking at their broadband infrastructure in the same way they look at their roads and utilities – as a basic foundational requirement for a successful 21<sup>st</sup>-century community. Hence, improving broadband access is both **strategic** – in that it is critical to your long-term success - as well as an **imperative** that requires short-term action to avoid being left behind.

### **Broadband Defined**

The term “broadband” is often used loosely so that its definition can be difficult to pin down. However, the Federal Communications Commission (FCC) has recently redefined what they consider to be broadband - a minimum download speed of 25 megabits per second (Mbps) (a significant increase from the prior definition of 4 Mbps), and a minimum upload speed of 3Mbps (up from 1). In most medium- and larger-sized jurisdictions those speeds are available from commercial providers such as the cable TV or telephone company. However, while technically meeting the FCC definition of “broadband”, those speeds are seen by most to be wholly inadequate for providing a robust broadband foundation to meet current and future needs. One FCC commissioner has argued that four times that speed, or 100Mbps, should have been their minimum threshold<sup>ii</sup>. There is also an increasingly commonly-held viewpoint that even that speed is insufficient for the long term. As a result, for many a 1 gigabit per second speed (a gigabit network), which is 40 times the current FCC threshold, has become the hallmark of what constitutes a broadband network,



at least for the backbone, if not for delivery directly into homes, businesses and government facilities.

### Current State of Broadband in the US

Realizing the strategic value of broadband to the nation, Congress directed the FCC to develop the National Broadband Plan<sup>iii</sup> of 2010 as well as to prepare annual updates to monitor and stimulate deployment across the country. Much of the motivation for this directive came from the realization that the country that created the Internet was lagging far behind other nations in broadband access. Unfortunately, in 2015 that still remains the case<sup>iv</sup>. According to an International Telecommunications Union report<sup>v</sup> the US ranks 24<sup>th</sup> in fixed broadband subscriptions per capita; 19<sup>th</sup> in percent of population using the Internet and 20<sup>th</sup> in access to speeds greater than 20Mbps. Only in wireless does the US claw our way into the top 10 as we are ranked 10<sup>th</sup> in mobile broadband per capita.



*At NTIA, we have seen firsthand how essential broadband is to schools, public safety, health care, businesses and most other sectors of society,”*

- NTIA Administrator Lawrence Strickling



Within the US itself there are also great disparities in access. The most notable of these is the distinct disadvantages rural communities face when compared to their urban counterparts. While 83% of Americans have some access to 25Mbps service, only 51% of rural residents do<sup>vi</sup>. Lower income communities as well as tribal areas also exhibit significantly lower rates of broadband access and use.

Some locations in the US do have access to commercial gigabit networks. However, even densely populated, urban areas that have actively pursued the commercial build-out of a gigabit network for their jurisdictions have not been successful in obtaining those services.

With the above as a backdrop it is not surprising that as of this writing only a relative handful of communities in the US have access to the same level of broadband commonly available in many other countries in the world.

## Addressing the Imbalance

While in the US we typically look to the market to address demand, some have made the argument that the above numbers prove that the market has failed in this instance. Given the critical nature of broadband to the community it is not surprising that the number of states, cities and counties taking proactive steps to close the gap is increasing - there are now some 40 communities in 13 states with publicly-built gigabit networks as delineated in Figure 1.

Some have also made the argument that the government has no role to play in what has been primarily a commercial venture. However, it is important to note that the government has always recognized the need to ensure equal access to telecommunications for all. Indeed, this concept was instilled way back in 1934 with the passage of the original Communications Act. Legislative actions by Congress, especially the Telecommunications Act of 1996, and regulatory actions since then have only served to strengthen this tenet as we move from traditional analog telephony services to digital broadband access. As many jurisdictions today already provide infrastructure services such as road, water, sewer, and/or electrical the provision of broadband infrastructure by the public sector does seem more evolutionary than revolutionary.

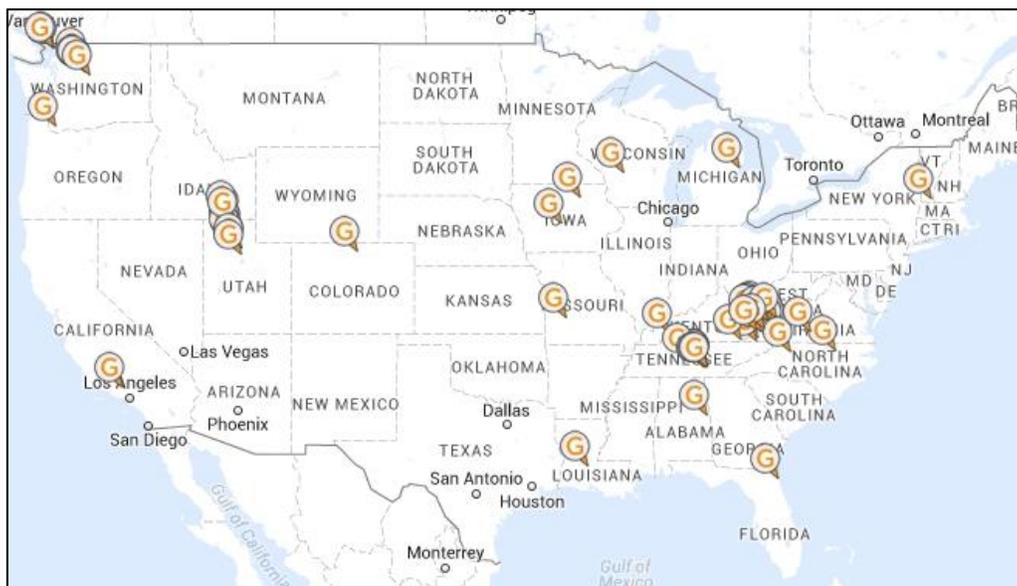


Figure 1. Publicly-developed Gigabit networks in the US<sup>vii</sup>

With that said however, from the government’s standpoint, the fastest, cheapest and easiest way to obtain broadband is through the commercial providers. Hence, your first step in improving access should be to talk to those commercial providers and discover why they have not deployed. Are there regulatory or



other barriers that the public sector could remove? Is there more demand for their services that you can document that they are unaware of? At the end of the day, the private sector will only build where they are convinced they will get a return on their investment (ROI). Be sure to talk to all potential broadband providers, not just the incumbents, as real, or even potential, competition can be a very strong incentive for private investment.

If those discussions prove unsatisfying you will need to develop a longer-term strategy to address the imbalance.

### Developing Your Strategy

Redressing a market imbalance is a significant undertaking which requires considerable thought as well as a structured process to develop an optimal way forward. When developing your deployment strategy best practices indicate that you should pay attention to the following:

- **Vision:** articulates your community's end state
- **Strategy:** defines how you will achieve the vision
- **Governance:** prescribes roles and responsibilities
- **Outreach Plan:** how you will inform, be informed, and gain support
- **Data Collection:** provides critical data for supporting the business case
- **Analysis:** turns the data into information and knowledge
- **Business Case:** documents and supports your final decision

By using this process you will be guided from the strategic, high level view down to making tactical decisions that are supported by data, information and knowledge. Note that you do not have to, indeed should not, do all of these things at the same time. Rather, a three-phase approach (Define, Manage and Decide) is recommended with each phase logically flowing into and supporting the next.

#### *Three Phase Approach*

**Phase 1:** Define your initiative. Here you will develop your high-level vision, strategy and governance structure. The vision serves as your guiding star, and

### Chattanooga Goes Gig

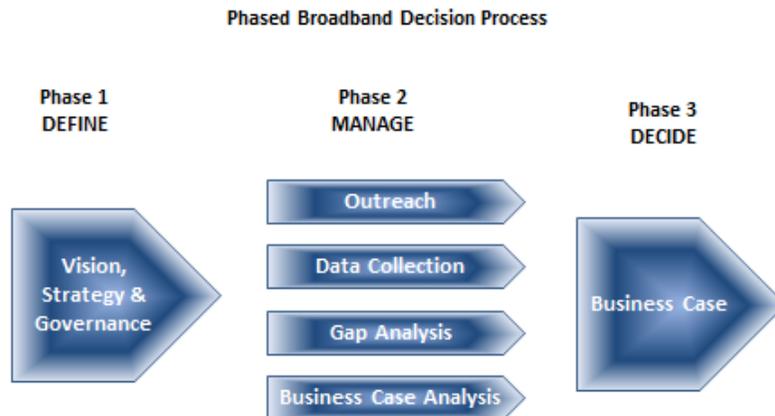
Chattanooga, Tennessee leveraged grant and bond financing to build out the first municipal gigabit fiber network. The city's electric utility built and operates the network. The network is credited with attracting large and small high tech companies, including Amazon, but also led to expansion of a more traditional industry - Volkswagen.



defines a rallying point and goal for all to work towards. Your strategic plan defines specific, achievable actions that you will take in pursuit of the vision. The governance model defines roles and responsibilities for executing the strategy and provides an organizational structure so that all efforts are properly aligned. All stakeholders should also be identified in this phase and their roles identified.

The outputs from Phase 1 will provide the foundation for all follow-on activities and must have buy-in and support from all key officials in your jurisdiction. Preferably, the senior elected official or similarly positioned person will be at the head of the governance structure to demonstrate their support.

**Phase 2:** Manage the initiative, which includes both “soft” and “hard” activities that will be executed under the governance structure you defined in Phase 1. In the former category the most important one is your outreach activities. Your outreach program should be designed with three goals in mind – to inform the community of the thinking behind the initiative, to get feedback from the community as to their interests and priorities, and to gain support. While the first two are obvious, the third goal is often overlooked. You will need to gain community buy-in in order to execute your vision. Without it your initiative will either fail or end up costing much more than you had anticipated. The best way to gain this support is to be open and transparent throughout the outreach process and to spend about twice as much time listening than talking.



**Figure 2.** Phased decision-making process.



The primary “hard” tasks in this phase include data collection and analysis. This should include all commercial options available, their costs, demographic data, etc. Make an inventory of all unused or underused public and private assets that could contribute to the solution, such as unused or underutilized “dark” fiber already in the ground. Note that many of the tasks in this phase can be conducted simultaneously by different teams to accelerate the process. Also, the specific activities in Phase 2 could be different for different jurisdictions depending on circumstances (Phases 1 and 3 should be pretty much the same for all).

The end product of this phase is the production of your business case analysis (BCA). The BCA is critical to not only your internal discussions, but also plays a vital role in attracting potential partners. It is therefore important that your Phase 2 activities are conducted as thoroughly and impartially as possible



**Phase 3:** Decide. Here you commit to decisions and the relevant actions you will take that are supported by the business case.

The benefits of this approach are substantial and will help you to identify and minimize risks and avoid ending up with a model that is unsustainable or costs much more than anticipated. Also, by basing decisions on knowledge rather than theory you will be able to substantiate your decisions to both gain support across your community as well as defend your decisions to the inevitable detractors.

### **Delivery Models**

Your business case analysis will likely include different delivery models – commercial, government, and hybrid. Selecting which one to pursue is the most important decision you will make. Of course, each has its own advantages and disadvantages that you will need to take into account.

*Commercial* – This represents the *status quo*, which is often included as an option in a BCA. While the shortcomings of the current state are what motivated you to conduct your BCA in the first place, it is still too early to rule out this option. Indeed, at this stage commercial providers may very well look at their potential ROI differently. One reason is to protect their market share now that the government itself may become, in effect, a competitive provider. It is also



possible that your outreach, data collection and analysis may provide additional information and justification to the commercial sector to build where they previously thought there was no advantage for them to do so. Given the benefits of this approach, you may decide at this point to talk to the incumbent and non-incumbent providers again before you commit to another course where you could expose yourself to significant costs and risks.

*Government* – As we have seen, a number of jurisdictions have studied the potential of building the infrastructure themselves, with dozens to date actually deploying. While this approach is generally the most expensive and time-consuming from the government’s perspective, it may be the only viable alternative if the commercial providers are not responsive to your outreach. This option is decidedly easier to pursue for jurisdictions with publicly-owned electric utilities, as they can easily leverage that infrastructure, including customer service and billing operations, for a fiber network. However, other jurisdictions have also gone this route without that advantage.

### **Silicon Prairie**

Kansas City, KS won the Google challenge to become that company’s first gigabit city. The network has since been expanded to include Kansas City, MO. The network has been credited with increasing competition which should keep consumer costs in check. It has also attracted a number of high-tech start-up companies who identify themselves under the moniker “Silicon Prairie”.

Many jurisdictions adopting the publicly-built option have come under political pressure from the commercial providers, and in some cases their own state legislature. Currently there are 19 states with laws on the books that restrict or constrain the ability of local jurisdictions to build telecommunications networks. In February, 2015 the FCC overruled statutes in two of those states<sup>viii</sup> – a move that is expected to impact the other 17 states. However, that ruling is being challenged in the courts. Should the FCC prevail the number of government-built broadband networks could rise dramatically.

Regardless of that case, you may still require enabling legislation at the state level if, for example, you plan to create a new, independent authority to build and operate your network.

Model	Pros	Cons
Commercial	<ul style="list-style-type: none"> <li>• Easiest to deploy</li> <li>• Fastest to deploy</li> <li>• No government up-front costs</li> </ul>	<ul style="list-style-type: none"> <li>• May not be universally available</li> <li>• Subject to provider's ROI estimates</li> </ul>
Government	<ul style="list-style-type: none"> <li>• Address market failings</li> <li>• New FCC rulings support</li> <li>• Provide universal access</li> </ul>	<ul style="list-style-type: none"> <li>• Hardest to deploy</li> <li>• Longest to deploy</li> <li>• May require new legislation</li> <li>• Up-front costs</li> <li>• Private sector resistance</li> </ul>
Hybrid	<ul style="list-style-type: none"> <li>• Share risk</li> <li>• Share cost</li> <li>• Can target underserved areas</li> </ul>	<ul style="list-style-type: none"> <li>• Still subject to provider's ROI and market drivers</li> </ul>

**Table 1.** Delivery Options Comparison

*Hybrid.* A hybrid solution contains both commercial and government components and can take on many different structures. One model allows the commercial providers to leverage government-installed fiber to introduce new services to residents and businesses. In this way the government has paid for the “middle mile” infrastructure and the commercial service providers build the “last mile”. A good example of this approach is the Mass Broadband 123 project in western Massachusetts<sup>ix</sup>. At the federal level, Executive Order 31616, “Accelerating Broadband Infrastructure Deployment” promotes this approach for federal agencies to stimulate broader access in the communities where federal facilities are located.

At the same time, it should be noted that many jurisdictions today do have high capacity fiber networks for their government use, and yet affordable commercial access for residents and businesses remains lacking. Hence, it may be that in some localities a hybrid approach is more beneficial for targeting specific underserved areas rather than for a broader community-wide approach.



## The Role of wireless

While the discussion so far has focused on fiber optics-based networks, wireless data transport can also play an important role in developing your broadband solution. While fiber optic cable will perhaps always remain untouchable for its near-infinite capacity, wireless technology continues to advance at a rapid pace and has significantly improved in both speed and reliability. As the LTE-Advanced standard replaces today's services based on 4G-LTE the viability and utility of wireless broadband will be enhanced even further.



The federal government, as part of the National Broadband Plan, is committed to freeing up additional spectrum for wireless use which will further increase its role in broadband networks. As part of this effort the FCC recently (April 2015) announced the creation of the Citizens Broadband Radio Service<sup>x</sup> and opened up spectrum previously reserved solely for use by the Department of Defense to shared use. The freeing up of additional spectrum in the coming months and years is expected in order to meet the goals outlined in the plan.

Wireless can play a number of distinct roles in your broadband solution, either with or without fiber:

*Network extension.* Your workforce is increasingly mobile. To boost their productivity they should have the same ability to access, transmit and process information in the field as they would have in a traditional desktop environment. With a mobile workforce integrated into your network you can drive operational efficiencies and provide services cheaper.

*Internet of Things.* Extending the network wirelessly also includes connecting devices as well as people. As discussed above, many of the “smart city” applications are based on the ability collect, process and analyze data from smart grid and other machine sources.

*Backbone.* The cost of trenching for fiber optic cables can be prohibitive, particularly where difficult terrain is involved. As a result, a business case to run a fiber network into remote and/or sparsely populated areas can be difficult to justify. In these circumstances wireless is an attractive alternative. The advent of gigabit LTE Advanced wireless for point-to-point transmission means that the



performance of a wireless backbone can compare favorably with fiber optics, at a fraction of the cost to install.

*Entire Network.* In addition to a wireless backbone, the entire community could receive their last-mile connectivity through a wireless connection. Download speeds of 100 – 300mbs could be easily attainable which would support a number of various use cases. This is particularly attractive for remote areas, but densely populated urban areas have also deployed wireless networks as well.

### **Paying for it**

Once you are armed with a solid business case that shows you have a sustainable model - one that documents that your operational and financing costs will be covered by user fees - there is still the not-so-small issue of those up-front costs to build the network. These costs can vary greatly depending on the availability of conduit, dark fiber, geography and population density, among others, but they are likely to be among the larger of your infrastructure costs.

Building out a fiber network with last-mile connectivity into homes and businesses for even a medium-sized area can be substantial. For example, in Chattanooga, a city of some 175,000 across 137 square miles<sup>xi</sup>, the network cost approximately \$330M to complete<sup>xii</sup>. Alternatively, a middle-mile network can be realized at a substantially cheaper cost. For example, MassBroadband 123 spent less than \$90M to build a 1,200 mile fiber network in the western part of Massachusetts<sup>xiii</sup>.

In order to make those construction costs more reasonable to the taxpayer, most jurisdictions look to develop a diverse set of funding sources, including, grants, bonds and public-private partnerships.

*Grants.* The most common federal sources for broadband grants (Department of Commerce, Department of the Interior and the FCC) are well-known to public sector personnel. These grants can help you plan as well as build your network and applying for funding from one or more of these programs is often the first step communities take in launching a broadband initiative.

### **Information Age Appalachia**

The Appalachian Regional Commission, a federal-state partnership, realized it needed to take proactive steps to stimulate broadband delivery into its underserved region. It developed a strategy and created partnerships with government and commercial sector to bring wireless broadband into communities that would not normally have received commercial coverage.



Another source of grants that is often overlooked is private foundations. Many of the larger foundations have grant programs that support public-sector priorities such as education, health and economic development that the broadband network will directly support. In addition to the larger foundations, there are also numerous small foundations, many of which focus on distinct geographical areas and/or topics that could also contribute to your efforts.



*People understand that high-speed Internet access is quickly becoming a national infrastructure issue just like the highways were in the 1950.*

- Chattanooga Mayor Andy Berke



**Bonds.** Issuing municipal bonds to cover the cost of building infrastructure is the most common way for the public sector to meet large up-front infrastructure costs and over \$300 billion was raised this way across the US in 2014<sup>xiv</sup>. While some broadband projects have been funded by bonds, their use for this purpose is still relatively rare. Bond issuances are also often constrained by law as to what they may be used to fund as well as how much money may be raised. The White House has recently proposed new bond regulations that would specifically authorize the funding of telecommunications networks.

**Public-Private Partnerships.** In a public-private partnership (P3) private financing or other assets contribute to building the infrastructure. In addition to sharing the costs, P3s also transfer some of the risk to the private sector which makes them attractive to many public sector entities.

A common example is a toll road, where the cost or a portion of the cost, of construction is borne by the private sector with some of the toll revenue going to repay the debt. For a fiber network, the user fees would serve the same purpose as the tolls. Another P3 model could entail private sector partners committing to leasing a certain amount of bandwidth for a set monthly fee thereby supporting the ongoing sustainability of the network.

Any partnership agreement will be subject to a significant level of due diligence by potential funders. It is therefore important that your data collection and business case analysis are comprehensive enough to support those efforts.



There are many permutations of P3 structures. NTIA has recently released “An Introduction to Effective Public-Private Partnerships” to help guide you through the various P3 models that you could leverage<sup>xv</sup>.

## Conclusion

Access to a high-speed broadband network infrastructure is as important to today’s communities as the electrical, telephone and interstate highway networks were in the last century. Absent commercial build-out of the infrastructure, many states, cities and counties are taking it upon themselves to address this need. By leveraging best practices and a structured, comprehensive planning process communities can optimize their chances for developing an approach that delivers the necessary capabilities in a sustainable manner.

## About the Author

Michael Herson has served as the CIO of the City of Boston where he was widely recognized as a leader in the strategic implementation of technology in the public sector. Under his leadership the city became the first large jurisdiction to deliver broadband to every school, library, and community center in the city. In honor of this and other initiatives *Computerworld* magazine named him as a “Super CIO’ – the only public sector official so honored. He has since served as an advisor to CIOs at the federal civilian, DoD, state and local levels including developing strategy and partnerships to deliver broadband into rural communities. Among other accolades, Mike has won a Hammer award and a Meritorious Public Service Award for innovative solutions in the federal civilian and DoD environments respectively.



Mike created P3PC to help the public sector meet its IT and infrastructure needs in times of declining budgets through effective strategic planning and partnerships.



## Endnotes

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- <sup>i</sup> [Lighting the Clean Revolution](#), the Climate Group, June 2012
- <sup>ii</sup> <http://www.fcc.gov/article/doc-331760a4>
- <sup>iii</sup> <http://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf>
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- <sup>v</sup> <http://www.broadbandcommission.org/Documents/reports/bb-annualreport2014.pdf>
- <sup>vi</sup> <https://www.fcc.gov/reports/2015-broadband-progress-report>
- <sup>vii</sup> Source: Community Broadband Networks
- <sup>viii</sup> <http://www.fcc.gov/document/fcc-preempts-laws-restricting-community-broadband-nctn>
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