

MUNICIPAL BROADBAND NETWORKS: A WORK IN PROGRESS

Daniel Emirkhanian

INTRODUCTION

In an increasingly global and connected world, access to the internet has quickly become crucial for many Americans. The Federal Communications Commission (FCC) writes that the internet provides "...access to numerous employment, education, entertainment, and healthcare opportunities" (*2018 Broadband Deployment Report*, 2018). Considering its importance, it's surprising that there are remarkably large areas across the country lacking high-speed broadband capability. One recent FCC study found that "about 41% of Americans living on tribal lands lack broadband access" (*2016 Broadband Progress Report*, 2016). This issue is not limited to tribal lands. The Pew Research Center found that 58% of rural Americans report that reliable internet service "is a problem in their communities" (Anderson, 2018). Overall, a staggering 7% of the country lacks access to high-speed broadband internet and 30% of the country has only one high-speed internet service provider (ISP) in their area ("Fixed Broadband Deployment," 2017). The issue can only be solved when two questions are answered: (1) How can unserved rural areas of the country gain access to high-speed broadband internet, and (2) How can ISP monopolies be challenged? This paper will explore how local governments are capable of providing access to high-speed broadband internet to local, rural, communities through municipal broadband networks. By using current networks as a basis for analysis, this paper will also offer insight into some best practices that local leaders can adopt.

HIGH-SPEED BROADBAND INTERNET

High-speed broadband internet is defined by the FCC as "a method of transmitting information using many different frequencies, or bandwidths, allowing a network to carry more data" and has a minimum speed of 25 megabits per second (Mbps) ("Broadband That Works: Promoting Competition & Local Choice in Next-Generation Connectivity," 2015). The definition of high-speed internet developed with the technology. In 2010, for example, high-speed internet was defined as having a download speed of a mere 4 Mbps. There are a variety of methods to access the internet, including dial-up, satellite, wireless transmissions. One of the most reliable methods is fiber-optic cable, which has an installation cost of "\$27,000 per mile" (Aman, 2017). Before fiber-optic cable became widely used, the internet was accessed through phone lines.

When the internet was first invented, most households accessed the service through the phone line, a system known as dial-up. This provided phone companies a natural monopoly on internet services. A natural monopoly is a "monopoly in an industry in which *high infrastructural costs* and other barriers to entry give the largest supplier in

an industry, often the *first* supplier in a market, an overwhelming advantage over potential competitors” (emphasis added) (Krugman & Wells, 2013). For ISPs, including AT&T and Time Warner Cable, the necessary infrastructure for internet delivery had already been built throughout the country, putting these companies at an enormous advantage and creating a large barrier to entry to smaller, regional corporations. As technology progressed, fiber optic cable spread throughout the country and ISPs started to compete with one another (Eisenach, 2016). Considering the high cost of cable-laying (\$27,000 per mile), only large, nationally established companies were able to compete. As the internet spread rapidly across the country, rural and urban disparities in access became greater.

WHY THE DISPARITY?

For internet access to spread to rural communities, telecom companies must believe that building infrastructure is a viable economic investment in those regions. As mentioned above, rural American residents report that internet access is a major problem in their community. As of 2016, “39% of rural America (23 million people)” lacked access to high-speed internet, compared to a mere “4% of urban Americans” (*2016 Broadband Progress Report*, 2016). Solving this disparity does not end by simply drawing ISPs to rural communities. According to the FCC, 30% of the country has only one high-speed internet provider. Without competition, there is little incentive for companies to offer competitive rates and services (“Fixed Broadband Deployment,” 2017). There are three issues that need to be considered when determining why rural areas lack high-speed internet: location, population, and competition.

Location

A difficult topography increases infrastructure installation costs and can interrupt wireless signals from radio towers (*2018 Broadband Deployment Report*, 2018). Rural communities that are located in heavily wooded areas or mountainous regions provide a diverse set of development challenges, which increases the cost to ISPs and make the region less attractive for development.

Population

“A key element of the ability to recoup investment in network infrastructure is the economies of geographic population density” (Brake, 2017). In other words, building internet infrastructure has high up-front costs, but once built, it is relatively easy and inexpensive to add a new user. Rural communities cover “97 percent of the nation’s land area” but only contain “19.3 percent of the population,” lacking the communal density necessary to create a viable market (“New Census Data Show Differences Between Urban and Rural Populations,” 2016).

Competition

Densely populated urban areas play host to competitive markets, motivating ISPs to expand and improve infrastructure and lower costs of services. However, rural areas, with only one or no ISPs, are paying more and receiving less (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). Even in ‘competitive’ areas, however, there are typically only two ISPs to choose from ("Fixed Broadband Deployment," 2017).

THE PUBLIC OPTION

Within the last twenty years, access to high-speed internet has become crucial. “A private good with large public spillovers,” high-speed broadband significantly benefits communities (Brake, 2017). Economic studies show that “broadband Internet creates significant value for consumers and makes an important and rapidly growing contribution to GDP” (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). Further, a 2009 study estimated that broadband creates “\$32 billion in annual consumer surplus” (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). Broadband internet connection creates new job opportunities, diversifying a community’s economy. In one particularly compelling example, a woman who, “after years of fighting an opioid addiction and unemployment,” was able to access remote job opportunities offered by U-Haul, ultimately increasing her annual earnings and helping to stabilize herself and, by extension, her locality (DePillis, 2017). In addition to the demonstrated economic benefits, high-speed internet provides a line to an increasingly connected world (Stanley, 2018). Yet there are large disparities in access across the US, and even locations that have access suffer as a direct result of the limited number of ISPs. The high cost of entry into the market means that potential new competitors cannot challenge well-established companies. The only entity capable of accessing the capital needed to fund, build, and manage a large infrastructure project on the scale to provide competition to the ISP companies is local government.

Municipal Broadband Networks

Municipal broadband networks refer to “high-speed internet services provided to consumers by either a public entity, such as a local government or public utility, or a public-private partnership, rather than a private telecommunications provider” (DuPuis, Langan, McFarland, Panettieri, & Rainwater, 2018). Local governments are uniquely positioned to provide high-speed internet access to rural communities, due to the correspondence principle, or the understanding that local government’s proximity to its population means it is better at solving local issues. A rural city does not need to provide high-speed access to more than one community and can provide unique solutions for specific geographical limitations. Profit does not motivate local entities when providing

services for their communities, so local governments have much more motivation to serve low-population density areas. Creating a municipal broadband network in a region with only one ISP has already shown to reduce costs and improve services by creating competition with the dominant corporation. Chattanooga, Tennessee's municipal broadband network began offering high-speed internet access at prices significantly lower than Comcast, the only private ISP in the region, causing the company to make an investment of "\$15 million in the area to launch the Xfinity Service" (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). Unfortunately, there are several roadblocks that local communities need to bypass before being able to adopt this type of policy.

The Legal and Political Perspective

One significant barrier to the launching of municipal broadband networks is existing preemptive state legislation. Preemption is "the use of state law to nullify a municipal ordinance or authority" (DuPuis et al., 2018). As of 2016, there were 21 states that had laws in place that made "it difficult or, in some cases, illegal to create networks or sell internet service to their citizens" (Koebler, 2015). If a law does not outright prevent a locality from providing internet access, it can open them to lawsuits from ISPs. These preemptive laws have resulted in a "chilling effect on municipal broadband projects," but has not completely discouraged localities from trying (DuPuis et al., 2018). One of the most well-known municipal broadband networks is located in Chattanooga, TN, where the city installed "8,000 miles of fiber for 60,000 residential and 4,500 business customers out of a potential 160,000 homes and businesses" in 2015 (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). The city had actively been battling Tennessee's ban on "offering services outside" of the city's limits and was even receiving support from the Obama administration and the FCC (Koebler, 2015). The Trump administration and new FCC leadership stopped supporting the town's efforts. Additionally, knowing that a greater number of homes have connection speeds of 10 Mbps, the FCC is attempting to redefine high-speed internet standards from 25 Mbps to 10 Mbps, effectively defining the disparity away. These legal and political blocks prevent localities from finding ways to be innovative and provide high-speed internet access to their communities, making this policy area limited in its understanding. However, by basing analysis on current municipal networks, we can establish best practices for funding and managing networks.

The Fiscal Perspective

Communities with established networks are consistently "underestimating the future costs" associated with network management (Wallsten & Gamboa Sorensen, 2017). A closer inspection of the Chattanooga, TN finances revealed that "repaying the project would take 412 years" due to the networks low profit margin (Yoo & Pfenninger,

2017). Residents now hold about “\$1 million in public debt,” though local political leaders maintain the economic benefits far outweigh these costs (Wallsten & Gamboa Sorensen, 2017). Other localities ended up selling the infrastructure to local ISPs. Marietta, Georgia sold their network at a “\$11 million loss” (Wallsten & Gamboa Sorensen, 2017). What can be done?

Broadband infrastructure funding is not simple, especially when considering that the return on investment depends exclusively on user subscription. Previous localities have opted to pay for broadband projects through “bonds, financial transfers from a municipality or utility, loans, or grants” (Wallsten & Gamboa Sorensen, 2017). In some cases, public-private partnerships were established with deals giving exclusive operating rights to private companies of the network for a set period of years. There is also the consideration of federal support. In the past, the federal government has established numerous funding programs adding up to “nearly \$100 billion” to subsidize rural broadband access (Wallsten & Gamboa Sorensen, 2017). Additionally, in states without municipal network preemption laws, state infrastructure funds can be established and specifically reserved for network development, much like what is being done for public transportation initiatives (Pula, Shinkle, & Rall, 2015). However, localities need to consider much more than just initial funding to successfully run a broadband network.

Many cities that implemented municipal broadband networks underestimated long-term costs and overestimated the number of users that would subscribe to their network. These are both problems that can be accounted for. First, proper cost-benefit analysis is a typical best-practice recommendation for any large project. The issue to this point was that those establishing municipal broadband networks were forging through uncharted territory, so to speak. Now though, there are several localities that have received close public and private scrutiny for which funding analysis is readily available. Second, relying on user-subscription is not in itself a flawed method of funding a network; rural areas frequently receive poor service quality from ISPs at very high costs, making them eager to switch to a more affordable option. The issue, rather, was the single-level payment plan that many of these cities offered. For example, Chattanooga was dubbed the ‘Gig City’ because it offered internet speeds of 100 Mbps to all users for a flat rate of “\$70 a month” (Wallsten & Gamboa Sorensen, 2017). While certainly a generous offer, it is inefficient and pushes the infrastructure to stressful levels of output. Rather than offering such a high-speed, the city should create a tiered subscription system, in which users pay varying amounts for desired speeds. Users will still receive competitive rates as well as excellent service while reducing stress on the infrastructure. An analysis projects a larger growth of users by adopting this system (Brake, 2017).

The Managerial Perspective

Because of the relative novelty of municipal broadband networks, cities have tried to implement a number of different management strategies with varying success. In

general, one report recommends cities follow three basic principles: “(1) High-speed broadband must be accessible and affordable to all, (2) Community broadband services must protect free speech, and (3) Community broadband services must protect privacy” (Stanley, 2018). The second and third principles emerge from recent privacy and net neutrality concerns and, while important, are not the focus of this paper. Instead, this paper will expand on how a municipal network can be simultaneously affordable and accessible to all.

A tiered subscription model, as mentioned previously, allows users to pay for slower speeds at more affordable prices. Cities then can focus their efforts on connecting as many users as possible. In several cities, proponents have focused on increasing internet speed, which has resulted in diminishing marginal benefits. Instead, public officials should focus on the public good served when high-speed internet becomes easily accessible.

A large reason why ISPs do not develop in rural communities is a lack of population density. One fiber-optic cable that connects to an entire apartment building is a wise investment when compared to a cable that connects to only three or four houses. Municipal networks must first focus on connecting as many individuals to their service before attempting to bring 100 Mbps to individuals who may not need it. A study done in the United Kingdom revealed that “100% coverage at 15 Mbps” earned an estimated “consumer surplus of €2.25” per euro spent, whereas “92% coverage at 50 Mbps” earned an estimated “with a €0.72 surplus per euro spent” (Brake, 2017). A broad approach is better suited for municipal networks for two reasons. First, it allows for an infrastructure system to support a large number of users. Second, it connects high-speed internet for everyone and addresses the existing market failure.

CONCLUSION

The FCC’s 2017 data on national broadband connection is bleak, showing an alarmingly large number of houses either completely lacking high-speed internet connection or limited to only selecting from one ISP in the region. Because the cost to enter into the broadband market is so high, emerging companies cannot hope to compete with the current internet giants. As has been done to address other types of natural monopolies, the government should step in to offer reliable and cheaper solutions, if only to reduce the disparity between urban and rural areas in the country. Unfortunately, the current political climate seems hostile to this type of innovation and has made establishing municipal broadband networks difficult, as demonstrated by the FCC’s recent shift in policy. Additionally, laws prevent the practice altogether or make cities vulnerable to lawsuits (Koebler, 2015). Even given the robust benefits, a municipal broadband network should not be established unless local leaders carefully consider the financial ramifications of undertaking such a large infrastructure project. In worst case scenarios, “underperforming projects have caused numerous municipalities to face

defaults, bond rating reductions, and direct payments from the public coffers” (Yoo & Pfenninger, 2017). However, with careful management and broad financial support, establishing these networks have shown to benefit local economies and reduce costs directly to users, predominantly through the spill-over effect. In Chattanooga, TN, several businesses located in coastal cities have migrated to the town, citing cheaper internet costs (*The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*, 2015). Without government intervention, the disparity that exists between urban and rural regions will only continue to worsen, making the need for municipal broadband networks all the more urgent.

REFERENCES

- 2016 Broadband Progress Report*. (2016). Retrieved from fcc.gov:
<https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report>
- 2018 Broadband Deployment Report*. (FCC 18-10). (2018). www.fcc.gov Retrieved from
<https://www.fcc.gov/document/fcc-releases-2018-broadband-deployment-report>.
- Aman, S. (2017, Apr 12, 2017). Dig Once: A Solution for Rural Broadband. Retrieved from <https://www.ustelecom.org/blog/dig-once-solution-rural-broadband>
- Anderson, M. (2018). About a quarter of rural Americans say access to high-speed internet is a major problem. *Fact Tank*. Retrieved from
<http://www.pewresearch.org/fact-tank/2018/09/10/about-a-quarter-of-rural-americans-say-access-to-high-speed-internet-is-a-major-problem/>
- The Benefits Of Competition And Choice For Community Development And Highspeed Internet Access*. (2015). Retrieved from The White House:
https://obamawhitehouse.archives.gov/sites/default/files/docs/community-based_broadband_report_by_executive_office_of_the_president.pdf
- Brake, D. (2017). A Policymaker's Guide to Rural Broadband Infrastructure. *Information Technology and Innovation Foundation*, 1991926981.1497921863-1851887776.1494256561.
- Broadband That Works: Promoting Competition & Local Choice in Next-Generation Connectivity. (2015). Retrieved from <https://obamawhitehouse.archives.gov/the-press-office/2015/01/13/fact-sheet-broadband-works-promoting-competition-local-choice-next-gener>
- DePillis, L. (2017). In rural America, building the Internet for everyone has stalled. *Cnn Business*. Retrieved from
<https://money.cnn.com/2017/12/14/news/economy/kentucky-rural-broadband-internet/index.html>
- DuPuis, N., Langan, T., McFarland, C., Panettieri, A., & Rainwater, B. (2018). *City Rights in an Era of Preemption: A State-by-State Analysis*. Retrieved from nlc.org:
<https://www.nlc.org/resource/city-rights-in-an-era-of-preemption-a-state-by-state-analysis>

Eisenach, J. (2016). Don't Make the Internet a Public Utility. *Room for Debate*. Retrieved from <https://www.nytimes.com/roomfordebate/2015/02/04/regulate-internet-providers/dont-make-the-internet-a-public-utility>

Fixed Broadband Deployment. (2017). Retrieved from https://broadbandmap.fcc.gov/#/area-summary?version=jun2017&type=nation&geoid=0&tech=acfosw&speed=25_3

Koebler, J. (2015). The 21 Laws States Use to Crush Broadband Competition. *MotherBoard*. Retrieved from https://motherboard.vice.com/en_us/article/qkvn4x/the-21-laws-states-use-to-crush-broadband-competition

Krugman, P. R., & Wells, R. (2013). *Microeconomics* (3rd ed.). New York, NY: Worth Publishers.

New Census Data Show Differences Between Urban and Rural Populations. (2016). [Press release]. Retrieved from <https://www.census.gov/newsroom/press-releases/2016/cb16-210.html>

Pula, K., Shinkle, D., & Rall, J. (2015). *On Track: How States Fund and Support Public Transportation*.

Stanley, J. (2018). *The Public Internet Option: How Local Governments Can Provide Network Neutrality, Privacy, and Access for All*. Retrieved from <https://www.aclu.org/report/public-internet-option>

Wallsten, S., & Gamboa Sorensen, L. (2017). Public Investment in Broadband Infrastructure: Lessons from the U.S. and Abroad. *Technology Policy Institute*, 41.

Yoo, C. S., & Pfenninger, T. (2017). Municipal Fiber in the United States: An Empirical Assessment of Financial Performance.