



Rural Broadband  
Consortium

# Understanding the Rural Broadband Problem

A Paper by the C Spire Rural  
Broadband Consortium



## EXECUTIVE SUMMARY

While broadband availability in the United States continues to expand, people living in rural areas remain among the least likely to have broadband access. Mississippi, for example, is ranked 46 in broadband access and 47 in terms of urban population. The lack of broadband access and usage places rural areas across the nation at a disadvantage for a variety of reasons including economic growth, healthcare, and education. However, cost-to-serve is the primary challenge associated with bringing broadband to rural areas. As a result, the C Spire Rural Broadband Consortium is actively tackling this problem and finding new solutions.



## INTRODUCTION

Much has been written about the digital divide and its impact on those with limited access to broadband Internet service. Broadband Internet service has become a cornerstone to the world economy, as many things including advertising, sales, news, education, job applications, and basic communication move predominantly online. **Those with broadband Internet tend to have an advantage over those without, and the people least likely to have broadband access live in rural areas.**

Defining rural is somewhat subjective, as various federal departments have differing definitions for what constitutes rural. Sometimes rural is defined by what is not urban. Urban can be classified on a county level, a census-block or block group level, or using an urbanized area or urban cluster definition. The three most commonly used federal definitions of rural are those of the US Census Bureau, the Office of Management and Budget (OMB), and the United States Department of Agriculture's Economic Research Service (USDA-ERS). Using the definitions of these organizations, the rural population in the United States in 2010 was between 46.3 million and 59.5 million people. The Federal Communications Commission (FCC) broadband studies appear to be based on the Census Bureau definition (59.5 million). <sup>[1]</sup>

Although the United States made progress towards increasing broadband availability to all corners of the country, there is still a long way to go especially with regards to rural broadband. <sup>[2]</sup> As a result, the C Spire Rural Broadband Consortium, which includes Airspan Networks, Microsoft, Nokia, and Siklu, was formed in early 2019 to find new ways to approach the rural broadband problem. C Spire started this consortium because its home state of Mississippi is prototypical of the US broadband problem, as one of least connected and most rural states in the country.



## BROADBAND DEFINITION

Broadband typically refers to high-speed Internet access that is always on and generally faster than dial-up access. **In the United States, in 2015, the Federal Communications Commission (FCC) defined the minimum broadband Internet service level as 25 Mbps downlink and 3 Mbps uplink (25/3 Mbps).**

The 2015 service level was an upgrade from the 2010 benchmark of 4/1 Mbps, which was an upgrade from the 1996 definition of 200/200 kbps.<sup>[3]</sup> The definition of ‘broadband’ has matured over time to better reflect Internet usage trends, including higher-bandwidth services (e.g. high definition video, 3-8 Mbps) and multiple in-home devices vying for access to the same shared connection. In the future, as newer services such as 4K streaming (18-25 Mbps) become common and the number of connected devices per household continues to increase, the broadband definition will likely increase minimum service levels as well.<sup>[4-6]</sup>

While uplink usage lags downlink in terms of peak and average consumption, uplink usage is also growing especially as users create and share content for both personal and business purposes. Latency and jitter have not been specified to date for broadband services, but they too are becoming more important, particularly to the gaming community. In fact, high latency (e.g. >100 ms) and/or inconsistent jitter (e.g.  $\pm 25$  ms) can make a gigabit connection seem “slow.”

# IMPORTANCE OF BROADBAND



Internet usage is common at college, where campus and departmental news and information, calendars, classwork, grades, etc. are all online, and emailing professors is just as common as office hours. K-12 education is likewise increasingly online, from online coursework and assignments to correspondence with teachers and grades. Since jobs are increasingly high tech, an understanding of computers and the Internet as well as coding are fundamental and should be required for students to learn before graduating from high school. This means that all schools, as well as every student, are required to have broadband Internet access.



As people enter the workforce, even non-technical jobs require Internet access and a certain level of fluency. Job searches historically relied on personal word-of-mouth networks and newspaper ads. Today, job search engines (e.g. Monster.com) and networking platforms (e.g. LinkedIn) are much more common job search tools. Big companies, in particular, have transitioned to online application systems where applicants fill out forms, upload resumes, and even take tests; many of these systems also automatically sort and reject applications based on identified suitability for positions. Being able to find a job and apply for it skillfully requires broadband connectivity in the digital age.

In the world of business, print ads, including yellow pages, are where customers once found specific businesses and contact information. Today, most businesses have an online presence, whether on social media or a webpage, that provides vital information about business location, business hours, and merchandise. Businesses that don't have an online presence are expected to lose business as tech-savvy users depend on their smartphones to identify attractions, stores, or restaurants they want to visit. Often, consumers don't even leave their homes to shop. Instead consumers order almost anything they need or want from web-based stores such as Amazon from the comfort of their couches. Amazon has made online shopping easy, and joining the digital age is becoming a necessity for businesses to remain competitive.





Challenges also exist when consumers attempt to access healthcare services in rural areas. In urban areas, physical access to quality healthcare is taken for granted as urgent care clinics, doctors' offices, and hospitals are numerous and transportation options such as walking, public transit, taxis, and Uber abound. Specialists, likewise, are more commonly available in urban areas. In comparison to rural areas, clinics and hospitals can be an hour or more away with primary care doctors and specialists many hours away. Not only is lack of healthcare access life-threatening in emergency situations, but it can also be dangerous for normally treatable conditions. A slight change in a controlled health condition, such as glucose levels for a diabetic, can rapidly deteriorate into an emergency when visiting a healthcare professional for a minor issue is put off due to a lack of transportation or the inability to spend an entire day (or two) visiting the doctor. Access to tele-medicine, including online doctor video calls or remote patient monitoring tools, can make a huge difference in all types of health-related scenarios. These options are especially vital in rural areas, but they are not available without connectivity.



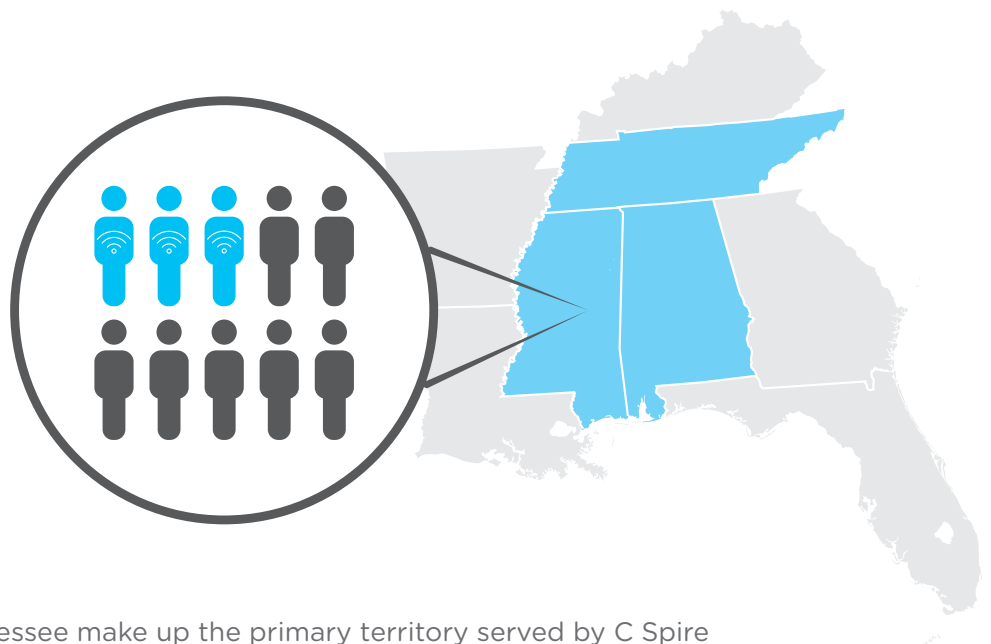
An industry that is unique to rural areas is precision agriculture. Precision agriculture is an Internet of Things (IoT) vertical where the requirements of the various connected things can vary widely, including telemetry and sensor data, seed and fertilizer used per square centimeter, and live-streaming high definition video from drones flying over fields; the total connectivity needs of farmers can be immense as they try to maximize yield and profitability while minimizing costs and resources used. The data collected from each planting, growing, and harvesting season can be huge and transmitting that data to the appropriate location (server, cloud, etc.) for analysis and getting a quick (near real-time) and usable prescription in return is vital to the process. Even for experienced farmers with highly productive

yields, there can be ways to reduce costs through proactive monitoring and automated adjustments. Years of study by organizations such as the Mississippi State University (MSU) Extension Service have produced recommendations for farmers in areas such as irrigation that can maximize yields while minimizing water usage. Pairing these types of recommendations with automation can produce powerful results in an area that is highly sensitive to weather and market volatility.

## BROADBAND CONNECTIVITY LANDSCAPE

The FCC requires service providers to self-report their networks and capabilities. According to the 2018 deployment report, approximately 92.3% of the population had access to fixed terrestrial services at 25/3 Mbps as of 2016. **In rural areas, however, only 69.3% of the population had access to broadband, as opposed to 97.9% of Americans in urban areas.** For various speed tiers, while greater than 97% of the population in urban areas had access to speeds from 10/1 Mbps to 50/5 Mbps, deployment in rural areas lags with 83.9% having access to 10/1 Mbps while only 64% have access to 50/5 Mbps service. The FCC's 2018 revised report indicates that from 2016 to 2017 broadband availability continued to improve with approximately 4.3 million rural residents gaining access to broadband. However, that still leaves at least 21 million people without access to broadband connections. <sup>[2, 7]</sup>

**28% of  
Mississippians**  
lack access to  
fixed broadband



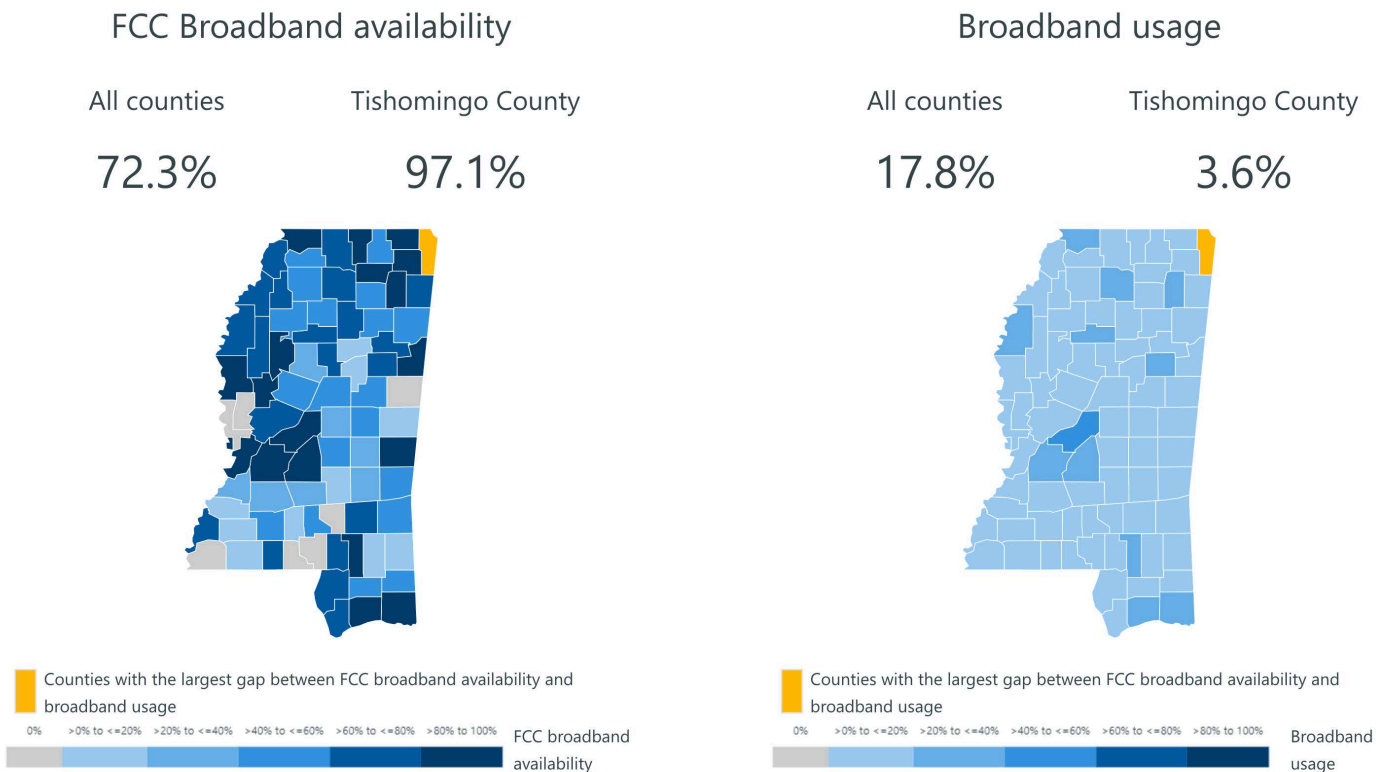
Mississippi, Alabama, and Tennessee make up the primary territory served by C Spire and are fairly rural states, ranked 47, 42, and 33 respectively in terms of urban population. Not surprisingly, broadband access in Mississippi is one of the lowest in the nation; it is currently ranked 46, while Alabama and Tennessee are ranked 40 and 25 respectively. Today, approximately 28% of Mississippians (829 thousand people) lack access to fixed broadband. As with the rest of the US, lack of access in the state is much higher in most rural counties.



Approximately 68% of Mississippians in the most rural counties did not have access to fixed broadband in 2015. An analysis by the MSU Extension Service estimated that millions of dollars are likely lost each year due to a lack of broadband Internet. <sup>[8-10]</sup>

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The difference between broadband availability and broadband usage, however, is stark. While the FCC indicates broadband is not available to 21.3 million people, Microsoft data indicates that 162.8 million people do not use the Internet at broadband speeds. In Mississippi, broadband availability is 72.3% across all counties, while broadband usage is only 17.8%. In Tishomingo County, the FCC claims broadband availability at 97.1%, while the usage is at 3.6% (see Figure 1). In Alabama, availability for all counties is 83.1%, with usage at 29.4%, and in Tennessee availability is 91.1% with usage at 38%. <sup>[11]</sup> There are a number of possible reasons for this discrepancy, including overly optimistic availability estimates as well as low actual usage of Internet connectivity (e.g. gaming and surfing the web do not require broadband). Regardless of whether broadband is available or not, low broadband usage statistics indicate massive economic opportunity losses in those areas.



Data sources: FCC 2018 Broadband Report based on Form 477 data from December 2016 and Microsoft data from September 2018  
Form 477 sample data format: 000000000000000,DBAName,0,0,0,0,0,0,0

Figure 1: Gap Between FCC Broadband Availability and Microsoft Data on Broadband Usage in Mississippi <sup>[12]</sup>





# CHALLENGES TO DELIVER RURAL BROADBAND

**The primary challenge to bringing broadband to rural communities is economic.** Rural areas are less densely populated. The cost to serve each customer increases as customer density decreases. For example, if there are 100 homes in a densely built neighborhood requiring X miles of fiber, the cost per home passed is much lower than in a more rural neighborhood requiring the same miles of fiber but with only 20 homes. This results in either a much longer return on investment (ROI) period or a much higher price for services for the rural neighborhood compared to the denser neighborhood. Not every Internet service provider (ISP) can tolerate a lengthy ROI, and it is a rare business that can build hundreds and thousands of neighborhoods this way year over year. Likewise, it is challenging for rural customers to pay 10x prices for the same Internet services offered in urban areas. The most common practices for rural builds are to 1) find less expensive ways to serve the neighborhood (i.e. fixed wireless), or 2) not serve that neighborhood at all.

With fewer customers and less available revenue, competition becomes less common in less populated areas. For areas with one ISP, that monopoly has total control over what technology is used, what service is provided (broadband or not), and how much is charged for service. In areas where the service charge exceeds the ability of many residents to purchase service, there may be Internet availability, but usage will still be limited. This creates two possible pictures of an area: 1) this area cannot support competition because its population cannot afford broadband or 2) there is pent-up demand for affordable broadband in this area. It remains to be seen which is true. There are technology challenges, including very rough terrain, power and backhaul availability, and distance limitations to fiber and wireless transmissions, etc. that are a struggle to overcome even with an infinite amount of money. It is entirely possible that some areas of the United States (and the world) cannot be served until those technology problems are solved. In the meantime, new business and technology solutions need to be discovered and explored.

Public policy efforts to promote rural broadband adoption also face unique challenges. Federal and state support programs, such as the Universal Service Fund or USDA's ReConnect Fund, are built on the assumption that reliable data exists for determining where high-capacity broadband services are and are not available to consumers. That assumption, however, is fundamentally flawed. The FCC and the rest of the federal government have long relied on "Form 477 data" to determine broadband service availability. But, Congress, the GAO, and third parties have pointed out in recent years that Form 477 data overstates broadband availability – often grossly. Despite these well-documented criticisms, the FCC has not corrected the significant and longstanding Form 477 data collection issues. For example, the FCC concludes that a census block is 100% "served" if any carrier is able to provide service to even one customer inside the block. Until these underlying issues with data are corrected, it is impossible for policymakers to accurately target public policy, including economic support mechanisms, in a manner that efficiently or effectively promotes the deployment of broadband services to the nation's rural areas.

## Conclusion

The United States has made progress over the last decade in broadband availability with all but 8% of the US population reportedly having access to fixed broadband 25/3 Mbps service. However, lack of broadband access and usage in rural areas reflects the existence of the digital divide. Mississippi is the poster child for the digital divide with nearly half of its population living in rural areas, nearly 28% of residents lacking in broadband connectivity, and less than 20% of residents using broadband today.

Unless broadband access is addressed in rural areas, today's disadvantages resulting from limited broadband access will continue to grow in prominence as bandwidth needs expand and the broadband definition changes in the future. The broadband access disparity driven by economic challenges has resulted in the C Spire Rural Broadband Consortium goal of defining new business models to deliver broadband by exploring innovative technologies and tools along the way.

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The C Spire Rural Broadband Consortium is made up of various partner companies interested in finding new ways to bring broadband Internet to rural communities. To learn more, click **here**.