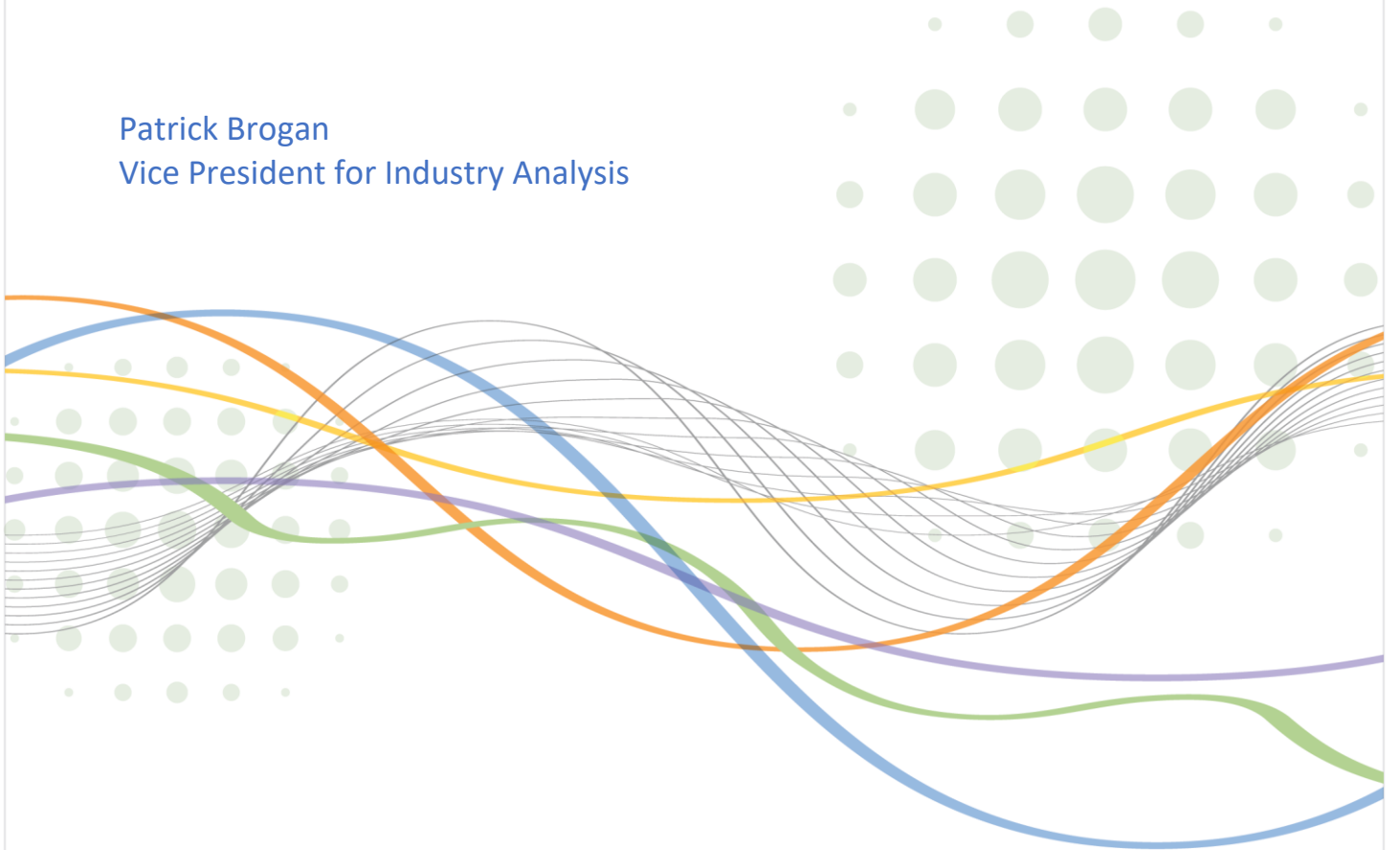


*USTelecom Research Brief
November 30, 2018*

U.S. BROADBAND AVAILABILITY MID-YEAR 2017

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THE BROADBAND ASSOCIATION

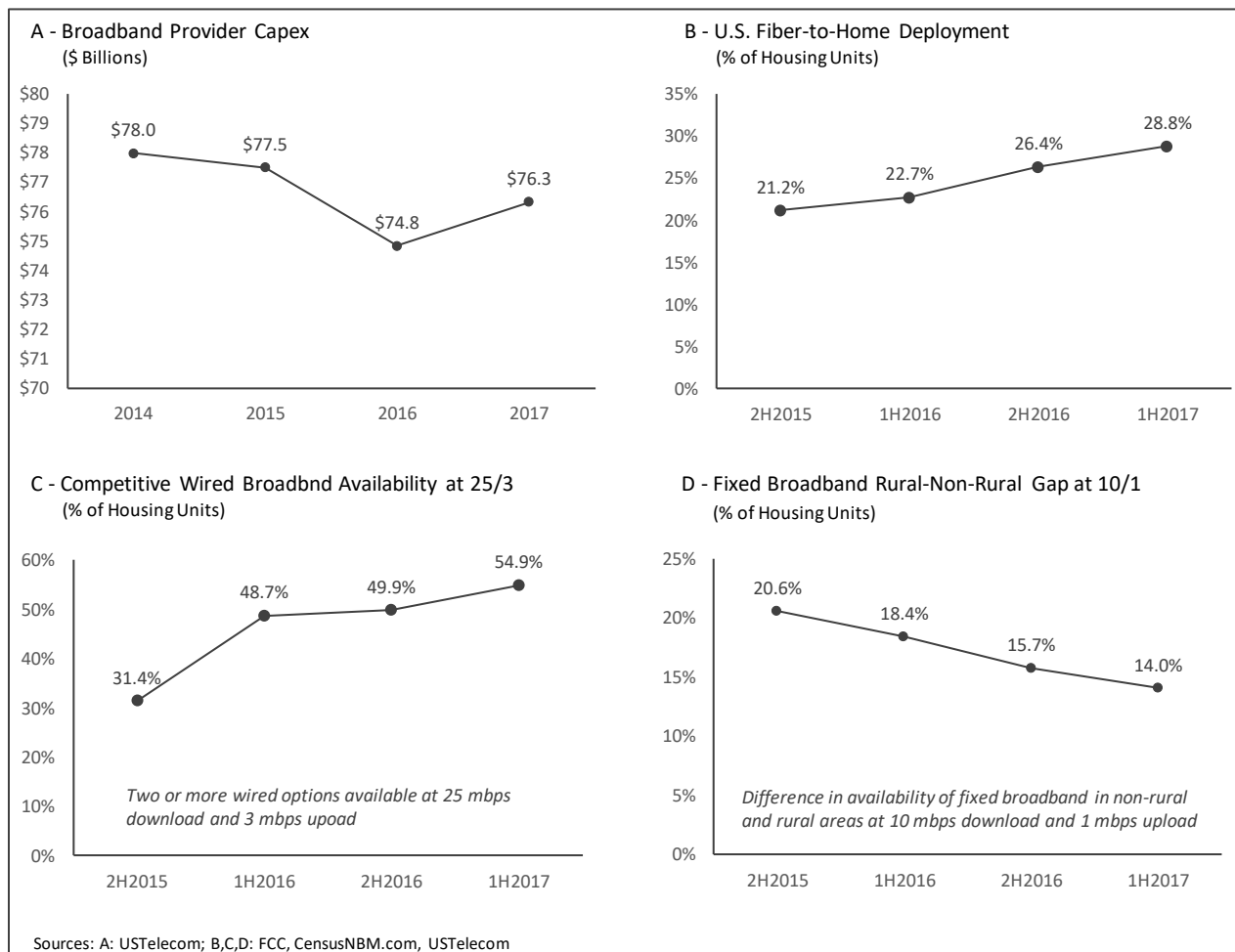
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Summary

U.S. broadband providers continue to deploy and upgrade networks to bring consumers across the nation ever-faster service and more competitive choice, according to a new USTelecom and CensusNBM analysis of Federal Communications Commission (FCC) broadband availability data for mid-year 2017. This research demonstrates the real economic impact of broadband capital investment dollars: more and faster broadband for American consumers and businesses. According to the latest USTelecom [analysis](#), wireline, wireless, and cable broadband providers invested \$76 billion in 2017 and more than \$1.6 trillion since 1996.

The broadband availability data indicate that deployment is progressing. Chart 1 shows that broadband investment generates real benefits for U.S. consumers. In the 18 months from the end of 2015 to mid-2017, fiber deployment grew from 21 percent to 29 percent of homes and competitive availability of wired broadband at 25 megabits per second (mbps) download and 3 mbps upload increased from 31 percent to 55 percent. During the same period, the difference between non-rural and rural deployment of fixed broadband at 10 mbps download and 1 mbps upload narrowed from 20 percent to 14 percent. By mid-2017, broadband at 100 mbps download was available to 89 percent of Americans. As discussed below, all of these metrics continue to improve. While progress is strong, the need to upgrade broadband network speed and quality is constant and significant challenges remain in closing rural broadband gaps. Therefore, it will remain imperative for policymakers to maintain an investment-friendly environment for broadband deployment.

Chart 1



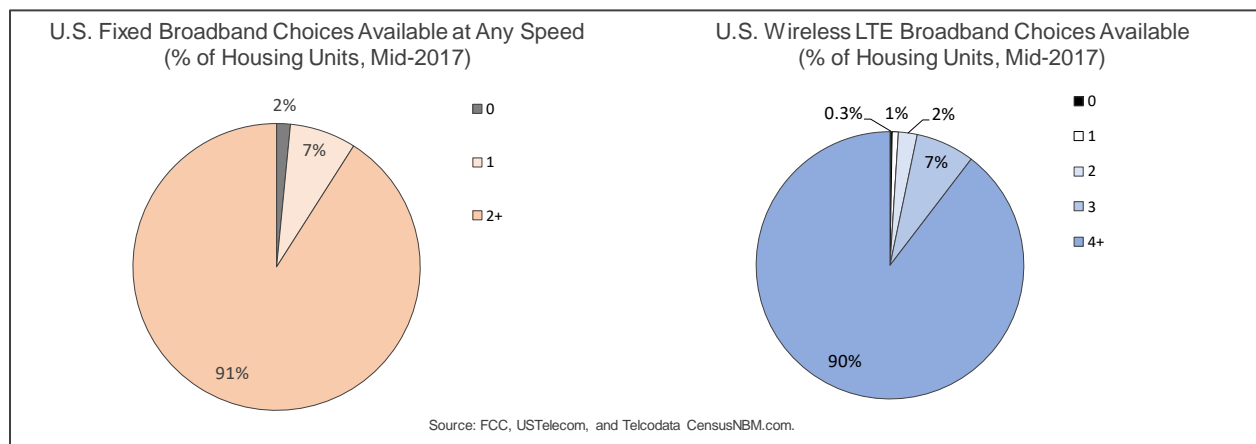
Framework for Analyzing Broadband Deployment and Competition

USTelecom [reiterates](#) that any assessment of broadband availability and competition must start with an examination of broadband at any speed using any technology and must account for the dynamics of deployment and technological progress over time. Simplistic snapshot analyses at a single point in time based on selective speed thresholds and technologies are at best uninformative. They miss this technological upgrade dynamic and they understate both the availability and competitiveness of broadband. At worst, such simplistic analyses can lead to misdiagnoses of market failure or can provide a false pretext for policy action.

Competitive Availability of Foundational Broadband Infrastructure

As of mid-year 2017, 98 percent of Americans had at least one fixed broadband network platform available at any speed and 91 percent had at least two fixed platforms at any speed. As of mid-year 2017, 99.9 percent of Americans had at least one mobile broadband network available; and nearly all Americans had a choice among LTE providers. See Chart 2. In addition, satellite providers offer national coverage and have recently launched next generation satellites that offer service capable of meeting FCC broadband speed standards.

Chart 2



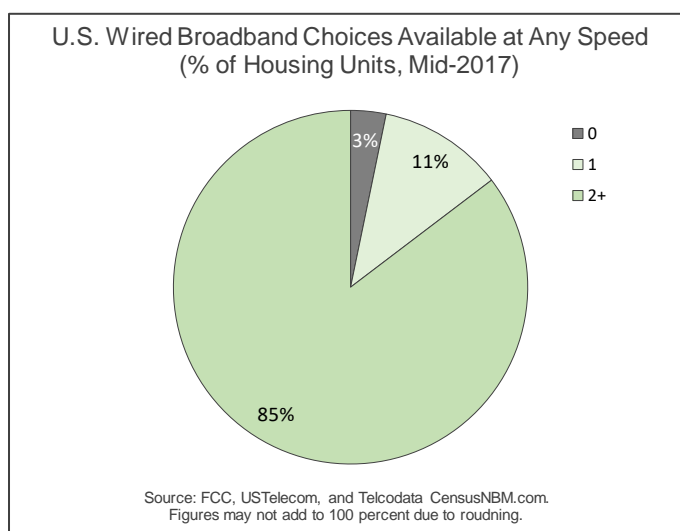
The FCC categorizes broadband as either fixed or mobile. Fixed broadband consists of wired broadband and fixed wireless broadband. Wireless Internet Services Providers (WISPs) use terrestrial fixed wireless technology to deliver broadband services. USTelecom and the FCC use the term fixed broadband to refer to *terrestrial* fixed broadband, which excludes satellite broadband. Wired broadband is a subset of fixed broadband, and it predominantly consists of broadband over fiber, digital subscriber line, and cable modem technologies. Mobile wireless broadband is separate from fixed wireless and fixed broadband.

The figures in Chart 2 reflect the foundational deployment of competitive broadband facilities. U.S. providers have been deploying broadband infrastructure using a range of technologies for more than two decades. As a result, basic underlying competitive infrastructure from multiple providers is available in the vast majority of the country. Moreover, broadband technologies are constantly evolving, with successive generations becoming increasingly powerful. Thus, upon the foundational infrastructure of underlying facilities, broadband providers invest tens of billions of dollars annually to extend and upgrade networks. As any provider or group of providers deploys advanced technologies,

competing providers respond by deploying differentiated technologies of their own, driving a competitive process of ever-expanding network capabilities.

Against the backdrop of this competitive dynamic, it is important to remember that broadband is one of the most capital-intensive industries in the economy and the geographic reach of the U.S. is vast. In such an environment, providers simply cannot deploy the latest technology upgrades instantaneously across their entire network footprints. Wide-scale deployment is expensive and time consuming. Deployment and upgrades typically occur first in dense, low-cost areas and progress to more rural, high-cost areas over time. Therefore, it is imperative to look at both current and historical trends across technologies and geographies. The data indicate that competitive deployment is widespread. As of mid-year 2017, 97 percent of Americans had at least one wired broadband network platform available to them and 85 percent had at least two wired options. See Chart 3.

Chart 3



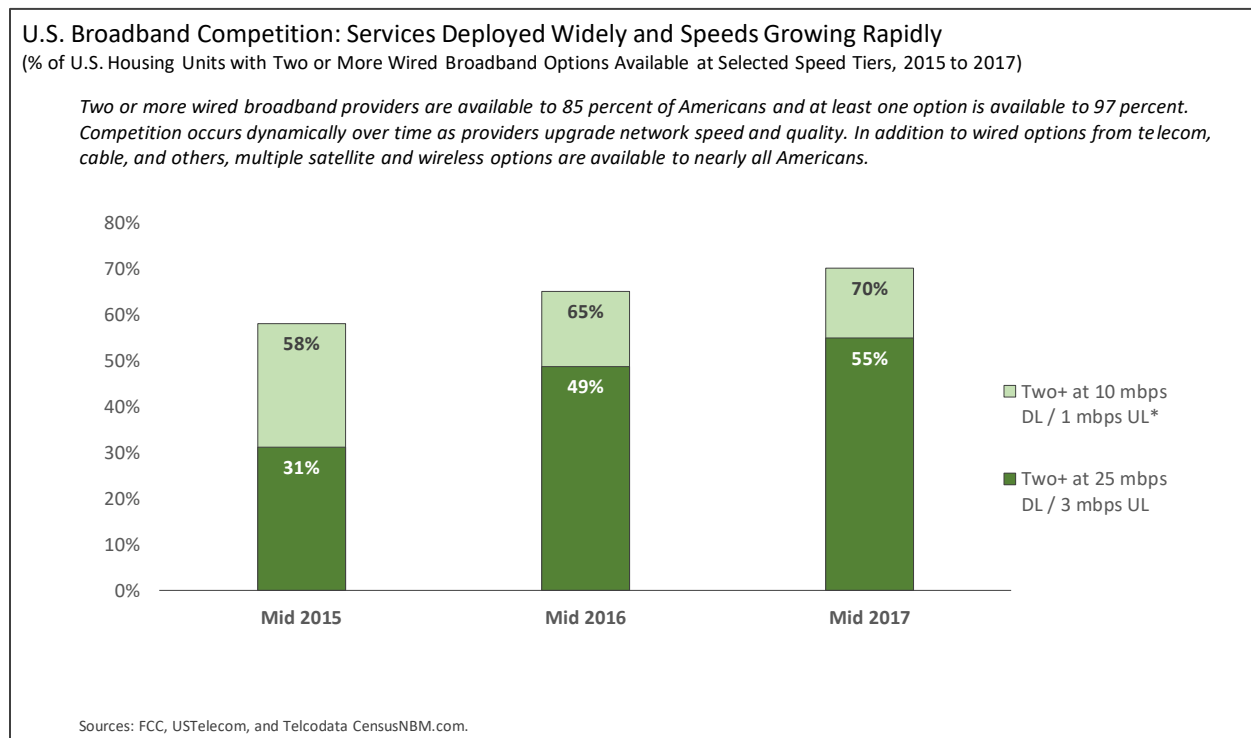
Competitive Availability at Higher Speeds Tiers

Competitive availability at higher speeds continues to grow as providers upgrade their widely deployed broadband networks. For example, available data allow us to look at wired broadband deployment, typically from wireline telecommunications and cable operators, at different speeds over time. Competitive availability – narrowly defined as at least two wired providers – at 25 mbps download (DL) and 3 mbps upload (UL) was 55 percent at mid-year 2017, up from 49 percent at mid-year 2016 and 31 percent at mid-year 2015. Wired broadband at 10 mbps DL and 1 mbps UL was available to 70 percent of households from at least two providers at mid-year 2017, up from 65 percent at mid-year 2016 and 58 percent at mid-year 2015. See Chart 4. For a longer-term perspective, previous USTelecom [research](#) estimated that as of mid-year 2012 competitive availability at 25 mbps DL and 3 mbps UL was 23 percent and competitive availability of broadband at 10 mbps DL and 1 mbps UL was 55 percent.

The FCC data also indicate that some portion of U.S. households can choose from three or more wired broadband providers. It is unclear the extent to which all of this is fully facilities-based competition. Of the 85 percent of Americans that had a choice of two or more wired broadband providers, 16.5 percent of Americans had a choice of three or more, according to the mid-2017 FCC data. USTelecom can identify approximately 40 percent of this group as having access to full facilities-based providers: former cable over-builders, such as Wide Open West and RCN, covered at least 5.6 million

housing units; identifiable municipal network operators covered at least 1.5 million housing units; and Google Fiber covered 1.4 million housing units. Together, these account for availability to 8.5 million housing units, or approximately 6.5 percent of Americans, assuming no overlap. The remaining portion of this group may include providers using their own facilities, providers who partially resell others’ facilities, or some combination of these.

Chart 4



As of mid-year 2017, fixed wireless service at any speed was available to 38 percent of Americans. The reported portion of Americans with three or more fixed broadband providers, which includes both wired and fixed wireless, available to them is significantly greater than for wired broadband, due to the inclusion of fixed wireless. Three or more *fixed* broadband options at any speed were available to 43 percent of Americans as of mid-year 2017, compared to 16.5 percent for wired broadband only, according to the FCC data.

Mobile broadband from multiple providers is also widely available throughout the U.S. As shown above in Chart 2, as of mid-year 2017, mobile broadband using 4G LTE wireless technology was available to 99.7 percent of Americans. Ninety-nine percent had a choice of two or more providers and 97 percent could choose among three or more. Four or more LTE mobile broadband options were available to 90 percent of Americans.

Broadband Availability and Deployment at Different Speeds Over Time

The FCC data for mid-year 2017 show that the broadband availability rates are higher at lower speeds, as expected given the upgrade dynamics discussed above. This is the case whether looking at wired broadband or the broader category of fixed broadband. See Chart 5 and Chart 6, respectively. However, consistent with the competitive deployment dynamic, the *overall* availability of higher speed services has been growing over time (see Chart 7); and the *competitive* availability of higher-speed services has been growing over time (see Chart 4).

Chart 5

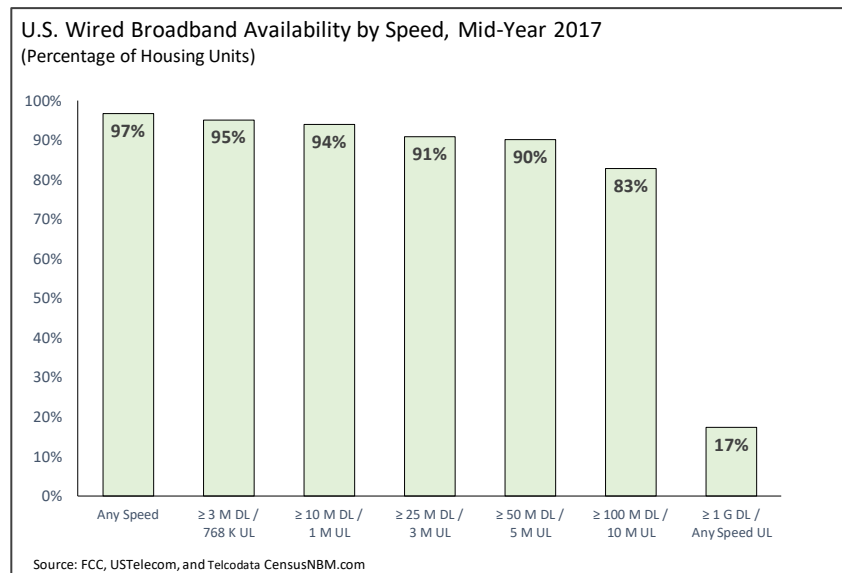
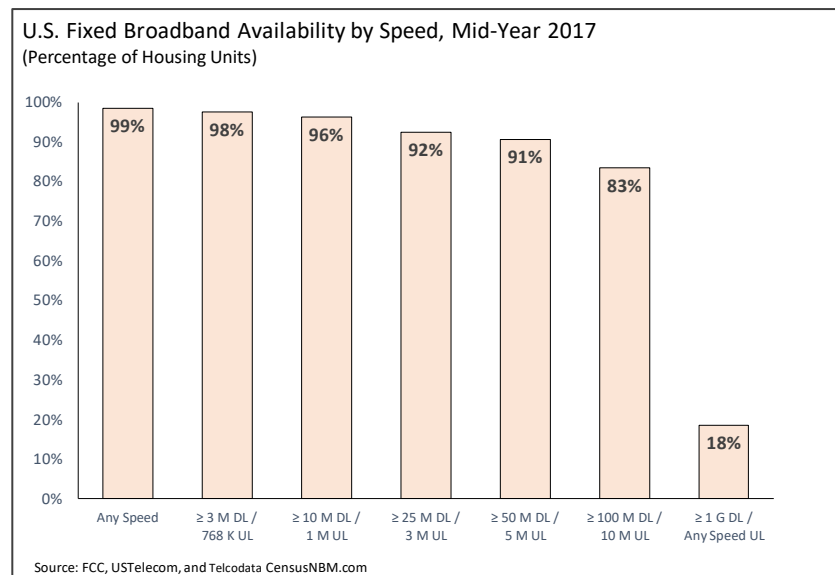


Chart 6

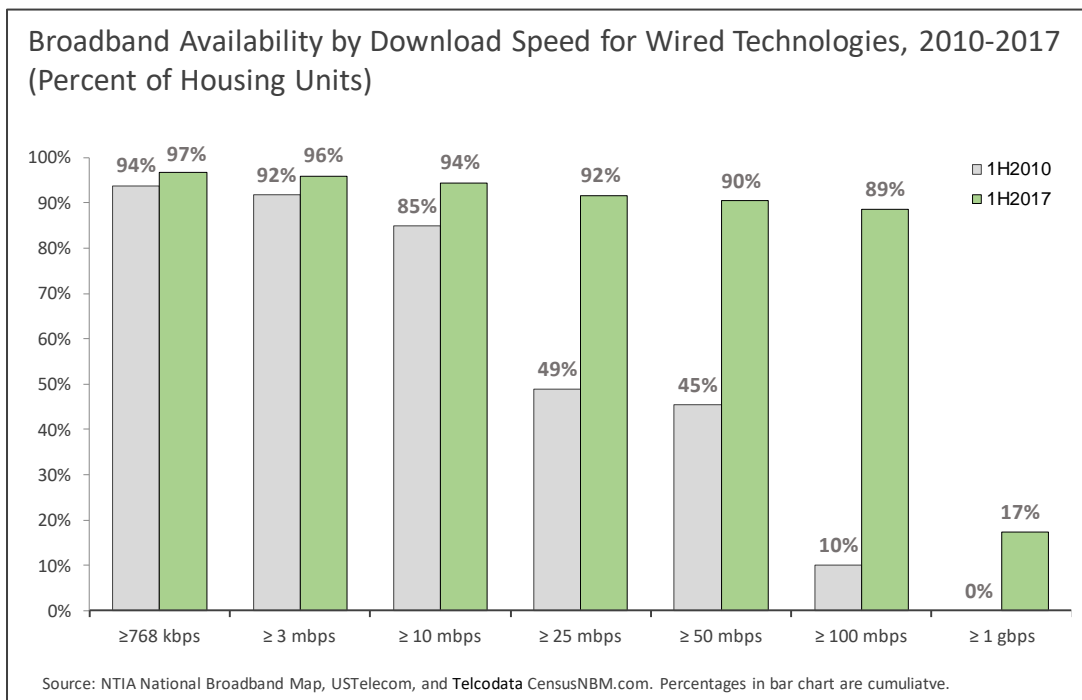


These data show that as of mid-year 2017, fixed broadband at any speed was available to 99 percent of Americans and wired broadband was available to 97 percent of Americans. The FCC currently defines advanced services over fixed broadband based on a speed threshold of 25 mbps DL and 3 mbps UL. Approximately 92 percent of Americans had fixed broadband available and 91 percent had wired broadband available at the FCC’s current speed threshold.

Broadband availability has been growing across all speed categories over time. Chart 7 compares availability of wired broadband from 2010 to 2017. Availability of broadband at 10 mbps DL grew from 85 percent to 94 percent during this period. Availability of broadband at 25 mbps DL grew from 49 percent in 2010 to 92 percent at mid-year 2017 while broadband at 50 mbps DL grew from 45 percent in 2010 to 90 percent at mid-year 2017. Availability of broadband at

100 mbps DL grew from 10 percent in 2010 to 89 percent at mid-year 2017. Gigabit consumer broadband, which did not exist in 2010, was available to 17 percent of households at mid-year 2017.

Chart 7



In Chart 7, corresponding data for fixed broadband, including fixed wireless, are not readily available for 2010; and historical 2010 data were only available for download speeds. Therefore, the analysis in Chart 7 is limited to wired broadband. Nonetheless, it is likely that the broader fixed broadband category would show similar historical trends. Additionally, in order to make accurate comparisons to 2010, the analysis in Chart 7 contains only download speeds for 2017. As a result, the availability figures in Chart 7 are higher than for the corresponding download-upload combinations in Chart 5. Finally, since the 25 mbps DL / 3 mbps UL and 50 mbps DL / 5 mbps UL are so similar, throughout the remainder of this research brief, USTelecom will not report the 50 mbps DL and 5 mbps UL figures.

An analysis of mobile broadband availability tells a similar story of competitive investment and growth. Data challenges make direct comparisons from 2010 to the present difficult. With 4G LTE technology, mobile carriers first began to report service at 10 mbps or greater DL. According to National Broadband Map (NBM), as of mid-2010, mobile broadband at 10 mbps DL or greater was available to less than one percent of Americans; by mid-2014 it was available to 98 percent. The FCC, which was responsible for the broadband deployment data collection as of year-end 2014, measures mobile wireless broadband speeds differently than the NBM; so, direct speed-based comparisons across the NBM and FCC data are not feasible. However, the FCC does report mobile broadband availability by technology. By year-end 2015, mobile broadband over LTE – a good proxy for 10 mbps or greater service – was available to 99.5 percent of Americans. By mid-year 2017, LTE was available to 99.7 percent of Americans. In other words, mobile broadband at 10 mbps DL or greater grew from near zero to 98 percent availability in four years and approached 100 percent availability within six years. As of 2017, nearly all Americans had multiple choices for 4G mobile broadband, as shown above in Chart 2 above. In 2018, we are seeing the initial commercial deployment of fifth generation (5G) wireless services. FCC mid-2017 data underestimate deployment and competition today since they do not account for developments in the year and a half since mid-2017. For example, pursuant to a DirecTV merger commitment, AT&T is in the process of

expanding its fiber footprint to 14 million new locations by mid-2019. AT&T [stated](#) as of second quarter 2017 it had extended its fiber-to-the-premises footprint to 5.5 million new locations. As of third quarter 2018, AT&T [stated](#) it had passed 10 million locations or 4.5 million more than mid-2017. In all, by mid-2019, AT&T will have added approximately 8.5 million more fiber locations than are reflected in the mid-2017 data, mostly residential. In October 2018, Comcast [announced](#) it had upgraded 58 million locations to gigabit broadband services using DOCSIS 3.1 technology. Finally, as discussed in greater depth below, initial commercial deployments of 5G wireless services began in 2018, including fixed and mobile wireless services as potential fixed broadband alternatives. Additional rollouts of both fixed and mobile 5G services will occur in 2019 and beyond.

Broadband Availability in Rural and Non-Rural Areas

Broadband deployment across the diverse and expansive geography of the United States presents many challenges. In rural areas, costs are high and population densities low, so the cost per user can be extremely high. The economics of providing broadband at affordable and nationally comparable rates in many rural areas is difficult and in some cases prohibitive for wired providers who must deploy facilities all the way to end user locations. Due to the cost differences and the timing of upgrade cycles, broadband is unsurprisingly more widely available in non-rural areas than in rural areas. This analysis of rural broadband availability updates USTelecom's previous analyses of [mid-2016](#) data (released in August 2017) and [year-end 2016](#) data (released in February 2018). The discussion below includes a comparison of mid-2017 to mid-2016 data. For a detailed review of rural broadband economics, see "[Rural Broadband Economics: A Review of Rural Subsidies](#)," by Steve G. Parsons and James Stegeman of CostQuest Associates, Inc.

Rural Broadband Availability Overall

Broadband availability varies between rural and non-rural areas, but also within rural areas. USTelecom reports availability as a percentage of housing units. Approximately 79 percent of housing units are non-rural and 21 percent are rural according to the 2010 Census.

As of mid-year 2017, wired broadband at any speed was available to 99 percent of Americans in non-rural areas and 87 percent of Americans in rural areas. See Chart 8. Wired broadband at 10 mbps DL and 1 mbps UL was available to 99 percent of Americans in non-rural areas and 77 percent in rural areas at mid-year 2017, up from 98 percent and 72 percent, respectively, at mid-2016. Wired broadband at 25 mbps DL and 3 mbps UL was available to 98 percent of Americans in non-rural areas and 65 percent of Americans in rural areas at mid-year 2017, up from 97 percent and 59 percent, respectively, at mid-2016. Wired broadband at 100 mbps DL and 10 mbps UL was available to 92 percent of Americans in non-rural areas and 50 percent of Americans in rural areas at mid-year 2017, up from 79 percent and 34 percent, respectively, at mid-2016.

When including fixed wireless in the analysis, there is slightly greater availability in rural areas than there is when analyzing wired broadband alone. Fixed broadband at any speed was available to nearly 100 percent of Americans in non-rural areas and 94 percent of Americans in rural areas. See Chart 9. Fixed broadband at 10 mbps DL and 1 mbps UL was available to 99 percent of Americans in non-rural areas and 85 percent in rural areas at mid-year 2017, versus 99 percent and 80 percent, respectively, at mid-2016. Fixed broadband at 25 mbps DL and 3 mbps UL was available to 98 percent of Americans in non-rural areas and 70 percent of Americans in rural areas at mid-year 2017, up from 97 percent and 64 percent, respectively, at mid-2016. Fixed broadband at 100 mbps DL and 10 mbps UL was available to 92 percent of Americans in non-rural areas and 51 percent of Americans in rural areas at mid-year 2017, up from 77 percent and 35 percent, respectively, at mid-2016.

Chart 8

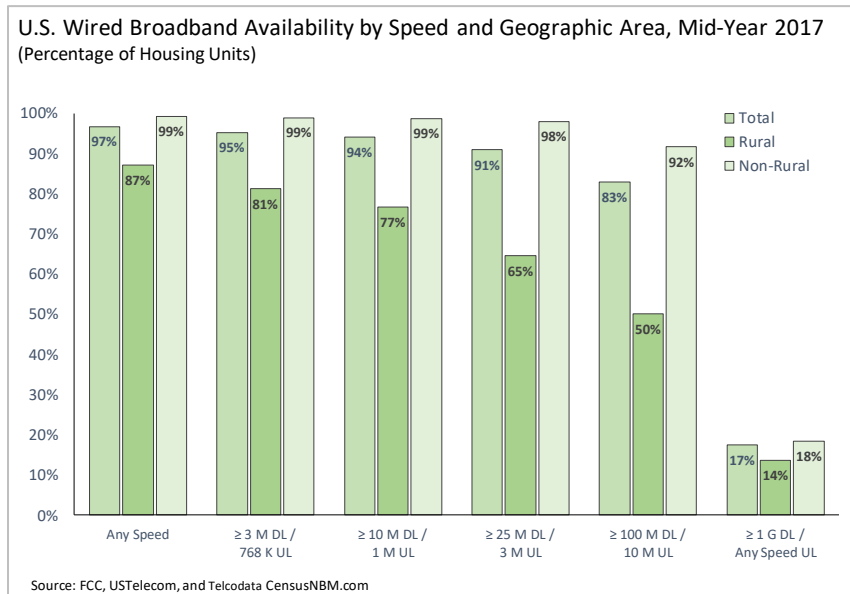
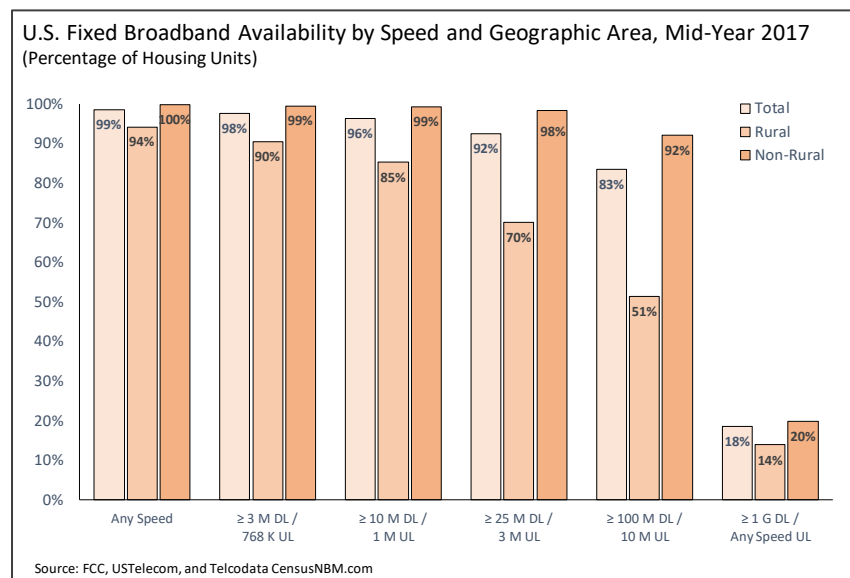


Chart 9



USTelecom does not provide a separate analysis for rural and non-rural deployment of mobile wireless broadband or satellite broadband. As shown in Chart 2 above, as of mid-year 2017, 4G LTE mobile wireless broadband was available to 99.7 percent of Americans, and the vast majority of Americans, including those in rural areas, had 4G mobile broadband available to them from multiple competitive providers.

Competitive Availability: Rural and Non-Rural Components

At mid-year 2017, wired broadband at any speed was available to 85 percent of Americans from two or more providers, with 11 percent having one option and three percent having no wired broadband option. See Chart 3. Figures do not add to 100 percent due to rounding. The 85 percent with two or more wired broadband options consisted of just under 75 percent in non-rural areas and just under 11 percent in rural areas. The 11 percent with one option consisted of nearly four percent in non-rural areas and seven percent in rural areas. The three percent that did not have a wired broadband provider consisted of less than one percent in non-rural areas and slightly greater than two percent in rural areas. See Chart 10.

While core wired infrastructure is competitively available to 85 percent of Americans, networks are at different stages of upgrading to higher-speeds. As of mid-year 2017, 70 percent of Americans could get 10 mbps DL and 1 mbps UL from at least two providers, while 55 percent could get 25 mbps DL and 3 mbps UL from at least two providers. Chart 11 breaks out availability at these speeds tiers for rural and non-rural areas as a share of the entire U.S. At any point in time, competitive availability appears lower at higher speeds since they reflect more recent upgrade cycles. This result is expected; and it reflects a dynamic, competitive marketplace. Regardless, as Chart 4 demonstrates, deployment at higher speeds by multiple providers is growing rapidly as competition drives upgrades.

Chart 10

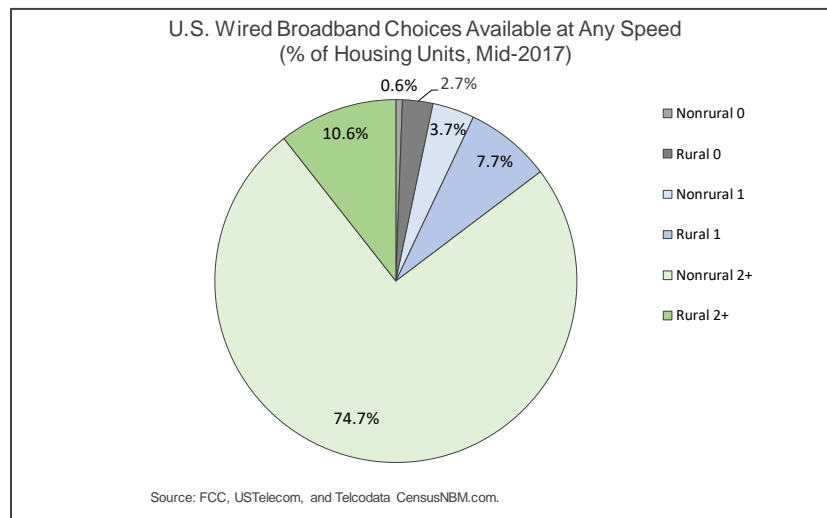
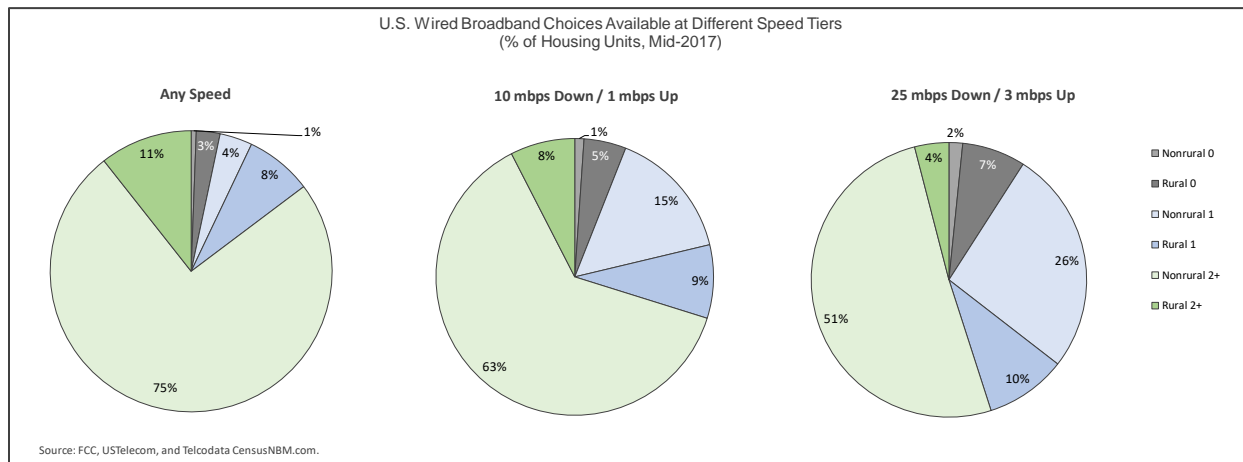


Chart 10 shows the percentages with one decimal place because otherwise rounding would yield different figures than discussed above. By contrast, Chart 11 uses the rounded figures because the individual charts are too small to accommodate decimals.

Chart 11



As of mid-year 2017, fixed broadband – including wired and fixed wireless – at any speed was available to 91 percent of Americans from two or more providers, with seven percent having one option and two percent having no fixed broadband option. See Chart 2. The 91 percent with two or more fixed broadband options consisted of 76 percent in non-rural areas and 15 percent in rural areas. The seven percent with one fixed broadband option consisted of five percent in non-rural areas and two percent in rural areas. The two percent that did not have a fixed broadband provider consisted of less than one percent in non-rural areas and just over one percent in rural areas. See Chart 12.

As with wired broadband, competitive availability estimates for fixed broadband are lower at higher speeds due to competitive dynamics and upgrade cycles. See Chart 13. Including fixed wireless yields slightly higher estimates than wired broadband alone.

Chart 12

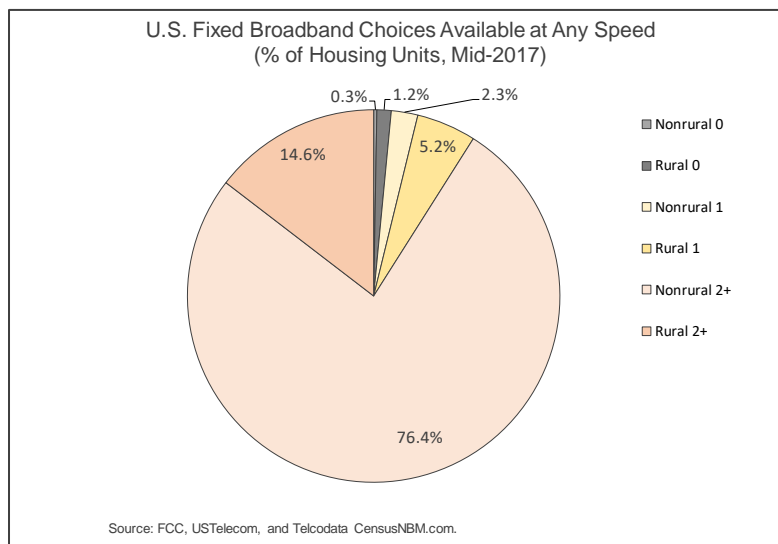
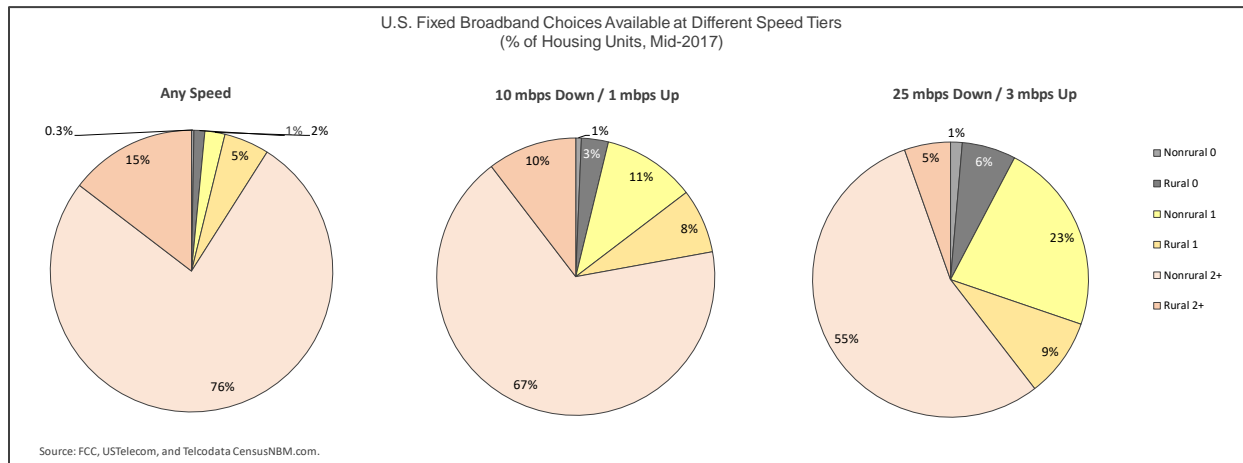


Chart 13



Rural Broadband Gaps

Rural broadband is not monolithic. The data show that there is variation across rural areas in terms of deployment, speeds, and competition. While there are gaps in rural broadband, there is no single “rural broadband gap.” Rather, gaps exist in specific rural areas either where broadband is not available due to challenging economics or areas where there is only one provider and either demand, industry technology trends, or subsidies are not driving sufficient upgrades. For a thorough analysis of rural broadband deployment and variation among different types of rural communities, see [“A Look at Rural Broadband Economics”](#) by Will Rinehart of the American Action Forum.

According to the mid-2017 FCC data, more than half of rural areas, where 11 percent of Americans reside, had two or more wired networks deployed. More than 36 percent of rural areas, where eight percent of Americans reside, had just one wired provider. Combined with those areas that had two or more providers, almost 87 percent of rural Americans had at least one wired provider available to them. Of all rural Americans, 77 percent could get services at 10 mbps DL and 1 mbps UL; 65 percent could get service at 25 mbps DL and 3 mbps UL; and 50 percent could get service at 100 mbps DL and 10 mbps UL. See Chart 8. If one includes fixed wireless and relaxes the upload requirement, these figures rise to 86 percent for 10 mbps DL, 72 percent for 25 mbps DL, and 59 percent for 100 mbps DL. See Appendix B. Historical USTelecom broadband availability research indicates that rural broadband gaps are declining. For example, the difference between non-rural and rural broadband fixed broadband availability at 10 mbps DL and 1 mbps UL has declined from 20 percentage points at the end of 2015 to 14 percentage points as of mid-2017. See Chart 1D.

The remainder may be unserved, depending on technology assumptions. Almost 13 percent of rural areas where three percent of Americans reside did not have a wired broadband option as of mid-year 2017. This falls to less than six percent of rural areas, or just over one percent of all Americans, if fixed wireless is included in the analysis. The unserved portion falls to about two percent of rural areas and 0.3 percent of all Americans if 4G mobile wireless is included in the analysis, conservatively assuming nearly all uncovered areas for 4G mobile wireless are in rural America. Satellite eliminates the gap for all but the most extremely remote areas of the country if it is included in the analysis. The FCC has [noted](#) that latency – delays in data transmission arising from the distances between users and satellites – may affect perceived quality of real time interactive applications. Nonetheless, satellite providers have [recently deployed](#) next generation satellites offering services that can meet the FCC’s current speed thresholds, and they may be able to accommodate real-time two-way communications. At minimum, in the very highest cost areas, satellite may be the most economical option for fixed broadband. In fact, Viasat, Inc., a satellite provider, [won FCC financial support](#) in the recent Connect America Fund reverse auction to provide broadband and voice service to more than a quarter of the more than 713,000 locations for which the FCC auctioned support.

USTelecom believes that every American should have the opportunity to connect to the internet through sufficiently robust broadband service. For some areas, this requires government support. The FCC’s Connect America Fund provides a good starting point. Further progress will require additional funding. Policies must be targeted, flexible, and efficient. Policies should target support to specific areas where the economics do not support deployment or upgrades. In addition, governments must not fund wasteful, duplicative overbuilding of existing facilities. Policies must also be sufficiently flexible to allow for the most cost effective solutions rather than adhering to rigid technology or speed requirements. Finally, it is essential that funding be dedicated and direct, using a mechanism like the Connect America Fund, for the most economically and administratively efficient distribution of funds.

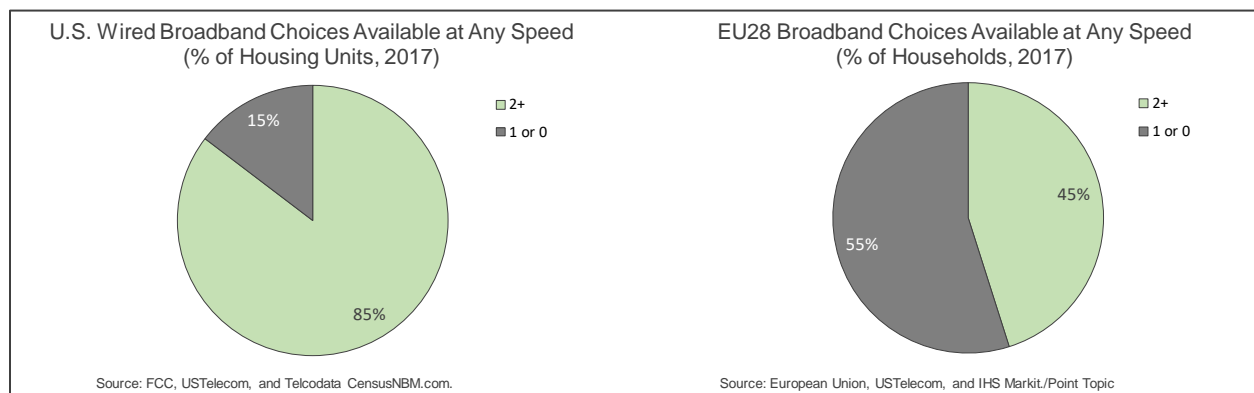
Mobile-Fixed Broadband Substitution

While the FCC [acknowledged](#) in February 2018 that some consumers choose “either fixed or mobile broadband Internet access service to the exclusion of the other,” it also stated that it does not believe that mobile broadband services are “currently full substitutes for fixed service.” Wireless broadband is evolving at a rapid pace. For several years now, 4G mobile wireless services have offered speeds on par with, and are increasingly surpassing, many wired broadband services. A [recent survey](#) showed that many consumers today are using mobile services for high-bandwidth applications such as live video streaming. Initial commercial rollouts of fifth generation (5G) fixed and mobile wireless services are now underway, with widespread deployment expected in 2019 and beyond. As 5G rolls out, the share of consumers using fixed and mobile wireless as an alternative to wired broadband may grow significantly. In order to minimize distortions and inefficiencies, it will be critical for government to monitor developments in fixed-mobile broadband substitution and to adjust policy in a timely manner should the trend gain momentum. As with voice telephony, broadband wireless-only adoption has started slowly. Yet, of U.S. households who have telephones, the portion relying on wireless-only telephone service has grown from three percent in 2003 to [56 percent](#) in the second half of 2017.

U.S. and European Broadband Availability

According to European Union data, U.S. consumers enjoy greater competitive choice among facilities-based wired broadband providers than do their counterparts in Europe. As detailed above, as of mid-year 2017, wired broadband from two or more providers was available to 85 percent of Americans. By contrast, as of mid-2017, wired broadband from two or more providers was available to an estimated 45 percent of households in the EU’s 28 member states (EU28), assuming that telecom providers cover most of EU and the cable footprint largely overlaps them. See Chart 14.

Chart 14



FCC Consolidated Communications Marketplace Report

The FCC released a [draft](#) of its first consolidated Communications Marketplace Report on November 21, 2018. Among other things, the draft report addresses broadband availability, and it includes tables with selected data calculations based on year-end 2017 broadband deployment data. At the time of this writing, the FCC had not finalized the report and had not released the raw year-end 2017 deployment data to the public. A portion of the FCC's analysis overlaps with a portion of this analysis, and it uses data that is more current by six months. In particular, the FCC provides data on fixed broadband that is more current than USTelecom's fixed broadband data. In general, the FCC year-end fixed broadband data show what one would expect: greater penetration and increasing competitive availability of fixed broadband at various speed tiers from mid-year 2017 to year-end 2017.

Despite the limited overlap, the USTelecom analysis is different from the FCC's analysis in several ways. The FCC reports on fixed broadband in aggregate, which includes wired and fixed wireless broadband. USTelecom breaks out wired broadband from fixed broadband, and breaks out a range of technologies that the FCC does not, such as fiber, DSL, and cable. USTelecom also provides an approximate breakout by type of provider, especially cable and wireline telecommunications broadband providers. One minor difference between the two reports is that the FCC measures availability by population whereas USTelecom measures it by housing units. Population tends to show very slightly higher availability than housing units does; but the difference is negligible and USTelecom has discontinued reporting by population. See the Methodology and Appendixes below for details. Finally, the USTelecom analysis includes a discussion of appropriate analytical frameworks and additional historical perspectives that the FCC does not.

Conclusion

As of mid-year 2017, 97 percent of Americans had at least one wired broadband infrastructure available to them – 98 percent, if fixed wireless is included in the analysis. When it comes to broadband deployment, the U.S. is making steady progress, with providers deploying advanced technologies at ever-greater speeds. Moreover, there are competing wired broadband infrastructures in 85 percent of the country – 91 percent, if fixed wireless is included in the analysis. Nearly all Americans could get broadband service via mobile wireless and satellite. These technologies are improving.

While the FCC 477 data are not perfect, they are the best available and the risk of overstatement is minimal at broad geographic levels of aggregation. These broadband availability data highlight that U.S. broadband providers continue to deploy and upgrade networks rapidly, bringing the vast majority of consumers across the nation ever-faster service and choice in a reasonable and timely fashion. Selected year-end 2017 deployment data included in the FCC's draft consolidated Communications Marketplace Report are generally consistent with USTelecom's mid-2017 data and reinforce that broadband deployment and competitive availability are steadily increasing. When properly analyzed, the data reveal no lack of competition and no systemic market failure when it comes to deploying broadband in the U.S.

The presence of facilities-based competition is spurring ongoing investment in network upgrades across the nation, and as a result, both fixed and mobile broadband speeds are growing. Statistical market snapshots that arbitrarily understate the extent of broadband availability and competition are analytically deficient and can generate bad policy decisions. With respect to rural areas, there is not a monolithic broadband gap, but a range of areas that do not have sufficient broadband available to them. Policies must be targeted, addressing specific problem areas, and must be flexible to allow for economically efficient solutions. To ensure both economic and administrative efficiency, governments must distribute any public funds for rural broadband deployment directly to providers through mechanisms such as the FCC's Connect America Fund.

Methodology

Data and Analysis

USTelecom worked with its consultant, Telcodata, to produce this research. Telcodata's broadband research service, CensusNBM (CensusNBM.com), compiled the data for this analysis by combining the Federal Communications Commission's (FCC) broadband availability and U.S. Census housing unit data that is filed at the granular census block detail level and then consistently aggregated by Telcodata analysts to produce statistics for all 50 states plus DC. CensusNBM uses the 2010 Census, the last period that the Bureau produced a full tabulation of housing units, households, and population. For mapping and compatibility purposes, CensusNBM computed the broadband availability and Census information at the census block level in order to produce consistent broadband availability ratios. Census housing units and households track very closely, but housing units is a broader measure: it includes occupied homes, vacant homes and vacation homes; the household measure would include only occupied housing units.

The FCC has reported broadband availability data semi-annually using data collected using its Form 477 since year-end 2014. The FCC data in this analysis are for mid-year 2017. At the time of this writing, the FCC had released a draft report incorporating data from its year-end 2017 broadband availability data collection, but it had not released the full year-end 2017 data set to the public. The FCC reports broadband availability at the census block level by provider and by technology type, with maximum download/upload speeds.

The FCC reports the following fixed technology categories based on its Form 477 data collection:

- Asymmetric xDSL
- ADSL2
- VDSL
- Symmetric xDSL
- Copper
- Fiber
- Cable DOCSIS 3.1
- Cable DOCSIS 3.0
- Cable DOCSIS 1 - 1.1 - 2.0
- Cable Other
- Terrestrial Fixed Wireless
- Satellite

To enable certain analyses at higher levels than possible with the FCC-reported technology categories, CensusNBM created several broader groupings using. For example, CensusNBM created categories for all Cable technologies and all DSL technologies. It also created categories for Any Wired Technology except Cable – a category intended to include all wireline telecommunications providers; Any Wired Technology, which includes wireline telecommunications and cable providers; and Any Fixed Technology except Satellite, which combined Any Wired Technology and Terrestrial Fixed Wireless categories.

The following list represents the hierarchy of fixed broadband groupings and sub-groupings (see Appendixes):

- Any Fixed Technology except Satellite
 - Any Wired Technology
 - Any Wired Technology except Cable
 - DSL
 - > Asymmetric xDSL
 - > ADSL2
 - > VDSL
 - > Symmetric xDSL
 - Copper
 - Fiber
 - Cable
 - DOCSIS 3.1
 - DOCSIS 3.0
 - DOCSIS 1 - 1.1 - 2.0
 - Cable Other
 - Terrestrial Fixed Wireless
- Satellite

The process for creating the broader categories eliminates duplication when appropriate, such as instances where a single provider reported multiple technologies in the same area, or where multiple types of providers in a broader category reported facilities in the same area. For example, since the FCC's Form 477 requires ISPs to record each broadband technology in a census block and its associated download/upload speeds, there can be duplicate records for a single provider. Therefore, when calculating the number of housing units with “Any Wired Technology except Cable” as a category, CensusNBM counts the number of housing units in census blocks where a single ISP reports both DSL and Fiber just one time – not once for fiber and once for DSL. Similarly, when calculating the number of housing units with “Any Wired Technology” as a category, CensusNBM counts the number of housing units in census blocks where both wireline telecommunications and cable operators report facilities just one time. Note that, due to methodological technicalities, the processes for estimating availability by technology and competitive overlap may produce small, insignificant differences for overall aggregated availability.

History

The National Telecommunications and Information Administration (NTIA) collected broadband availability data semi-annually for the “National Broadband Map” from mid-2010 to mid-2014. Those data are similar to, but not the same as, the broadband availability data the FCC collects using its Form 477. As a result, it is not possible to produce precise consistent time series between the NTIA data and the FCC data; but it is possible to create some rough comparisons over time using high-level data.

As part of the National Broadband Map, NTIA produced several reports detailing results by discrete technology and speed categories. Thus far, the FCC has released a great deal of raw data and a mapping capability, and has used selected data in its Section 706 broadband deployment reports, but has not provided reports similar to those NTIA previously provided. USTelecom worked with CensusNBM to develop several reports similar to, though not identical, to the NTIA technology and speed reports. See Appendixes. In prior research briefs, USTelecom published broadband availability in the Appendixes as a percentage of housing units and as a percentage of population. Typically, the share of population is slightly greater than share of households; but the differences between share of housing units and share of population are extremely small. Therefore, publishing both housing unit and population shares adds little value.

Consumers usually purchase fixed broadband service at the household level. Since the major focus of this research is on fixed broadband, USTelecom is not publishing broadband availability as a share of population.

With the FCC data, CensusNBM has flexibility to create speed tiers, technology aggregates, and other reports. It does not have as much flexibility with the NTIA data. Below is a discussion of some of the relevant differences between the NTIA and the FCC data.

- The NTIA only provided speed data in ranges, such as “1.5 mbps to 3.0 mbps.” Certain speed thresholds that have become standards, like upload speeds “greater than 1.0 mbps” are not possible to ascertain with the NTIA data. In contrast, the FCC 477 data specifies unique maximum advertised speeds, such as “1.0 Mbps.” With such data points, as opposed to pre-defined ranges, it is possible for CensusNBM to create its own ranges or thresholds.
- The FCC 477 report identifies residential and business census blocks and further differentiates residential maximum advertised speeds from business/government maximum contracted speeds. Since the NTIA filings did not distinguish residential from business advertised speeds any comparison over time between the NTIA and FCC are not precisely compatible. Since the NTIA data also include business broadband deployment, earlier data will show relatively higher broadband availability results than the FCC 477 at comparable maximum advertised speeds.
- The NTIA data has only seven categories of fixed technologies, while the FCC data has 11.
- Unlike NTIA, the FCC data treats mobile wireless broadband differently than fixed broadband, so it is now not possible to report mobile data in the same manner as fixed broadband.

Geography

These data are national (50 states plus DC) with breakouts for rural and non-rural areas based on Census classification of census blocks. In terms of housing units, approximately 79 percent are in non-rural areas and 21 percent are in rural areas.

Appendix A – Mid-Year 2017 Broadband Availability by Housing Units, Download and Upload

US Broadband Availability by Technology and Speed, Mid-Year 2017, Selected Download and Upload Speeds (Percentage of Housing Units)

All Areas

Technology	Total HU Any Speed	Total HU ≥ 768 K DL / 200 K UL	Total HU ≥ 3 M DL / 768 K UL	Total HU ≥ 10 M DL / 1 M UL	Total HU ≥ 25 M DL / 3 M UL	Total HU ≥ 50 M DL / 5 M UL	Total HU ≥ 100 M DL / 10 M UL	Total HU ≥ 1 gbps DL
	Any Fixed Technology Except Satellite	98.5%	98.3%	97.6%	96.3%	92.4%	90.6%	83.4%
Any Wired Technology	96.8%	96.3%	95.2%	94.1%	91.0%	90.2%	82.9%	17.4%
Any Wired Technology Except Cable	92.9%	89.5%	82.4%	75.3%	57.3%	51.6%	28.3%	12.1%
DSL	89.1%	84.9%	75.5%	63.4%	38.4%	32.2%	4.0%	0.1%
Asymmetric xDSL	66.6%	55.8%	31.6%	15.8%	4.8%	1.7%	0.2%	0.1%
ADSL2	60.0%	48.4%	36.7%	20.9%	2.9%	0.0%	0.0%	0.0%
VDSL	39.3%	39.3%	38.8%	38.5%	33.8%	30.6%	3.9%	0.0%
Symmetric xDSL	0.9%	0.9%	0.4%	0.3%	0.2%	0.1%	0.1%	0.0%
Copper	2.1%	2.1%	2.0%	2.0%	0.4%	0.2%	0.2%	0.0%
Fiber	28.8%	28.8%	28.8%	28.8%	28.1%	24.9%	24.4%	12.1%
Cable	88.3%	88.3%	88.2%	88.1%	87.6%	87.1%	80.0%	5.8%
DOCSIS 3.1	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	55.8%	55.8%	55.8%	55.7%	55.3%	54.9%	47.8%	3.1%
DOCSIS 1 - 1.1 - 2.0	1.6%	1.6%	1.6%	1.5%	1.1%	0.4%	0.3%	0.0%
Cable Other	1.3%	1.3%	1.3%	1.3%	1.2%	1.0%	0.8%	0.3%
Terrestrial Fixed Wireless	37.8%	37.7%	35.8%	29.5%	15.7%	6.1%	5.1%	1.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%

Rural Areas

Technology	Rural HU Any Speed	Rural HU ≥ 768 K DL / 200 K UL	Rural HU ≥ 3 M DL / 768 K UL	Rural HU ≥ 10 M DL / 1 M UL	Rural HU ≥ 25 M DL / 3 M UL	Rural HU ≥ 50 M DL / 5 M UL	Rural HU ≥ 100 M DL / 10 M UL	Rural HU ≥ 1 gbps DL
	Any Fixed Technology Except Satellite	94.1%	93.3%	90.4%	85.2%	70.0%	63.8%	51.4%
Any Wired Technology	87.1%	85.1%	81.2%	76.7%	64.6%	62.1%	50.1%	13.7%
Any Wired Technology Except Cable	80.2%	75.5%	67.5%	57.2%	30.5%	26.9%	14.8%	8.2%
DSL	75.9%	70.4%	61.0%	48.8%	18.3%	14.7%	2.1%	0.1%
Asymmetric xDSL	49.6%	42.4%	31.0%	12.9%	4.5%	4.0%	0.4%	0.0%
ADSL2	49.7%	42.3%	34.8%	26.6%	1.1%	0.2%	0.0%	0.0%
VDSL	21.7%	21.7%	20.2%	19.7%	13.5%	10.8%	1.8%	0.0%
Symmetric xDSL	1.2%	1.1%	0.9%	0.7%	0.5%	0.4%	0.3%	0.0%
Copper	0.6%	0.6%	0.6%	0.4%	0.0%	0.0%	0.0%	0.0%
Fiber	16.0%	16.0%	16.0%	16.0%	15.0%	14.2%	12.8%	8.3%
Cable	54.4%	54.4%	54.1%	53.8%	52.5%	51.4%	42.7%	5.8%
DOCSIS 3.1	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	39.2%	39.2%	39.0%	38.9%	37.8%	37.0%	28.5%	2.9%
DOCSIS 1 - 1.1 - 2.0	2.0%	2.0%	1.8%	1.7%	0.8%	0.7%	0.4%	0.0%
Cable Other	1.5%	1.5%	1.4%	1.4%	1.1%	0.9%	0.7%	0.2%
Terrestrial Fixed Wireless	42.4%	42.2%	37.9%	29.3%	14.2%	4.4%	3.1%	0.2%
Satellite	100.0%	100.2%	99.9%	99.9%	99.9%	0.0%	0.0%	0.0%

Nonrural Areas

Technology	Nonrural HU Any Speed	Nonrural HU						Nonrural HU ≥ 1 gbps DL
		≥ 768 K DL / 200 K UL	≥ 3 M DL / 768 K UL	≥ 10 M DL / 1 M UL	≥ 25 M DL / 3 M UL	≥ 50 M DL / 5 M UL	≥ 100 M DL / 10 M UL	
Any Fixed Technology Except Satellite	99.7%	99.6%	99.5%	99.2%	98.3%	97.7%	92.0%	19.7%
Any Wired Technology	99.3%	99.2%	98.9%	98.7%	98.0%	97.6%	91.7%	18.4%
Any Wired Technology Except Cable	96.3%	93.2%	86.4%	80.1%	64.4%	58.1%	31.8%	13.1%
DSL	92.6%	88.8%	79.4%	67.2%	43.7%	36.8%	4.5%	0.1%
Asymmetric xDSL	71.1%	59.4%	31.7%	16.6%	4.8%	1.0%	0.1%	0.1%
ADSL2	62.8%	50.0%	37.2%	19.4%	3.4%	0.0%	0.0%	0.0%
VDSL	44.0%	44.0%	43.8%	43.6%	39.1%	35.8%	4.4%	0.0%
Symmetric xDSL	0.8%	0.8%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%
Copper	2.5%	2.5%	2.4%	2.4%	0.5%	0.2%	0.2%	0.0%
Fiber	32.2%	32.2%	32.2%	32.2%	31.6%	27.8%	27.4%	13.1%
Cable	97.3%	97.3%	97.3%	97.3%	97.0%	96.6%	90.0%	5.8%
DOCSIS 3.1	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	60.3%	60.3%	60.2%	60.2%	59.9%	59.7%	52.9%	3.1%
DOCSIS 1 - 1.1 - 2.0	1.5%	1.5%	1.5%	1.5%	1.2%	0.3%	0.3%	0.0%
Cable Other	1.3%	1.3%	1.3%	1.2%	1.2%	1.0%	0.8%	0.3%
Terrestrial Fixed Wireless	36.6%	36.5%	35.3%	29.6%	16.1%	6.6%	5.6%	1.5%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%

Source: FCC, USTelecom, and Telcodata CensusNBM.com

Appendix B – Mid-Year 2017 Broadband Availability by Housing Units, Download Only

US Broadband Availability by Technology and Speed, Mid-Year 2017, Download Speeds Only (Percentage of Housing Units)

All Areas

Technology	Total HU Any Speed	Total HU ≥768 kbps DL	Total HU ≥1.5 mbps DL	Total HU ≥3 mbps DL	Total HU ≥6 mbps DL	Total HU ≥10 mbps DL	Total HU ≥25 mbps DL	Total HU ≥50 mbps DL	Total HU ≥100 mbps DL	Total HU ≥1 gbps DL
Any Fixed Technology Except Satellite	98.5%	98.5%	98.2%	98.0%	97.3%	96.6%	93.0%	90.9%	89.0%	18.5%
Any Wired Technology	96.8%	96.7%	96.2%	96.0%	95.4%	94.5%	91.6%	90.5%	88.7%	17.4%
Any Wired Technology Except Cable	92.9%	92.9%	88.6%	87.5%	83.8%	76.3%	59.9%	50.9%	28.2%	12.1%
DSL	89.1%	89.1%	85.1%	83.2%	76.1%	66.0%	42.9%	32.5%	4.9%	0.1%
Asymmetric xDSL	66.6%	66.2%	56.8%	54.2%	46.5%	16.0%	5.4%	1.7%	0.9%	0.1%
ADSL2	60.0%	60.0%	48.3%	47.5%	39.9%	34.0%	9.4%	0.1%	0.0%	0.0%
VDSL	39.3%	39.3%	39.3%	39.0%	38.6%	38.6%	35.2%	30.7%	3.9%	0.0%
Symmetric xDSL	0.9%	0.9%	0.8%	0.4%	0.4%	0.3%	0.2%	0.1%	0.1%	0.0%
Copper	2.1%	2.1%	2.1%	2.1%	2.0%	2.0%	0.4%	0.2%	0.2%	0.0%
Fiber	28.8%	28.8%	27.6%	28.8%	28.8%	27.6%	28.2%	25.0%	24.6%	12.1%
Cable	88.3%	88.3%	88.3%	88.3%	88.2%	88.1%	87.7%	87.4%	86.6%	5.8%
DOCSIS 3.1	36.0%	36.0%	35.9%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	55.8%	55.8%	55.8%	55.8%	55.7%	55.4%	55.4%	55.1%	54.5%	3.1%
DOCSIS 1 - 1.1 - 2.0	1.6%	1.6%	1.6%	1.6%	1.5%	1.5%	1.1%	0.4%	0.4%	0.0%
Cable Other	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.2%	1.1%	0.8%	0.3%
Terrestrial Fixed Wireless	37.8%	37.7%	37.1%	36.0%	32.1%	30.5%	15.8%	6.2%	5.1%	1.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%

Rural Areas

Technology	Rural HU Any Speed	Rural HU ≥768 kbps DL	Rural HU ≥1.5 mbps DL	Rural HU ≥3 mbps DL	Rural HU ≥6 mbps DL	Rural HU ≥10 mbps DL	Rural HU ≥25 mbps DL	Rural HU ≥50 mbps DL	Rural HU ≥100 mbps DL	Rural HU ≥1 gbps DL
Any Fixed Technology Except Satellite	94.1%	94.1%	92.8%	92.2%	89.0%	86.2%	72.4%	64.5%	59.1%	13.9%
Any Wired Technology	87.1%	87.1%	85.1%	83.9%	81.3%	78.3%	67.2%	62.9%	57.8%	13.7%
Any Wired Technology Except Cable	80.2%	80.1%	73.7%	71.8%	65.7%	58.7%	35.1%	26.1%	16.0%	8.2%
DSL	75.9%	75.8%	70.3%	68.0%	60.6%	52.6%	25.5%	15.4%	4.4%	0.1%
Asymmetric xDSL	49.6%	49.3%	42.6%	39.8%	32.7%	13.6%	5.6%	4.1%	2.3%	0.0%
ADSL2	49.7%	49.5%	42.1%	41.3%	36.1%	32.0%	9.0%	0.2%	0.0%	0.0%
VDSL	21.7%	21.7%	21.5%	20.9%	19.9%	19.9%	15.2%	11.0%	1.8%	0.0%
Symmetric xDSL	1.2%	1.1%	1.0%	0.9%	0.7%	0.7%	0.5%	0.4%	0.3%	0.0%
Copper	0.6%	0.6%	0.6%	0.6%	0.6%	0.4%	0.0%	0.0%	0.0%	0.0%
Fiber	16.0%	16.0%	15.6%	16.0%	16.0%	15.6%	15.2%	14.5%	13.4%	8.3%
Cable	54.4%	54.4%	54.3%	54.3%	54.0%	53.9%	52.9%	52.0%	50.3%	5.8%
DOCSIS 3.1	36.0%	36.0%	35.9%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	39.2%	39.2%	39.1%	39.1%	38.9%	38.9%	38.2%	37.5%	36.3%	2.9%
DOCSIS 1 - 1.1 - 2.0	2.0%	2.0%	2.0%	2.0%	1.7%	1.7%	0.8%	0.7%	0.6%	0.0%
Cable Other	1.5%	1.5%	1.5%	1.4%	1.4%	1.4%	1.2%	1.1%	0.7%	0.2%
Terrestrial Fixed Wireless	42.4%	42.2%	38.9%	38.4%	32.7%	29.4%	14.3%	4.4%	3.1%	0.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	0.0%	0.0%	0.0%

Nonrural Areas

Technology	Nonrural HU Any Speed	Nonrural HU ≥768 kbps DL	Nonrural HU ≥1.5 mbps DL	Nonrural HU ≥3 mbps DL	Nonrural HU ≥6 mbps DL	Nonrural HU ≥10 mbps DL	Nonrural HU ≥25 mbps DL	Nonrural HU ≥50 mbps DL	Nonrural HU ≥100 mbps DL	Nonrural HU ≥1 gbps DL
Any Fixed Technology Except Satellite	99.7%	99.7%	99.6%	99.6%	99.5%	99.3%	98.4%	97.9%	97.0%	19.7%
Any Wired Technology	99.3%	99.3%	99.2%	99.2%	99.1%	98.8%	98.1%	97.8%	96.9%	18.4%
Any Wired Technology Except Cable	96.3%	96.3%	92.5%	91.7%	88.6%	81.0%	66.5%	57.5%	31.5%	13.1%
DSL	92.6%	92.6%	89.1%	87.2%	80.2%	69.5%	47.6%	37.0%	5.0%	0.1%
Asymmetric xDSL	71.1%	70.7%	60.6%	58.0%	50.2%	16.7%	5.4%	1.1%	0.5%	0.1%
ADSL2	62.8%	62.8%	50.0%	49.1%	40.9%	34.5%	9.5%	0.1%	0.0%	0.0%
VDSL	44.0%	44.0%	44.0%	43.9%	43.6%	43.6%	40.5%	36.0%	4.5%	0.0%
Symmetric xDSL	0.8%	0.8%	0.7%	0.3%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%
Copper	2.5%	2.5%	2.5%	2.4%	2.4%	2.4%	0.5%	0.2%	0.2%	0.0%
Fiber	32.2%	32.2%	30.8%	32.2%	32.2%	30.8%	31.6%	27.8%	27.6%	13.1%
Cable	97.3%	97.3%	97.3%	97.3%	97.3%	97.3%	97.0%	96.9%	96.3%	5.8%
DOCSIS 3.1	36.0%	36.0%	35.9%	36.0%	36.0%	36.0%	36.0%	36.0%	35.8%	2.6%
DOCSIS 3.0	60.3%	60.3%	60.2%	60.2%	60.2%	60.2%	60.0%	59.8%	59.4%	3.1%
DOCSIS 1 - 1.1 - 2.0	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.2%	0.3%	0.3%	0.0%
Cable Other	1.3%	1.3%	1.3%	1.3%	1.3%	1.2%	1.2%	1.1%	0.9%	0.3%
Terrestrial Fixed Wireless	36.6%	36.5%	36.6%	35.4%	32.0%	30.8%	16.2%	6.6%	5.6%	1.5%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%

Source: FCC, USTelecom, and Telcodata CensusNBM.com