BROADBAND IN VIRGINIA: VITAL FOR ECONOMIC DEVELOPMENT

Broadband service connects businesses and individuals to the global marketplace. It has flattened the world by allowing businesses to communicate and collaborate in ways never before possible.

– Matt McQuade, "The Importance of Broadband to Economic Development," Site Selection magazine, 2011

Up to 70 percent of the world's internet traffic flows through Northern Virginia. Tysons Corner became the home to MAE-East, one of the earliest internet exchanges and one of the building blocks of what would become the backbone of the internet. Firms such as Amazon Web Services, whose customers reputedly handle one-third of all daily internet messages, are located there. Northern Virginia and especially Loudoun County are dotted with internet data centers that underpin cloud computing.[1] Movers and shakers such as CACI and VeriSign inhabit this internet hothouse.

The internet by itself now generates an estimated 5 percent of the gross domestic product (GDP) of the United States and has been responsible for 21 percent of recent economic growth in mature world economies.[2] Broadband access and speeds – two keys to accessing the power of the internet – have become essential foundation stones for local and state economic development.

There is abundant empirical evidence available to support these conclusions. A 2006 econometric study of U.S. regions done at MIT found that the presence of broadband internet connections added 1.0 percent to 1.4 percent to the rate of growth of employment and 0.5 percent to 1.2 percent to the rate of establishment of new businesses. A 2007

1 For a fascinating history of how the internet developed in Northern Virginia, see Paul Ceruzzi, Internet Alley: High Technology in Tysons Corner, 1945-2005 (Cambridge: MIT Press, 2008).
2 James Manyika and Charles Roxburgh, "The Great Transformer: The Impact of the internet on Economic Growth and Prosperity," McKinsey Global Institute, 2011.

Brookings Institution study found that every 1 percent increase in broadband penetration in a state increased that state's employment by 0.2 percent to 0.3 percent annually.[3] A study published in Telecommunications Policy (December 2014), authored by Brian Whitacre et al., examined economic growth in rural areas of the United States between 2001 and 2010. The conclusion: "high levels of broadband adoption in rural areas positively (and potentially casually) impacted income growth between 2001 and 2010, and negatively influenced unemployment growth."

The potential of broadband internet connections to increase productivity and/or reduce costs is astonishingly great – up to $2.5 trillion in a single decade in health care and $11.6 trillion in global manufacturing if the "internet of things" is exploited. Industries with less dynamic reputations are not exempt: municipal energy and service provision entities could lower their costs by $757 billion in a decade.[4] (All of these estimates are viewed from 2015.)

Broadband currently is defined by the Federal Communications Commission (FCC) as representing internet speeds equal to 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads. The definition of broadband, however, is much less important than the reality that high-speed internet access has become a critical element of economic development and has reshaped how we live our lives.

For Virginia, the good news is that broadband access and speed have increased dramatically over the last decade. Nevertheless, access is not evenly distributed across the Commonwealth, with urban households being more likely to have access to broadband and broadband-related services than rural households. Another divide exists along income lines, which in turn implies the existence of racial and ethnic differentials. It will suffice for us to note that the urban/rural, rich/poor and racial/ethnic dichotomies present challenges to policymakers. Should high-speed broadband access be viewed in the same fashion as telephone service – something that should be made available to virtually every household, even if cross-subsidies are required to achieve this?

The FCC and the Virginia Office of Telework Promotion and Broadband Assistance both classify broadband access as "critical infrastructure." Understanding what broadband is, how it is delivered and how it can be utilized is essential to any policymaking and hence we will shift our attention to some internet and broadband basics.

What Is Broadband?

Simply put, "broadband" refers to methods of transmitting data on the internet at higher than usual speeds. To be sure, it always has meant internet speeds that are faster than traditional dial-up access via a telephone landline.

Internet speed, however, is a relative concept that is constantly evolving. internet download and upload speeds are measured in terms of megabits per second, or Mbps in shorthand.[5] In 1988, broadband meant speeds greater than 1.5 to 2 Mbps downstream – rather pokey when compared to the 2010 FCC definition of 4 Mbps downstream and 1 Mbps upstream, or the FCC's 2015 benchmark of 25 Mbps/3 Mbps. Even this latest benchmark is a subject of contention, with some members of the FCC arguing for a definition of 100 Mbps downstream. We'll stick with the 25 Mbps/3 Mbps definition until it is revised.[6]

In Virginia, as throughout the country, broadband delivery can occur by utilizing a range of technologies, including cable, fiber optic wire, digital subscriber lines, satellites and wireless. One can see in Table 1 that fiber optic use in Virginia exceeds the U.S. average. Other forms of transmission are close to this average, suggesting that broadband providers continue to leverage multiple means of broadband delivery.

3 Robert Crandall, William Lehr and Robert Litan, "The Effects of Broadband on Output and Employment: A Cross-Sectional Analysis of U.S. Data," Issues in Economic Policy (July 2007), www.brookings.edu.
4 Adam Thierer and Andrea O'Sullivan, "Projecting the Growth and Economic Impact of the Internet of Things," Mercatus Center, George Mason University, 2015.

5 Mbps is not, however, the same as MBps, which refers to megabytes per second and is used when one is measuring the size of files.
6 Those interested in greater detail on these or related issues are advised to read "The Role of State and Local Governments in Broadband Deployment," Southern Legislative Conference of the Council of State Governments, April 2016.

TABLE 1

BROADBAND DELIVERY METHODS: VIRGINIA AND THE UNITED STATES

	PERCENT OF POPULATION	
Technology	Virginia	Nationwide
DSL	83.9%	90.0%
Fiber	47.8%	25.4%
Cable	79.5%	88.8%
Wireless	99.2%	99.4%
Other	0.0%	0.0%

Source: Federal Communications Commission, National Broadband Map, June 2014

Broadband Connection Speeds And Penetration: International Comparisons

The United States has made significant advances in the deployment of broadband in the last two decades and typically leads the Americas in terms of connection speeds. Nevertheless, in fourth quarter 2015, the United States did not even rank among the top 10 countries in the world in terms of its average peak connection speed, which was 61.5 Mbps (see Table 2). Singapore's average peak connection speed of 135.7 Mbps dwarfs that of the United States.

The internet may have been founded in the United States, but the U.S. now lags several other developed countries in terms of broadband penetration. Broadband penetration averages 111 broadband subscriptions per 100 inhabitants in the United States. This may seem to be a large number, but the U.S. nevertheless clearly trailed Finland's 138 and Japan's 130 in the United Nations/Organization for Economic Cooperation and Development 2015 rankings.[7]

TABLE 2

TOP GLOBAL AVERAGE PEAK CONNECTION SPEEDS

1 Singapore	135.70
2 Hong Kong	105.20
3 South Korea	95.30
4 Macao	83.10
5 Japan	82.90
6 Indonesia	79.80
7 Mongolia	78.90
8 Taiwan	78.81
9 Qatar	77.80
10 Romania	73.60
Global Average	32.50

Source: Akamai, "Q4 2015 State of the Internet Report"

7 www.oecd.org/sti/ict/broadband

Broadband In Virginia

With 53 percent of households having adopted at least 25 Mbps/3 Mbps internet speeds, Virginia boasts the fifth-highest rate of broadband adoption among the states (see Table 3). Virginia's adoption rate is well above the U.S. average of 37 percent and almost 3.5 times that of North Carolina.

The Commonwealth ranks among the top 10 states in terms of its average peak internet connectivity speed, which is 77.5 Mbps (see Table 4). If it were a nation, Virginia would rank 10th in the world in terms of internet speed and well above the global average peak connectivity of 32.5 Mbps.

TABLE 3

ADOPTION RATES OF BROADBAND BY HOUSEHOLDS: COMPARING VIRGINIA TO OTHER STATES, 2015

Rank	State	Percent at Least 25 Mbps/3 Mbps
1	Massachusetts	68%
2	Maryland	59%
3	New Jersey	58%
4	New Hampshire	56%
5	Virginia	53%
6	Colorado	52%
7	Washington	52%
8	Vermont	51%
9	Oregon	49%
10	Pennsylvania	46%

Source: 2016 Broadcast Progress Report, Federal Communications Commission, www.fcc.gov

TABLE 4

AVERAGE PEAK CONNECTION SPEED FOR VIRGINIA

Quarter and Year	Average Peak Connection Speed Mbps	National Rank
Q4, 2012	37.0	9
Q4, 2013	59.2	2
Q4, 2014	73.5	2
Q4, 2015	77.5	6

Source: Akamai, "State of the Internet Reports," 2012-2015

THE URBAN-RURAL DIVIDE

Virginia mirrors the United States with regard to having an urban-rural divide in internet access and speeds. The gap between urban and rural areas in Virginia represents a public policy challenge because reality is that it reflects economic circumstances. Urban areas can better afford to deploy high-speed internet connections, not only because of greater wealth, but also because providers there usually can realize cost economies of scale when their customer base is concentrated together and easy to reach. It is much more expensive per customer to provide broadband access in rural areas than in urban areas.

As Table 5 discloses, in 2015, 11 percent of Virginians lacked access to "fixed advanced telecommunications capability," a federal statutory term that is slightly more inclusive than broadband.[8] However, the 11 percent number disguised the fact that only 3 percent of Virginians residing in urban areas lacked broadband access, while it was 38 percent in rural areas. The bottom line is that approximately 900,000 residents of the Commonwealth currently lack high-speed access to the internet.

Virginia's Center for Innovative Technology (CIT) recently provided a more up-to-date analysis. Graph 1 discloses that the CIT found 29 percent of those Virginians living in rural areas lacked access to

8 Note, however, that BroadbandNow (www.broadbandnow.com/Virginia) says that 16 percent of Virginians lack broadband coverage that provides them with at least 25 Mbps speeds downloading and 3 Mbps speeds uploading.

broadband services at any speed, while 47 percent did not have access at the 25 Mbps/3 Mbps threshold. On the other hand, 96 percent of those living in urban areas had access to broadband at the 25 Mbps/ 3 Mbps threshold or faster. Separately, www.broadbandnow.com/ Virginia reports that 11 of Virginia's largest 54 cities and towns now have 100 percent broadband coverage of their households. All of these 11 cities and towns are located in Northern Virginia.

Figure 1 provides a geographic view of broadband access in the Commonwealth. The Urban Crescent of Hampton Roads, Richmond and Northern Virginia benefits from 95-plus percent household broadband access, while a few other larger cities and college towns exhibit 80-plus percent household broadband access possibilities. Still, if one ignores population and considers only geographic areas, a majority of the surface area of the Commonwealth has fewer than 70 percent of households that have the ability to access the internet via high-speed connections.

Having broadband access, however, does not necessarily mean that this access is truly high speed. Figure 2 shows the percentages of households in each county that have access to the internet at various download speeds. As one might expect, higher-speed broadband penetration follows major urban corridors and interstates, but even then the pattern is surprisingly spotty. Literally, neighbors can find themselves dealing with different internet providers and therefore experience very different download speeds. One can see that circumstances frequently differ from one county or city to the next.

In May 2016, Gov. Terry McAuliffe announced a statewide initiative (RUOnline VA?) to identify and reduce the urban/rural broadband divide in Virginia. It is coupled with 2016 legislation that will make it easier to place broadband and telecommunications infrastructure in the rights-of-way of state-maintained roads throughout the Commonwealth. This will reduce the expense involved in serving rural customers.

TABLE 5

VIRGINIANS WITHOUT ACCESS TO FIXED ADVANCED TELECOMMUNICATION CAPABILITY, 2015

	Population Without Access	Percent of Population	Urban Population Without Access	Percent of Population	Rural Population Without Access	Percent of Population
United States	31,353,263	10%	9,001,161	3%	22,352,102	38%
Virginia	925,477	11%	186,349	3%	739,128	38%

Source: Federal Communications Commission 2016 Broadband Progress Report

THE INCOME AND EDUCATIONAL DIVIDE

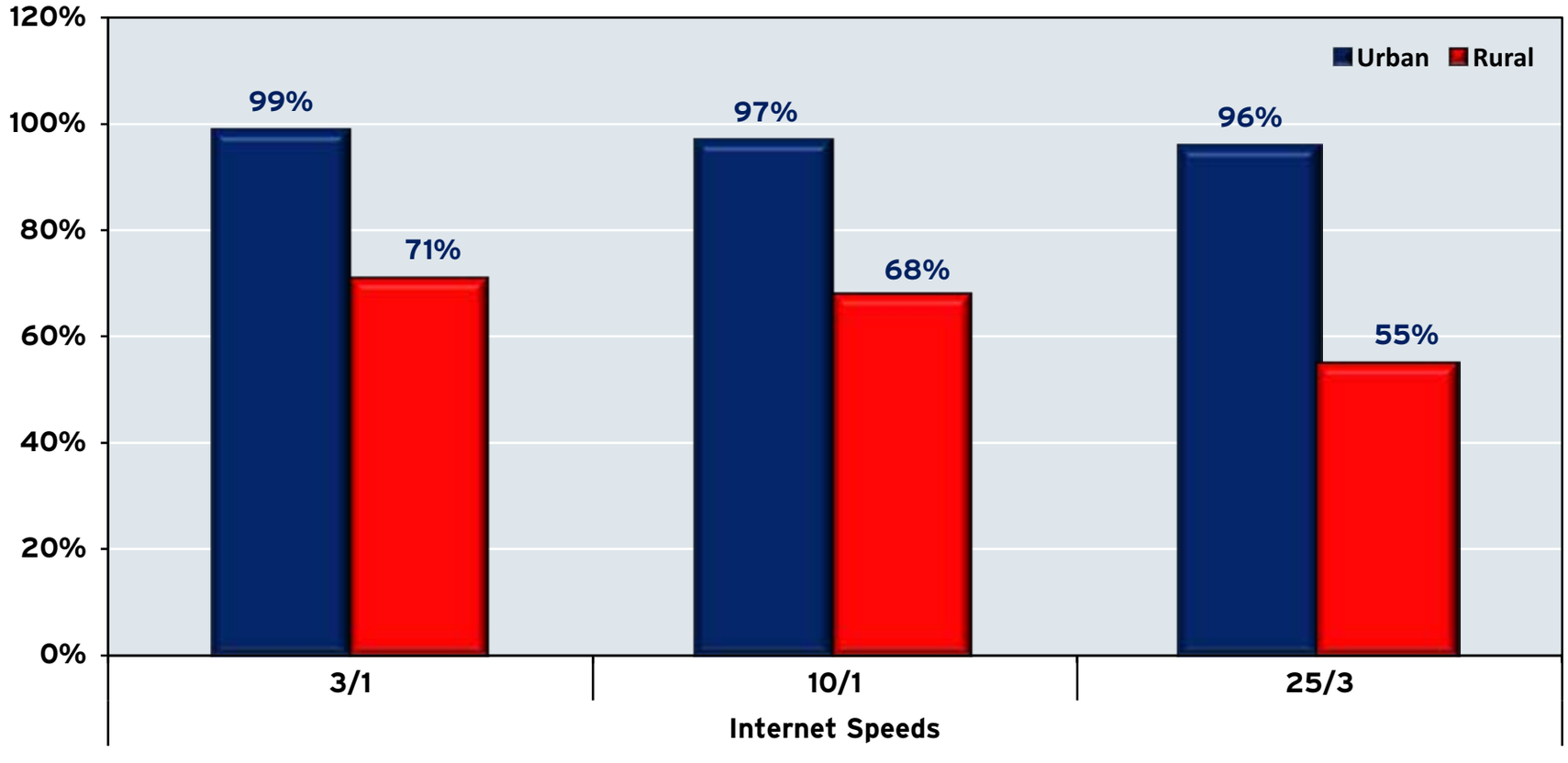
The Brookings Institution issued a report in December 2015 that focused on broadband adoption rates in the United States as a whole.[9] Brookings concluded: "Multiple factors – including higher levels of income, educational attainment and telecommuting – all have a positive and significant effect on broadband adoption rates." Graph 2, which is derived from Brookings data, drives home these points. There were observable links between income, age, education and employment and broadband adoption in 2014.

Table 6, also derived from Brookings data, reveals that the same general relationships held within the five largest Virginia metropolitan areas in 2014. One cannot help but be struck by the very low broadband adoption rates of non-Hispanic blacks and Hispanics. This has profoundly negative social and economic consequences and renders these individuals not only less employable, but also less informed, less able to communicate and less able to access many forms of entertainment. We will have more to say about this in a following section.

9 www.brookings.edu/research/reports2/2015/12/07-broadband-adoption-rates-metropolitan-areas-tomer-kane.

GRAPH 1

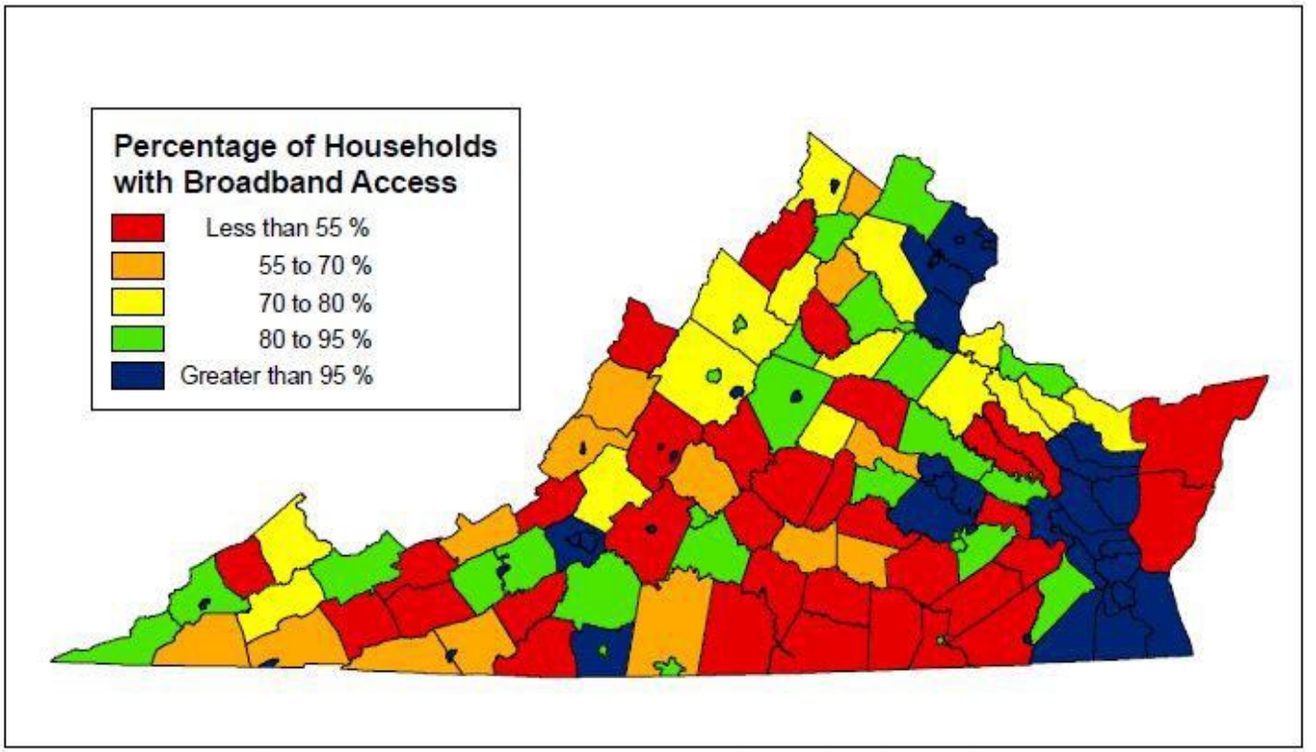
HOUSEHOLD PERCENT ACCESS TO BROADBAND IN VIRGINIA: URBAN VS. RURAL AREAS, 2015



Sources: Center for Innovative Technology, Virginia Tech and Virginia Geographic Information Network: "Broadband Activities in the Commonwealth: An Annual Status Report," October 2015

FIGURE 1

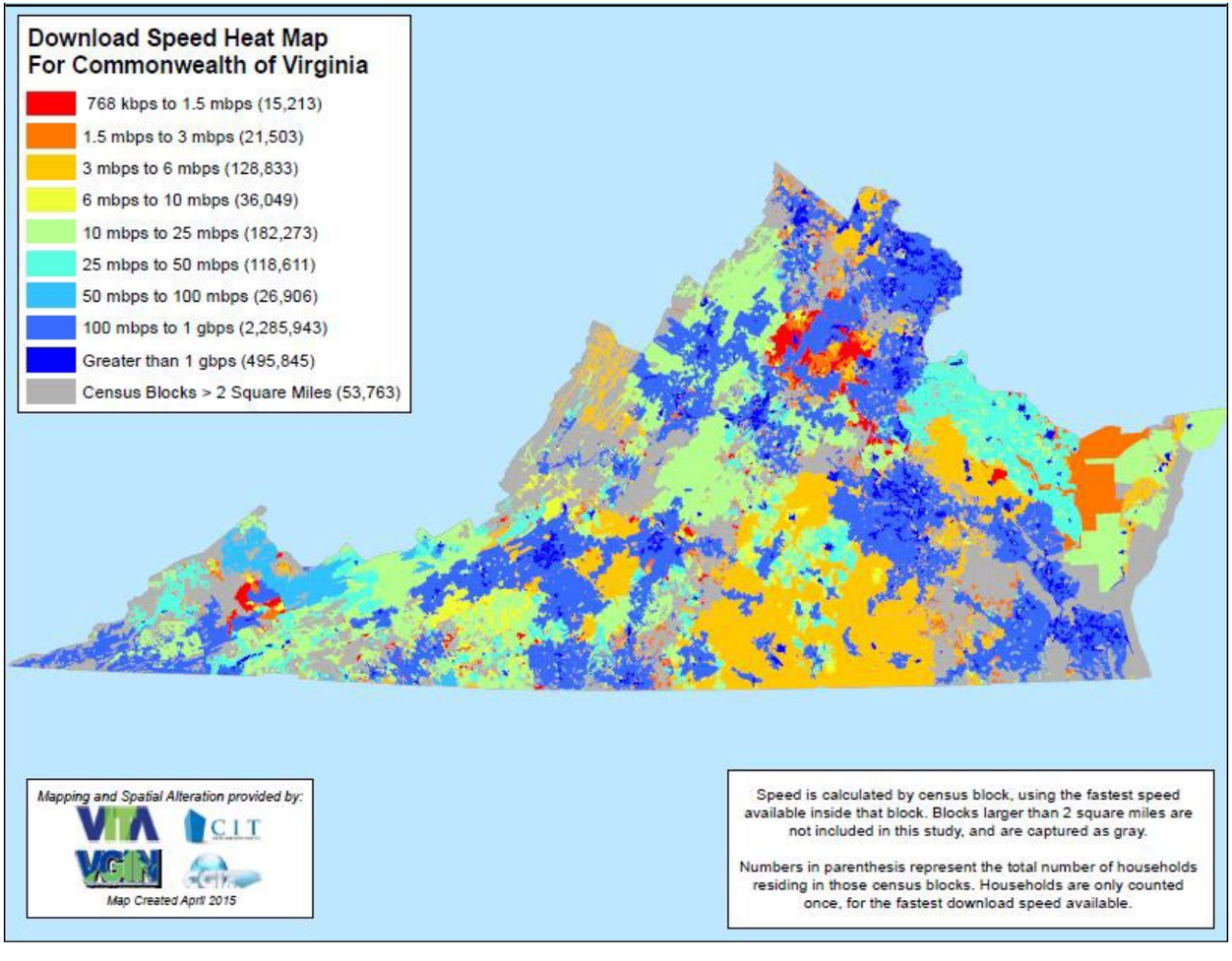
PERCENTAGE OF HOUSEHOLDS WITH BROADBAND ACCESS IN VIRGINIA COUNTIES, 2015



Source: Virginia's Center for Innovative Technology

FIGURE 2

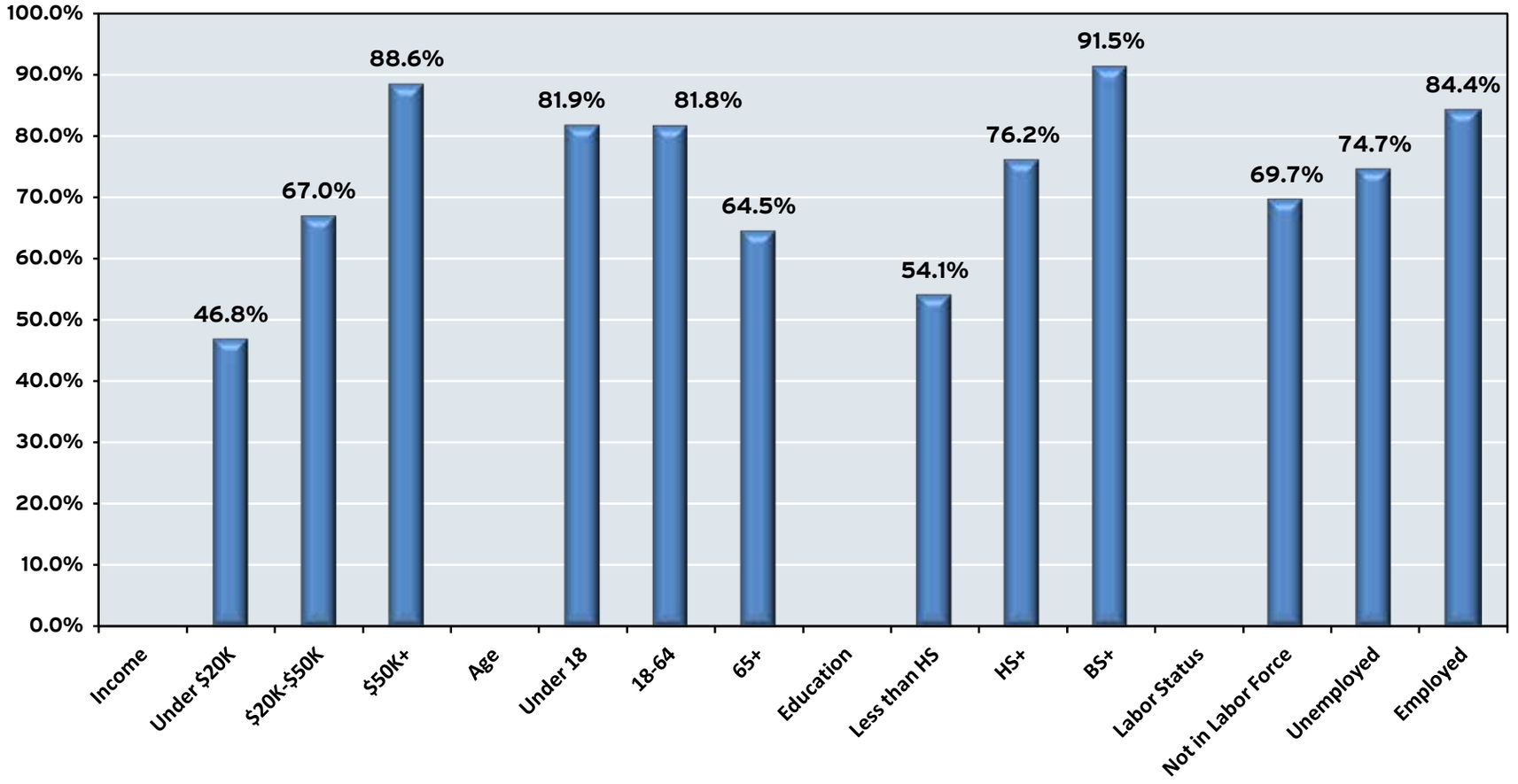
INTERNET DOWNLOAD SPEEDS BY GEOGRAPHIC AREA OF VIRGINIA, 2015



Source: Virginia's Center for Innovative Technology

GRAPH 2

INTERNET ADOPTION CHARACTERISTICS: UNITED STATES, 2014



Source: www.brookings.edu/research/reports2/2015/12/07-broadband-adoption-rates-metropolitan-areas-tomer-kane

TABLE 6

INTERNET ADOPTION CHARACTERISTICS: VIRGINIA, 2014

Metro Area	Percent HHs Broadband	Percent HHs $50K+	Percent Work at Home	Percent 25 Yrs+ with HS+	Percent 65+ Years	Percent Tech/Ed Workers	Average Mbps Download Speed	Percent Urban	Percent Non-Hispanic Black	Percent Hispanic
Lynchburg	64.3%	47.8%	3.4%	87.3%	15.4%	20.3%	18.6%	48.4%	17.2%	2.3%
Richmond	77.4%	59.3%	4.2%	88.4%	11.9%	25.1%	32.5%	80.7%	29.8%	5.4%
Roanoke	68.3%	52.1%	3.2%	88.5%	15.7%	19.1%	25.9%	68.1%	12.5%	3.4%
Wash DC	84.7%	74.1%	5.1%	90.2%	10.0%	39.9%	33.6%	92.4%	25.0%	14.4%
Va. Beach	78.9%	57.6%	3.1%	90.2%	11.3%	23.9%	32.4%	90.3%	30.2%	5.8%

Source: www.brookings.edu/research/reports2/2015/12/07-broadband-adoption-rates-metropolitan-areas-tomer-kane

Virginia's Center For Innovative Technology Leads The Way

In 2006, Gov. Tim Kaine established an Office of Telework Promotion and Broadband Assistance within the Office of the Secretary of Technology. This guaranteed that high-speed broadband internet access would become and remain a high priority for the Commonwealth. The secretariat actively promotes high-speed internet access via advocacy, administering funded programs such as those involving big data, promoting cybersecurity awareness and solutions, sponsoring workshops, and supporting eight regional technology councils and a broadband advisory council, etc. Among the councils, the Northern Virginia Technology Council is particularly active and sponsors 150 or more networking and educational events annually.

The Commonwealth's Center for Innovative Technology, a part of the technology secretariat, is specially tasked with promoting the spread and use of broadband in Virginia. It undertakes a wide variety of activities to pursue its portfolio, including producing useful maps that readily show the areas of the Commonwealth that have broadband coverage and the speeds associated with that coverage; promoting and assessing the use of information technology in health provision; assisting localities in mobilizing their resources to expand the reach of broadband in their regions; and assessing the economic impact of its broadband initiatives. Shortly, we will examine several of those initiatives.

The costly nature of broadband developments in rural areas and the relatively modest expected financial returns from such developments have

deterred many private firms from investing in broadband developments outside of urban areas. "Too many regulations and too expensive" was the concise evaluation of a senior executive of a large telecommunications firm when asked why that firm did not undertake more projects in rural areas.

Firms such as Comcast, Cox, DIRECTV, Time Warner, Verizon, Virginia Broadband, Windstream and XFINITY typically have focused on serving urban areas and have not been the recipients of National Telecommunications Information Agency (NTIA) funding.

CITIES AND REGIONS MOBILIZE

Virginia's Center for Innovative Technology has been the driving organizational element in the deployment of broadband in rural Virginia. The CIT utilizes its expertise to orchestrate projects that nearly always have multiple sources of funding and involve a variety of governmental units and organizations. In general, the extension of broadband to rural areas of the Commonwealth has involved extensive federal funding from multiple agencies, but most often via the U.S. Department of Agriculture or the NTIA's Broadband USA program, which has awarded more than $200 million in 13 grants to Virginia entities in the past several years. The recipients have included the CIT itself, the Mid-Atlantic Broadband Communities Corp. and the Bristol Virginia Utilities Authority. We will look at the latter two in greater detail.

The Mid-Atlantic Broadband Communities Corp. (MBC) has been operating an open-access, fiber optic network in Southside Virginia since 2004. MBC's creation was in partial response to the demise of the furniture, textiles and tobacco industries in Southside Virginia. This was one of the reasons the venture was able to receive more than $36 million in funding from the Virginia Tobacco Commission to enable it to get off the ground.

Already by 2006, MBC had laid 600 route miles of new fiber, connecting 20 counties and four cities in a network that included all major business, industrial and technology concentrations in the region. In 2012, MBC ended its cooperative governance structure and became a 501(c)(4) not-for-profit corporation. The MBC network now spans 1,800 route miles.

MBC asserts that it is responsible for 1,100 incremental jobs and $2.1 billion of private-sector investment in Southside Virginia (www.mbc-va.com/history). Private-sector investments have included data centers, call centers/operations centers, advanced manufacturing, research and development, and biotech industries. Most recently, MBC played a critical role in securing the expansion of a Microsoft data center project for Southside Virginia that will involve $346.7 million in private-sector investment and 90 attractive additional jobs. MBC participates in the Mid-Atlantic Research Infrastructure Alliance (MARIA), a membership that enables it to offer internet connections up to four terabits per second in selected instances.

The Bristol Virginia Utilities Authority (BVU) operates within a narrowly crafted segment of Virginia law that classifies broadband services as private business ventures, and this is why providers such as Comcast, Cox and Verizon inhabit this business space. No municipality classified as a "city" in Virginia currently has fewer than 12 alternate internet providers, according to www.broadbandnow.com/Virginia, and overall there are 133 different broadband providers in Virginia.

Even so, Code of Virginia sections §56-265.4:4 and §56-484.7:1 allow municipal electric utilities to become certified municipal local exchange carriers and to offer communications services that their systems are capable of supporting (cable television services are an exception), provided that they do not charge rates lower than incumbents, they do not subsidize services, and they impute private-sector costs into their rates. These restrictions clearly are attractive to private-sector broadband vendors because they effectively insulate them from price competition and price-cutting.

Because the Code of Virginia requirements and other Commonwealth regulations are so limiting, this has effectively discouraged local governments from entering the broadband business. There are some exceptions. A particularly interesting one involves the city of Bristol, which years ago used its municipal utility system as an umbrella to offer broadband services. Subsequently, Bristol was grandfathered when more restrictive regulations went into effect in 2002.

A BVU residential customer is able to purchase 250 Mbps download speed and 30 Mbps upload speed plus four email accounts and an IP address for $99.95 per month. These internet speeds are not blazing, but exceed those of most of rural and Southwest Virginia.

BVU provides electricity, water, wastewater and fiber-optic telecommunications and information services to the city of Bristol, Washington County and the town of Abingdon. BVU OptiNet is a nonprofit division of BVU that began in 2001 to provide telecommunications services to approximately 12,500 customers in Southwest Virginia.[10] BVU generally is acknowledged to be the first municipal utility in the United States to deploy an all-fiber network offering video, voice and data services.[11]

The utility received a federal award of $22.7 million that it combined with money from the Tobacco Indemnification Commission, the Virginia Department of Transportation and the Cumberland Peak Co. This enabled BVU to field 339 miles of fiber optic access to 5,600 residences, 220 businesses and 95 percent of all K-12 schools in an eight-county region of Southwest Virginia.[12]

BVU recently became newsworthy for less attractive reasons because it is alleged to have developed what the Roanoke Times labeled a "culture of corruption, entitlement and greed."[13] According to the Times, "the utility was rife with self-dealing, extortion, tax evasion and fraud" and this resulted in nine convictions and/or guilty pleas. While shattering, these conspicuous malfeasances did not alter the fact that BVU was the first of its kind in terms of a utility providing broadband access.

10 *The Bristol Herald Courier* reported on Feb. 5, 2016, that OptiNet, which generated $23 million in revenues in 2014-15, was up for sale. The reasons for this are not yet clear.

11 Bristol's program was challenged in the courts. In City of Bristol, VA v. Earley (145 F.Supp.2d 741, 745 W.D. Va. 2001), the court held that the City had authority to provide telecommunications services. However, in *Marcus Cable Associates, LLC v. City of Bristol* (237 F.Supp.2d 675, 678-79, W.D. Va. 2002), the same court held that the City did not have authority to provide cable television service. According to the court, the critical difference was that Virginia's statute authorizing localities to establish "public utilities" applies to telecommunications services, but not to cable television.

12 Approximately 40 percent of eligible residences later subscribed to broadband. This underlines a persistent reality – the fact that broadband is available does not mean that it will be used.

13 Dan Casey, "Bristol Virginia Utilities Shows Culture of Corruption, Entitlement and Greed," *Roanoke Times* (May 6, 2016), www.roanoke.com.

EDUCATIONAL INITIATIVES

Virginia's research universities have enjoyed higher internet speeds for some time via Internet2. They are members of the nonprofit Mid-Atlantic Research Infrastructure Alliance (MARIA), which provides campus connections up to 100 gigabits per second (Gbps), an almost unheard of speed only a few years ago. Translating this capability into research productivity and increased research funding, however, remains a challenge.

At the K-12 level, the Commonwealth's Department of Education not only is interested in connectivity – 94 percent of school divisions have a fiber optic connection – and connection speeds – 46 percent of school divisions have 100 kilobits per second (Kbps) speeds or better – but also in the prices school divisions pay for their internet access. Action seems merited in this area because only 5 percent of Virginia school divisions meet the NTIA's national goal of paying no more than $3 per Mbps for internet access (http://stateofthestates.educationsuperhighway.org).

Some public broadband ventures compete with private-sector broadband providers and this provokes understandable tension. An example in point involves the Roanoke Valley Broadband Authority, which operates a fiber optic network in Roanoke, Salem, and surrounding Roanoke and Botetourt counties. The authority asked the Roanoke County Board of Supervisors to provide $3.4 million in public funding for an expansion of the project – a notion that the Virginia Cable Telecommunications Association found wanting. The project previously had received $6.2 million in bonding authority from the Virginia Resources Authority. As of this writing, the issue is not yet settled. (See Carmen Forman in the Roanoke Times, May 12, 2016.)

Final Thoughts

Much of the modern development and maturation of the internet has taken place in Northern Virginia. Even so, more than half of our state's geographic area currently does not meet the 25 Mbps download speed/ 3 Mbps upload speed standard that is commonly used today to delineate what constitutes a genuine broadband connection.

Many in Virginia do not yet seem to understand that broadband internet connections have assumed an importance that rivals that of roads, bridges and highways. In a nutshell, broadband internet connections have become an essential part of our economic infrastructure. Economic success or failure in an increasingly wide range of ventures now depends upon one's ability to utilize the internet effectively and to harness the potential of broadband connections.

Is it now time to consider broadband internet connections in the same fashion we do telephone connectivity? Since 1985, the Federal Communications Commission's Lifeline Program has subsidized telephone carriers so that they can provide telephone connectivity in geographic areas where otherwise it would be entirely uneconomic to do so. The FCC did so because it concluded that telephone connectivity was fundamental not only for economic development, but also for citizenship and meaningful interpersonal relationships. On March 31, 2016, the FCC formally extended this policy to include discounted broadband internet coverage. It will take time and funds to implement this change, but it seems likely to reduce the rich/poor broadband gap that is apparent in Graph 2 for the United States and Table 6 for Virginia.

It is in the best interests of Virginia to diminish the urban/rural, rich/ poor and white/black differentials that currently exist in broadband coverage in the Commonwealth. An important economic reason is that such gaps reduce the quality of the labor force to which employers have access even while it diminishes their ability to access information, utilize modern technologies and sell to customers. It is not a good thing, for example, for only 29.8 percent of African-Americans in Richmond to have broadband access, while 77.4 percent of the overall Richmond population enjoys that status. The already large income and educational gaps that exist between the races will only become larger if the two groups have dramatically different levels of access to the internet tools that have become essential to economic prosperity.

Much the same conclusion would be reached if we were to focus on the urban/rural divide in broadband coverage that continues to persist in Virginia. Such disparities are a recipe for rising economic inequality and future distress.

Is state government the best available vehicle to address these challenges? Probably so – because there are many economic and social "spillover" effects generated by broadband internet deployment that no single individual or firm can take into account. These span the economic activity of schools, health care institutions, law enforcement, entertainment, the provision of governmental services, etc. Further, broadband access has stealthily become a vital part of our societal infrastructure and now occupies a role similar to that of roads, highways and bridges, for which the Commonwealth provides major funding.

Mark well that this does not mean Virginia itself should get into the business of supplying broadband infrastructure, or that it should become a broadband supplier that competes with private firms. **Nevertheless, it is appropriate for state government to provide its organizational talents and to supply partial funding for broadband activity even while it ensures coverage, seeks to minimize disparities and monitors quality levels. These are proper roles for government to assume because broadband benefits and costs spill over to virtually every citizen, whether or not they are aware that it is happening.**