Broadband Activities in the Commonwealth

An Annual Status Report

Presented to:

Governor Terry McAuliffe,

The General Assembly of Virginia, and the

Joint Commission on Technology and Science

November 2016

CIT CENTER FOR INNOVATIVE TECHNOLOGY

VGIN Virginia Geographic Information Network

CGIT Center for Geospatial Information Technology

VirginiaTech

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Legislative Mandate

§ 2.2-225 (Secretary of Technology) Monitor the trends in the availability and deployment of and access to broadband communications services, which include, but are not limited to, competitively priced, high-speed data services and internet access services of general application, throughout the Commonwealth and advancements in communications technology for deployment potential. The Secretary shall report annually by December 1 to the Governor and General Assembly on those trends.

§ 2.2-2699.4. (Broadband Advisory Council) The Council shall have duty to annually report to the Governor and the Joint Commission on Technology and Science on the progress towards the goal of universal access for businesses and on the assessment of Commonwealth broadband infrastructure investments and utilization of Council-supported resources to promote broadband access.

Executive Summary

The Center for Innovative Technology's (CIT) Broadband service line remains the only resource in Virginia that is solely focused on expanding broadband access and adoption throughout the Commonwealth. In 2016, CIT and its partners, Virginia Tech's Center for Geospatial Information Technology (CGIT) and Virginia Information Technology Agency's (VITA) Virginia Geographic Information Network (VGIN) continued to work towards Governor McAuliffe's goal of ubiquitous, affordable broadband access and ensuring its citizens and localities are realizing the benefits broadband brings.

CIT is committed to driving broadband expansion at the local level. Through use of its NASCIO award-nominated methodology, in 2016 CIT provided direct assistance to many localities, some of which are considered the most unserved in the Commonwealth. As a result of the assistance, these localities are better positioned to pursue broadband solutions and have either established public-private partnerships or are on the path to doing so in the months ahead. There are, however, many unserved and underserved localities in the Commonwealth that also need to define their broadband goals and set their path to improved broadband by leveraging CIT's assistance and a proven methodology.

In May Governor McAuliffe announced the RUOnlineVA campaign – a statewide, crowdsourcing initiative designed to identify, document and analyze Virginia's areas of greatest "unmet" broadband demand. RUOnlineVA, led by CIT, was a key component of the Governor's 2016 strategy to increase connectivity throughout the Commonwealth. The survey received more than 15,000 responses and received strong support from a number of agencies, associations, and counties.

Libraries are increasingly becoming an integral part of community connectivity by providing Internet access as well as technology training and workforce development. Working closely with the Library of Virginia and Virginia Tech's Center for Geospatial Information Technology (CGIT), CIT conducted the second annual Library Broadband Assessment. This year's assessment was more comprehensive and provided greater insight into how much libraries in the Commonwealth are paying for broadband and the quality of service they're receiving. In addition to better understanding Virginia library's connectivity and usage, the assessment helps to ensure that libraries are fully leveraging resources available to them.

The Virginia Broadband map continually evolves to consume available federal data to present broadband availability, demand and assets. The latest edition of the map is contained within Virginia's Integrated Broadband Planning and Analysis Toolbox (IBTX) and allows users to view RUOnlineVA data, population density, vertical assets, and other themes all in comparison to reported broadband coverage. The new features were added to facilitate improved broadband assessment and planning and expedite expansions and utilization to support the New Virginia Economy.

The Virginia broadband team has made great strides in 2016 to improve broadband in the Commonwealth. This report highlights Virginia's current broadband environment and the initiatives and activities that have occurred in the past year. This report also provides recommendations that will help to improve broadband access and adoption in the Commonwealth.

Broadband Recommendations

The majority of broadband in Virginia and across the nation has been deployed because it was profitable for the private sector to deliver the service. In rural and less populated areas the cost to deliver the service often exceeds the potential revenue. Leaders at all levels of government realize the necessity of broadband to support many aspects of life today and into the future as we witness increased innovation and technological advancements. There is a gap between the Internet service that every home and business should have and what was profitable to build. How we bridge this gap is the basis for continued work and focus of many broadband industry experts and evangelists across this nation. This is not an easy gap to bridge and there is not one answer for every unserved or underserved area. The technologies leveraged to deliver Internet service continue to evolve and advance daily. We cannot predict what technology may resolve this gap in the future; however, we are certain there must be enough capacity coming into an area to meet the community's broadband needs to support education, public safety, healthcare and economic development. We can certainly build and deploy the infrastructure needed to deliver Internet service if there is enough funding to cover the capital expenses, however, the resulting networks must be self-sustaining and profitable enough to fund upgrades and expansions in capacity to support future demand.

The following recommendations are based on CIT's extensive knowledge of broadband and many years of working directly with Virginia localities. These items are considered critical to expanding broadband throughout the Commonwealth.

Virginia should target state broadband funding to unserved and underserved areas with priority for areas with documented unmet demand.

Unmet demand can mean two things; gaps in service or quality of service issues. For many reasons, unmet demand exists and if locally widespread, can have a serious impact on education, healthcare, public safety and economic development.

Virginia is fortunate to have service providers deploying a mix of technologies including fiber, copper, cable and fixed wireless (including whitespace technology) to deliver fixed Internet access throughout the Commonwealth. Nevertheless, our rural and less populated areas are struggling with lack of access and/or limited capacity.

To underscore the level of funding that is required to expand broadband access and capacity in Virginia, CIT gathered information about investments made by industry, federal and state government over the past 3-5 years. **A conservative estimate of over $1 billion** has been invested by the private sector in the past three to five years to expand broadband in the Commonwealth. This total includes over $14 million by fixed wireless providers, over $191 million by incumbent wireline providers and over $800 million by the cable industry. These totals are not comprehensive as all providers were not willing and/or able to respond to our request in time for this report. Communities and providers have also successfully obtained over $7 million in federal telecommunications funding from the USDA alone over in the past 3

years. The Commonwealth has awarded hundreds of thousands in funding to localities to support broadband expansion and has allocated $1.25 million in fiscal year 2017 to fund construction of broadband infrastructure (Virginia DHCD's VATI program mentioned below). There is no doubt that the Commonwealth's citizens and businesses are benefiting from these investments, yet there remains a large segment of the population that does not have adequate Internet access.

The Commonwealth must ensure every Virginia citizen, business, school, library, first responder and health care provider has adequate and affordable access to the Internet. The new state funding for broadband expansions recently announced by Virginia's Department of Housing and Community Development (DHCD); the Virginia Telecommunication Initiative (VATI) will provide financial assistance to supplement construction costs by private sector providers to extend services to areas that are presently unserved by any broadband provider. DHCD's attention to unserved areas is an important first step in furthering the expansions of broadband into areas of need. In many unserved areas, VATI funding may be the only way to offset the economics of deploying new broadband services.

Details and Cost Estimate: Considering there are more than 52 underserved localities and the cost of expansions in rural areas, the Commonwealth should allocate whatever is feasible within the state budget as long as documented unmet demand exists. Several states have allocated funding to help offset the costs of broadband expansions such as Virginia's VATI funding: California, $10 million; New York, $500 million; Wisconsin, $1.5 million annually, Minnesota, $35 million.

Virginia should formally engage broadband service providers to help identify state and local policies that can be made more favorable for broadband deployment.

Broadband favorable policies are being addressed at the federal level (FCC). CIT is working at the local level to help localities identify policy related barriers to deployment. CIT created "The Path" as a way to help Virginia localities streamline the process of local broadband expansion. Leveraging Virginia's Broadband Toolkit, CIT's Path to improved broadband aims to eliminate as many local barriers as is reasonable to improve the economics for broadband expansions in less populated areas.

Broadband supports all sectors of the New Virginia Economy and it is going to take the public and private sectors working together to further expand broadband across the Commonwealth. The public sector is best positioned to identify the broadband goals and priorities for their communities. The private sector is best positioned to deliver broadband services. There may be situations in which a locality can facilitate the delivery of new services to help offset the economics for the providers. For instance, if infrastructure is lacking, a locality may be able to fill an infrastructure gap to assist the private sector in reaching a distant location. Otherwise, more efforts to improve the economics of broadband expansions such as lowering costs through broadband friendly policies, incentives to stimulate private sector investments in areas with a longer return on investment, additional funding targeting areas of documented unmet demand or needing additional capacity and supporting and promoting awareness and adoption programs are Virginia's best path forward to further advance the benefits of broadband.

CIT currently receives $500,000 annually to provide technical assistance to local governments, staff the Broadband Advisory Council and manage and support the Governor's Office of Telework Promotion and Broadband Assistance. CIT began functioning under this funding in the spring of 2015 once the federally funded state broadband initiative ended. Because federal funding didn't end until the third quarter of FY15, state funding wasn't tapped until then, there was funding remaining at the end of the fiscal year. CIT has been allowed to roll unused funding from prior years and has expended more annually than what is allocated.

Details and Cost Estimate: An estimated cost of $250,000 which is based on providing additional funding (above the current $500,000) to CIT to expand technical assistance to a greater number of localities per year. The Broadband Advisory Council should include at least one session per year dedicated to hearing state policy recommendations to lower deployment costs from the various Internet service provider industry leaders.

Virginia should consider another RUOnlineVA campaign to obtain more extensive data from more localities.

The data from the RUOnlineVA campaign (discussed later in this report) has already been proven to be valuable for several localities. RUOnlineVA data has provided the basis for local assessments in several counties currently engaged in broadband expansion projects. By targeting areas of unmet demand and aggregating demand across the locality three of the fourteen most responsive localities are on their way to meeting their broadband goals by partnering with the private sector.

Where sufficient, RUOnlineVA data has proven its value in helping localities to understand their broadband environment and needs. Unfortunately, many counties were not adequately represented in the data. Some of the most unrepresented are localities that appear to be deficient in broadband access based on the FCC 477 coverage data.

As with many things in life that we do for the very first time, you immediately identify things you wish you had done differently. The same is true with the RUOnlineVa campaign. This campaign ran during summer vacation months and ideally should be conducted during the winter months when people are more likely to be at home and school is in session (schools are immensely helpful is getting the message out). There were many citizen inquiries after the campaign closed, highlighting how long it took for the news about the campaign to disseminate throughout the state. Based on the feedback, there needs to be a longer lead time before launch to support a more extensive marketing and outreach campaign to stimulate greater participation. Finally, during the data cleansing and validating process it was discovered that some data should be formatted differently to lessen the effort required validating data and the survey needed additional questions to provide a more comprehensive view of the demand.

Details and Cost Estimate: The 2016 campaign leveraged the CIT staff and Virginia Tech's CGIT staff under CIT's current broadband funding. An estimated cost of $28,000 will be needed to run another RUOnlineVA campaign. This figure is based off of costs from the 2016 campaign with additional funding to support greater marketing effort to solicit wider participation, modifications to the survey format to capture additional data and longer campaign duration.

Virginia should support and promote adoption and awareness initiatives to ensure all Virginians recognize the value of broadband access.

Almost a quarter of RUOnlineVA respondents indicated that they have no Internet service. It is important to research some of these locations and the FCC coverage data compared to RUOnlineVA "No Service" response locations because often times broadband services are available to many of those respondents. The survey did not provide the ability for a respondent to offer an explanation of why they do not subscribe to the service; this ability may be considered if the survey is repeated.

According to national studies various factors influence why citizens do not subscribe to broadband services when they are available. Industry reports set the average take rate at about 40%. In rural, less populated and remote areas a low take rate works against the economics for deploying new services.

Also, affordability and age are among the most common factors that influence whether a person subscribes to a broadband service. In both cases, adoption and awareness programs can remove barriers to adoption and help change the economics of broadband expansions. These programs help citizens understand how they can leverage broadband access to improve their quality of life and enable economic, educational, and occupational and health related opportunities. It is important to ensure Virginians are realizing the benefits of broadband to improve their lives and their communities.

Details and Cost Estimate: This effort could be accomplished by leveraging CIT resources to broadly distribute the information to local governments, civic groups and libraries for an estimated cost of $25,000 of additional funding allocated to the CIT Broadband program. For reference, Nebraska and Minnesota are allocating $500,000 for adoption programs.

Virginia should formally adopt/encourage state/local Dig Once policy to facilitate further and faster expansion of broadband.

State/local franchise agreements should be reviewed for long-drop policy, and that information should be conveyed to all new homebuilders, and real estate developers.

Local planning departments should encourage real estate developers to consult/collaborate with local broadband service providers for provisioning service or installing conduit during the plan review process.

Virginia should consider tax incentives to lessen the cost burden of the installation of broadband conduit in any new housing development or home build.

The cost of constructing and expanding broadband networks is capital intensive. Much of the cost of expanding networks to bring services to new housing developments or new homes with long driveways (known as "setbacks" or "long-drops") can be attributed to the lack of preparation for broadband infrastructure by real estate developers and homeowners. The same considerations a developer or home owner uses for provisioning electrical or water infrastructure to new developments should be given to broadband infrastructure as well. It is much easier to

accommodate these costs during the planning and construction phases than after construction is completed.

The cost to the developer for providing the infrastructure for power, water or other utilities is built into the price of the home. When a fixed broadband provider has to bring their services in after other utilities have been installed, the cost escalates and may be prohibitive. The simple addition of including broadband quality conduit along roads and/or driveways of new developments would enable providing broadband services to new locations much faster and at less cost. This strategy is the basis of the federal "Dig Once" policy agenda.

Dig Once is intended to help lower the costs and speed up the deployment of laying broadband infrastructure. Localities across the country have adopted dig once policies to streamline and simplify the process of installing or upgrading broadband equipment. For instance Santa Cruz California instituted a dig once policy that stipulates whenever there is construction, reconstruction, or repaving work in or adjacent to a county rights of way, provisions will be made to include "the installation of telecommunication cable, conduit or other related equipment whenever practical or feasible[1]."

Details and Cost Estimate: CIT currently works with local governments on policy reviews, franchise agreements reviews and policy recommendations are shared with the Broadband Advisory Council under current CIT broadband funding. State agencies such as DHCD and VDOT should evaluate state legislation affecting their areas to identify policy changes that can lower broadband deployment costs. Several states offer tax incentive programs such as tax credits for qualified broadband expenditures, sales tax exemption for broadband technology equipment used to expand broadband access, and tax exemption for equipment used in broadband deployments into unserved areas. The cost to the Commonwealth would be dependent on the criteria set and the current tax revenue against those equipment sales.

Virginia should give preference (points) to localities seeking funding that have adopted favorable broadband policies. Ideally this should be applied to DHCD's new VATI program.

Policies that reduce barriers for expanding broadband, establish favorable broadband environments that are attractive to service providers. Virginia's Rural Broadband Bill (HB912) is a great example of a broadband favorable policy. The provisions of HB912 allow broadband providers to leverage areas along rural roads to deploy their infrastructure to expand into underserved and unserved areas. While seemingly a small change in law, HB912 removed a large barrier that has the potential to have a big impact on broadband expansion in Virginia's rural communities. The one service provider in Virginia, CenturyLink that accepted the FCC's Connect America Fund Phase II (CAFII) subsidy noted that without HB912 "participation in CAFII would have been put in serious risk." HB912 helped make the business case for

[1] http://www.tellusventure.com/downloads/bank/santa_cruz_county_dig_once_ordinance_2015.pdf

CenturyLink to accept the CAFII funding for Virginia. HB912 represents the kind of policy change that is needed to enable the expansion of broadband services for all Virginians.

Policies at every level of government should be examined to identify ways of streamlining and decreasing the costs of broadband deployments, for example reducing or waiving permitting costs for expanding broadband. Reducing barriers with broadband favorable policy helps to improve the economics and incentivizes providers to expand broadband across the Commonwealth.

Details and Cost Estimate: This recommendation could be implemented as part of the criteria/scoring of the VATI program and any future broadband funding programs.

Virginia Standings

National Broadband Standings

The Q1 2016 Akamai State of the Internet report ranks Virginia among the top ten in numerous categories; however Virginia's ranks have fallen from 2015.

- **Virginia fell from #2 to #9 nationwide in average connection speed with a -1.8% year-over-year change.**
  - In 2015 Akamai removed traffic coming from major cloud hosting providers since typically cloud services data centers have extremely fast internet connections which skews the metrics. Although Virginia's ranking has dropped, its quarter over quarter change remains positive which indicates broadband speeds in Virginia continue to improve.
- **Virginia fell from #3 to #4 nationwide in average peak connection speed with a 7.7% increase year-over-year.**

	State	Q1 2016 Avg. Mbps	QoQ Change	YoY Change
1	District Of Columbia	24.0	13%	48%
2	Delaware	21.2	3.6%	21%
3	Rhode Island	20.0	4.6%	30%
4	Massachusetts	19.9	7.1%	29%
5	Utah	19.7	10%	26%
6	New Jersey	18.5	7.3%	39%
7	Maryland	18.4	4.4%	40%
8	New York	18.0	7.6%	34%
9	Virginia	18.0	4.7%	-1.8%
10	Washington	17.4	3.9%	14%

	State	Q1 2016 Peak Mbps	QoQ Change	YoY Change
1	District Of Columbia	93.0	13%	22%
2	Delaware	92.2	4.4%	15%
3	Massachusetts	86.8	6.8%	23%
4	Virginia	84.9	9.6%	7.7%
5	Maryland	84.5	5.9%	32%
6	Utah	84.0	13%	24%
7	Rhode Island	83.5	5.5%	20%
8	New Jersey	83.0	7.4%	31%
9	Washington	78.6	6.5%	16%
10	New York	78.2	7.6%	24%

The report also ranked Virginia 8th nationwide in both broadband adoption of 10mbps and 25mbps as well as 7th in broadband adoption of 15mbps.

Virginia Broadband Coverage

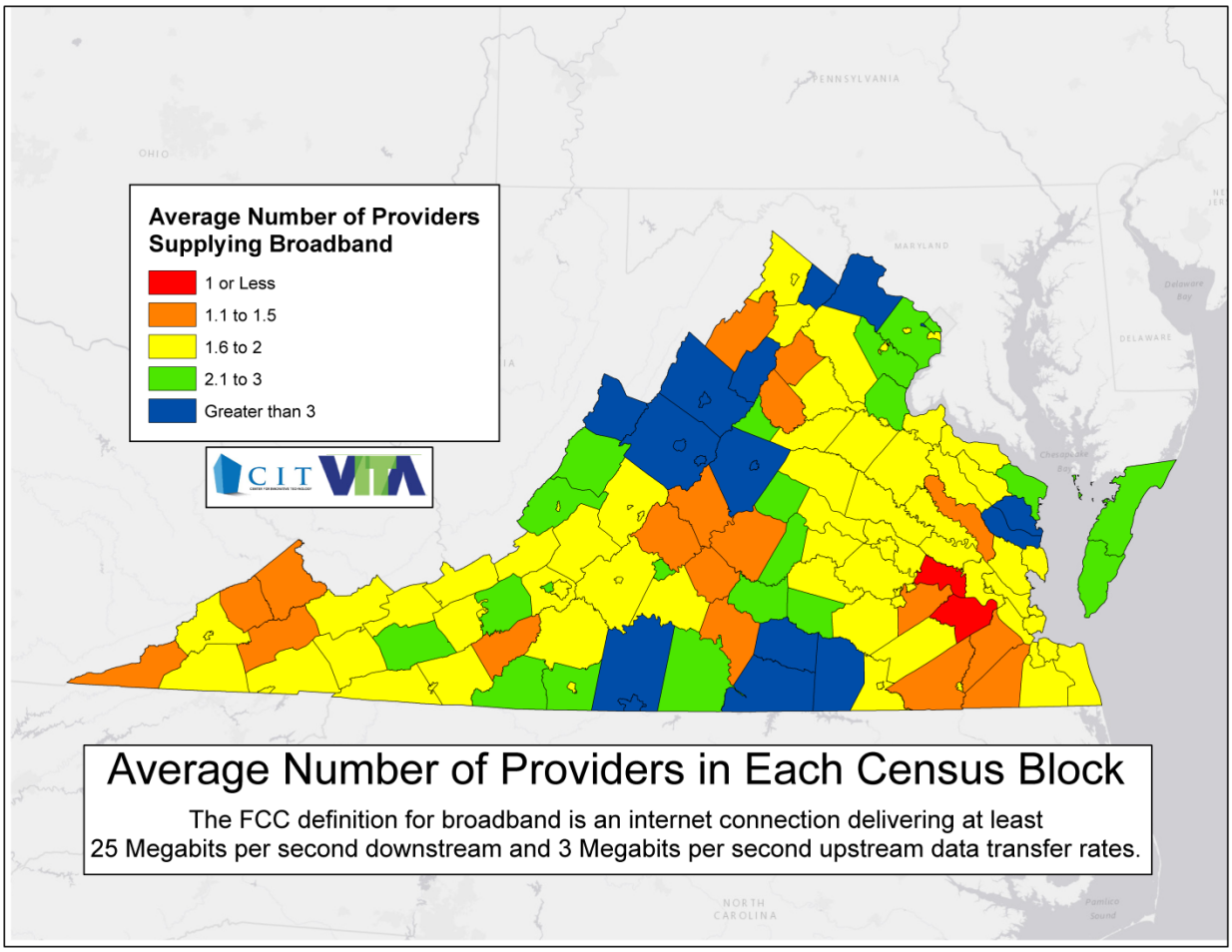
Based on data collected by CIT and partners, Virginia Tech and VGIN, the following chart shows the progression of expanding broadband coverage to citizens across the Commonwealth of Virginia from 2010 to 2016. This data was collected in December 2015 and is based off of the FCC's 477 data which is provider-submitted data and is often overstated. The numbers pertaining to the earlier years are skewed since it took a few years to collect data from all providers.

	Population of the State	Total Population with Coverage	Percentage with Coverage
2010	8,001,024	2,540,371	32%
2011	8,001,024	4,832,810	60%
2012	8,001,024	7,283,916	91%
2013	8,001,024	7,339,793	92%
2014	8,001,024	7,379,999	92%
2015 (NTIA)	8,001,024	7,356,578	92%
2015 (477)	8,001,024	7,747,705	97%
2016	8,001,024	7,752,806	97%

It is important that citizens have options in regards to Internet service providers in order to ensure quality of service and competitive pricing. The following chart shows the average number of providers available per census block for the blocks that have coverage. According to this data, more than 69% of the localities (and 60% of households) in the Commonwealth have fewer than 2 providers on average.

Number of Providers per Census Block, average across the locality	**Number of Localities** (134 localities in the Commonwealth)	**Percentage of Localities in this class**	**Households** (3,364,939 total in the Commonwealth)	**Percentage of Commonwealth Households**
1 or Less	2	1.49%	6,673	0.20%
1.1 to 1.5	18	13.43%	197,777	5.88%
1.6 to 2	73	54.48%	1,825,317	54.25%
2.1 to 3	33	24.63%	1,166,365	34.66%
More than 3	8	36.57%	168,807	5.02%

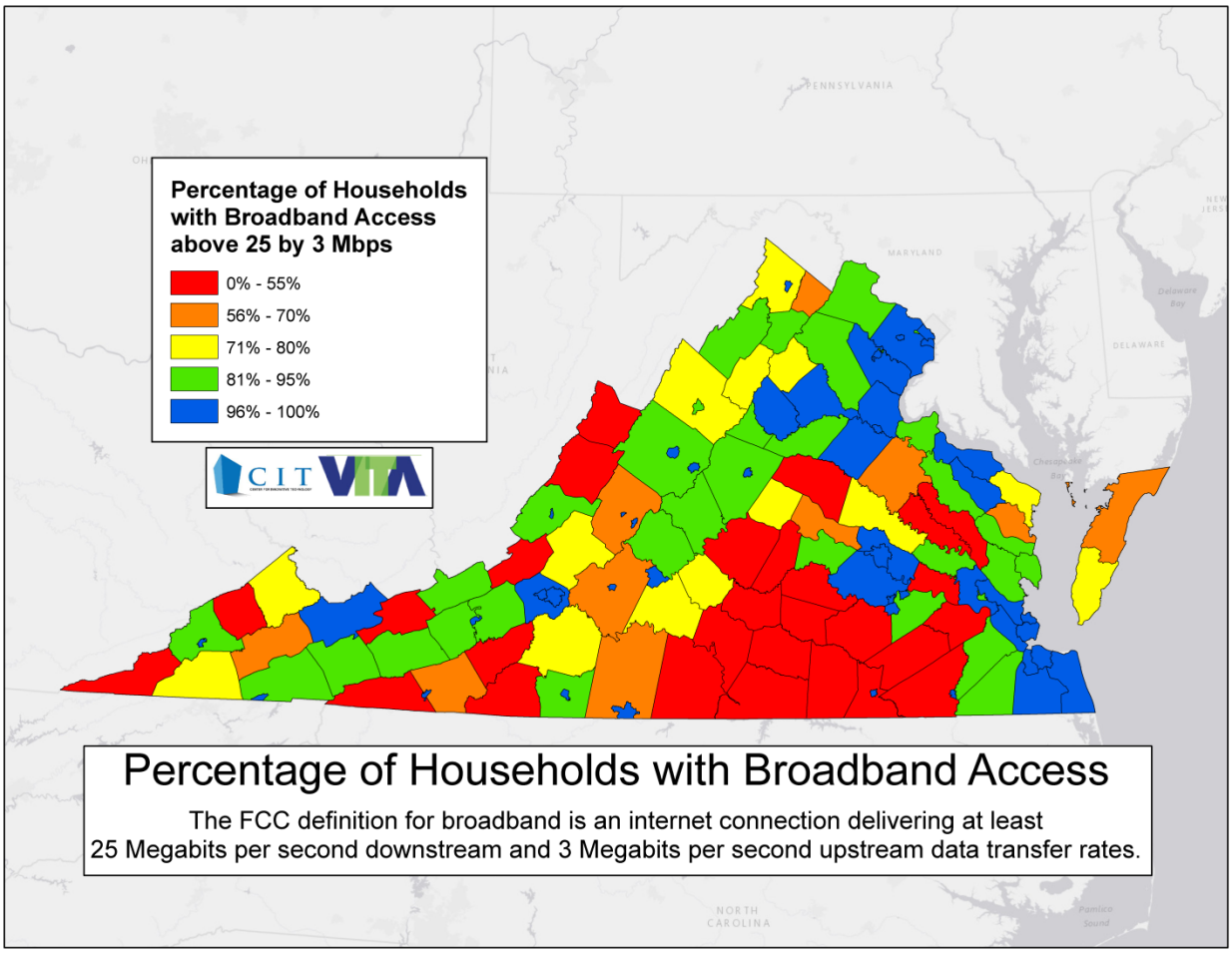
The following map depicts the average number of broadband providers per census block as defined by the FCC (25mbps download and 3 mbps upload).



Virginia's Un/Underserved Localities

The marketplace for broadband has continued to evolve since the FCC first established its initial broadband minimum speed benchmark of 4 Mbps download and 1 Mbps upload in 2011. In 2014, the FCC changed the designation for broadband to 10 Mbps download and 1 Mbps upload. The FCC issued another revision, in January 2015, designating 'true broadband' to be 25 Mbps download and at least 3 Mbps upload.

Based on the current FCC definition, **39% of Virginia localities are considered un/underserved (52 localities total).** This is an improvement from 2015 when 46% (62 localities total) were considered un/underserved. The map below shows the percentage of households by locality with access to at least 25mbps/3mbps.

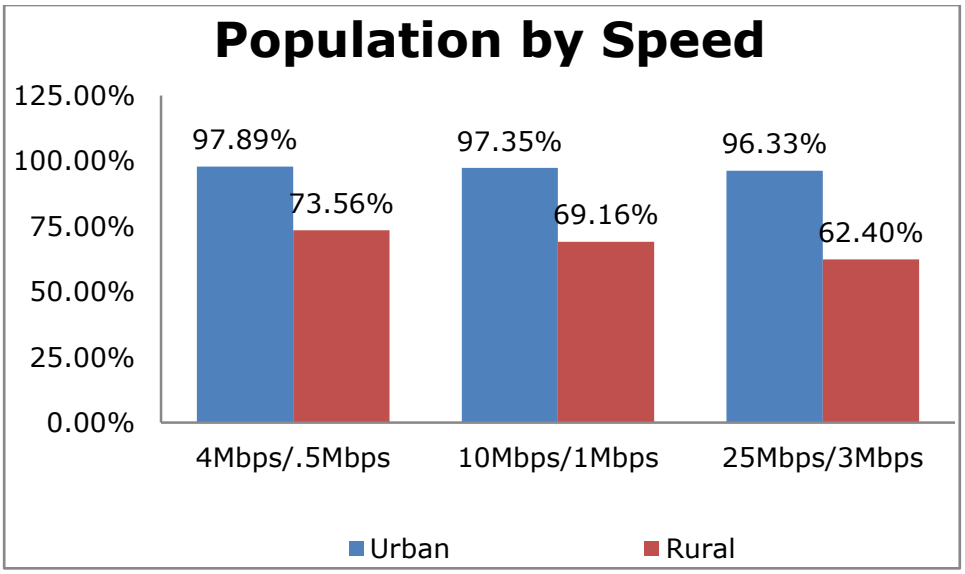


Urban vs. Rural Population

Based on the FCC's 477 data, the following chart shows the difference in coverage between urban and rural population based on different speed definitions.

The 10mbps/1mbps definition is the minimum speed requirement for the Connect America Fund. The 25mbps/3mbps definition is the FCC's definition of broadband.

- **The percentage of rural population with 25/3 rose from 55% in 2015 to 62.4% in 2016.**
- **Approximately 26% of Virginia's rural population does not have access to broadband by any definition.**



Technical Assistance

CIT Broadband is the only resource in the Commonwealth focused solely on broadband. We take a holistic (we view broadband as essential to all aspects of life including education, healthcare, public safety, economic development and overall quality of life) and technology agnostic (we recognize the need for all broadband technologies) approach to providing technical assistance to local governments and state agencies to expand broadband capacity and access and improve utilization.

CIT's Path to Better Broadband

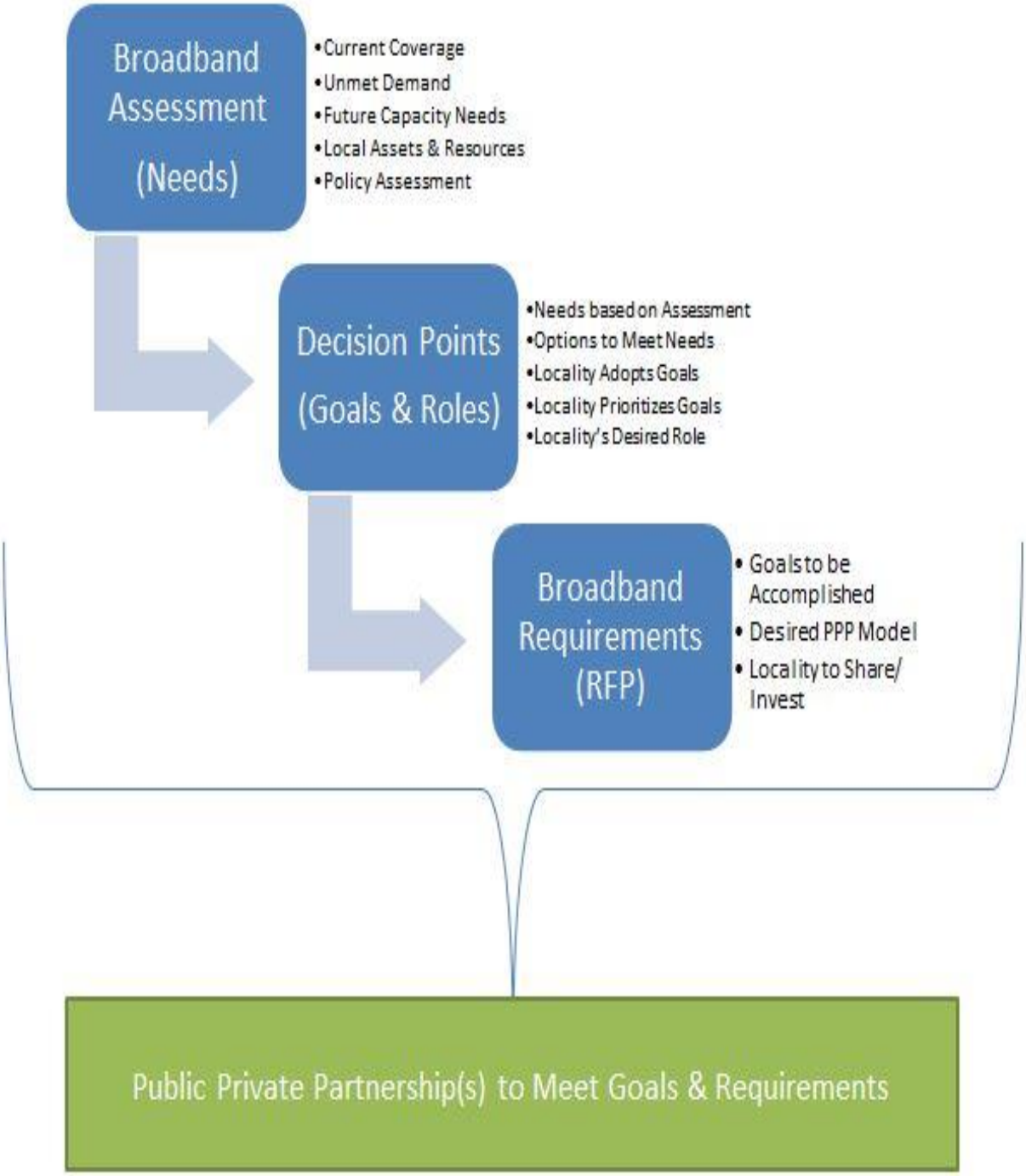
It is important for localities to develop a strategic broadband plan that takes into account their needs, assets, priorities, and goals before pursuing partnerships, however, most localities do not have the resources or expertise to accomplish expansions in a cost effective and efficient manner. Localities need tailor-made, actionable strategic broadband plans in order to form partnerships that will address the specific needs of the locality. CIT developed the Broadband Path in order to drive goal-driven and cost effective broadband solutions at the local level. The Broadband Path is a six step process that leverages CIT's experience, knowledge, resources and relationships to develop a tailor-made strategic broadband plan resulting in public-private partnerships that meet the locality's specific, prioritized goals.

This process has been proven to be effective as it has already led to successful partnerships between localities and broadband providers and has begun to change the way localities approach improving their broadband. Nominated by VITA for a National Association of State Chief Information Officers (NASCIO) award, this methodology has seen support across many different groups including local and state government officials, authorities, broadband providers and associations.

"The VCTA truly values the important work of CIT, especially in the development of the Broadband Roadmap. The Broadband Roadmap makes it simple for local governments to begin the due diligence necessary to understand the assets communities have, the regulatory barriers that may exist, and the willingness of its citizens to adopt broadband. Local governments that do not use this tool developed by CIT are not doing a service to their citizens or elected officials. In a time when public resources are scarce this tool plays an important role in managing the taxpayer's assets wisely."

Ray LaMura
President
Virginia Cable Telecommunications Association

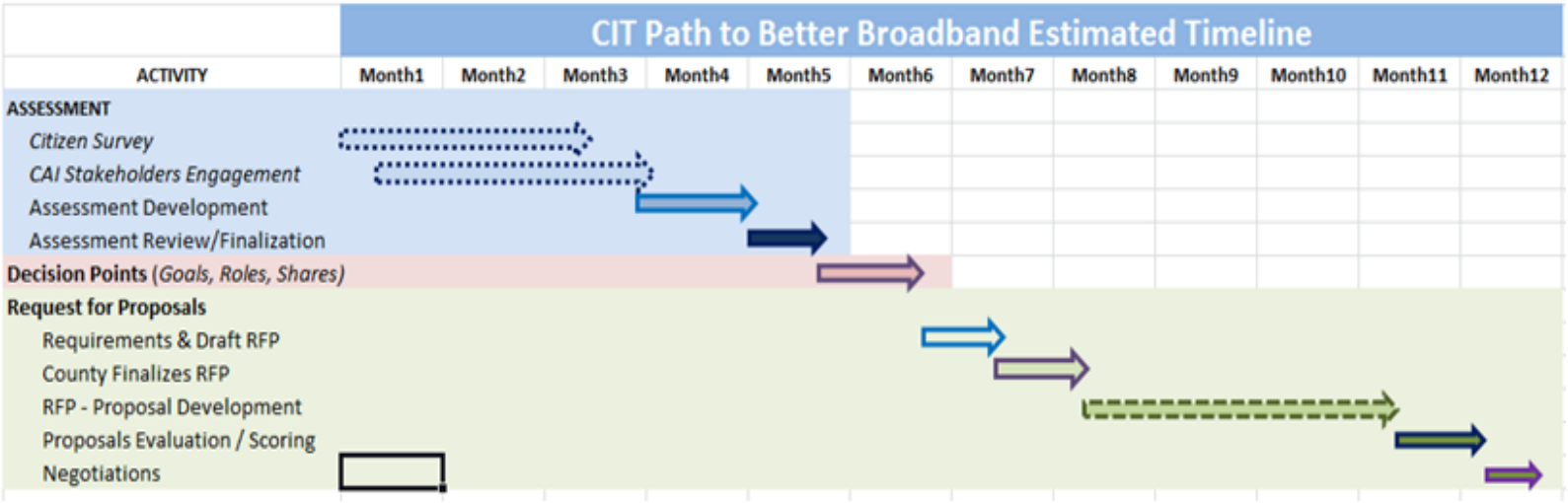
The following diagram and summary outlines the process of the Broadband Path.


Broadband Assessment (Needs)
•Current Coverage
•Unmet Demand
•Future Capacity Needs
•Local Assets & Resources
•Policy Assessment
Decision Points (Goals & Roles)
•Needs based on Assessment
•Options to Meet Needs
•Locality Adopts Goals
•Locality Prioritizes Goals
•Locality's Desired Role
Broadband Requirements (RFP)
• Goals to be Accomplished
• Desired PPP Model
• Locality to Share/ Invest
Public Private Partnership(s) to Meet Goals & Requirements

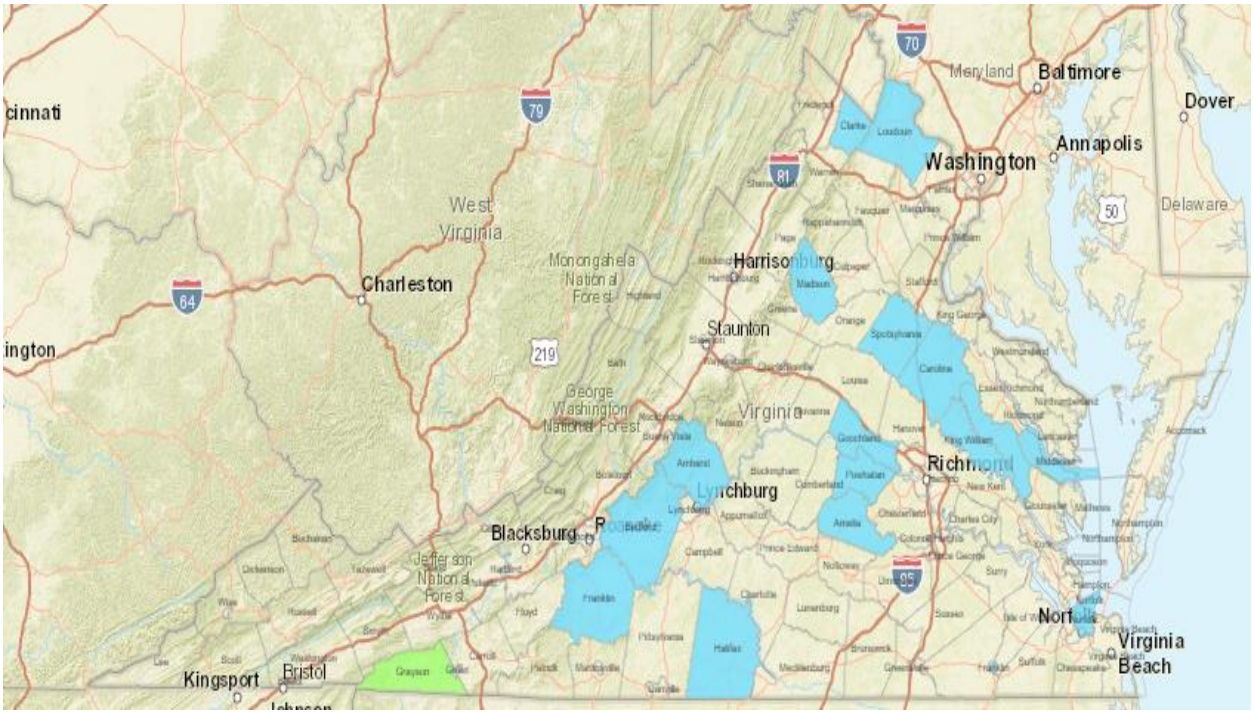
Broadband Assessment – In the broadband assessment phase CIT leverages its Strategic Broadband Roadmap and Toolkit (see the Strategic Broadband Roadmap and Toolkit section below for more information) to identify community broadband needs based on an evaluation of the locality's current broadband coverage, available capacity, current and future demand, local assets and resources, and local policies that may be hindering broadband expansion. CIT works with the locality to conduct a citizen broadband survey in order to gain an understanding of its citizens' and business' Internet usage and needs.

Decision Points – Based on the needs identified during the Broadband Assessment phase, CIT facilitates the locality's adoption and prioritization of goals, decide the role the locality wishes to have in a partnership, and identify options for funding and meeting the goals.

Broadband Requirements – Once the previous phases are complete CIT works with the locality to develop a strategic broadband plan that defines the county's priorities and actions to be taken. CIT assists in the development of a Request for Proposal and the review of proposals.



Below is a map and a list of localities that CIT is either currently assisting or has assisted in 2016.



Map showing localities currently working with CIT.

County	Broadband Initiative Information
Halifax County	CIT began working with the county in February 2016.
	ASSESSMENT completed in August.
	Draft RFP and Requirements delivered.
	Board at DECISION POINTS.
Clarke County	CIT has provided information, maps and data and presented to the Board of Supervisors in June. The Board advised they would be back in touch once we completed the RUOnlineVa campaign.
Bedford County	CIT has worked on/off with Bedford for several years providing information, guidance and maps.
	We presented to their Broadband Committee in August 2016.
	ASSESSMENT completed.
	Board at DECISION POINTS.
King William County	CIT and CGIT began working with the county in late 2015 and completed a county-wide wireless propagation study in early June 2016. The study evaluated existing vertical assets and made recommendations for a few additional locations to support a fixed wireless deployment to serve the citizens.
Loudoun County	CIT has provided the county information, maps and advice for the last few years.

Powhatan County	CIT began working with the county in October 2015
	ASSESSMENT completed in February.
	REQUIREMENTS & RFP completed in April.
	Powhatan signed a contract with a private provider in August 2016. Detailed design by partner due early December.
Goochland County	CIT met with the County Broadband Committee in August 2016.
	ASSESSMENT completed and delivered in October.
	Awaiting county's decision points.
Dinwiddie County	CIT provided the county a RFP template in late 2014.
	The county issued the RFP in 2015 and signed a contract with a fixed wireless provider in 2016.
Amelia County	CIT began working with the county in February 2016.
	ASSESSMENT completed in early August.
	DECISION POINTS completed in late August.
	REQUIREMENTS and RFP delivered to the county in early September.
	The county has issued the RFP. Proposals are due December 1.
Franklin County	CIT met with the county in October.
	CIT is just beginning the ASSESSMENT process.
Middlesex County	CIT met with the county in October.
	CIT is just beginning the ASSESSMENT process.
Madison County	Conducted first meeting with authority in October.
	CIT is just beginning the ASSESSMENT process.
Grayson County	CIT held an initial meeting with the county and will begin working with them in November.
Department of Conservation and Recreation (DCR)	CIT began working with DCR in the Fall of 2015 to find solutions for better broadband in Virginia's state parks.
	ASSESSMENT – CIT assessed all state parks, highlighted those that needed better broadband, and connected DCR with potential partner broadband providers.
	DCR published their RFI and CIT is assisting DCR in reviewing the responses.
Amherst County	CIT provided the county with a RFP template in February 2016.

Ashland	CIT assisted the county in conducting a stakeholder meeting.
Floyd County	CIT created and submitted a letter of support for the county's letter of intent to the USDA's Cool and Connected program.
Orange County	CIT has provided the county information, maps and advice for the last few years.
City of Chesapeake	CIT met with the city to discuss their needs
	CIT reviewed, provided feedback and disseminated the city's RFP.
Surry County	CIT assisted the county in reviewing letters of interest they received to their RFP.
Botetourt County	CIT provided maps and information to the county.
Roanoke County	CIT provided maps and information to the county.
	CIT connected the county with a local provider.

Assessments

RUOnlineVA

In an effort to identify strategies to expand broadband access, in April 2016, Virginia's Secretary of Technology, Karen Jackson, convened a meeting of stakeholders to explore ways to increase connectivity throughout the Commonwealth. The meeting took place in the Town of Ashland and included representatives from many of the organizations that offered support for the initiative: The Center for Innovative Technology's (CIT), Virginia Association of Counties (VACO), Virginia Municipal League (VML), Virginia Economic Developers Association (VEDA), Virginia Planning District Commission (the VAPDC), Virginia Rural Center, Virginia Cable Telecommunications Association (VCTA), Virginia Telecommunications Industry Association (VTIA), Department of Housing and Community Development (DHCD), Department of Education (DOE), Library of Virginia, Mid-Atlantic Broadband Cooperative (MBC), and Old Dominion Electric Cooperative (ODEC.)

The goal of the meeting was to identify what the state could do to promote further expansion into underserved and unserved areas. It was agreed that the first step should be to determine areas with greatest need - citizens that need broadband today and have no access or limited access.

For years the Commonwealth, as well as the rest of the nation, has struggled with the question of 'where is broadband currently available and where is it needed most?' In an attempt to answer this question the Virginia Broadband Availability Map was created. This map is based upon provider reported broadband coverage information using the FCC's form 477 data which all broadband providers are required to submit twice per year. Virginia's Broadband map remains current with new releases of the data and is publicly available through Virginia's Office of Telework Promotion and Broadband Assistance website. However, federal reporting rules allow providers to overstate their coverage which means many unserved and underserved areas are being reported as served. Therefore in order to more accurately determine which areas in Virginia have the greatest need, the team decided that it needed to collect information directly from the citizens to compare to the map data.

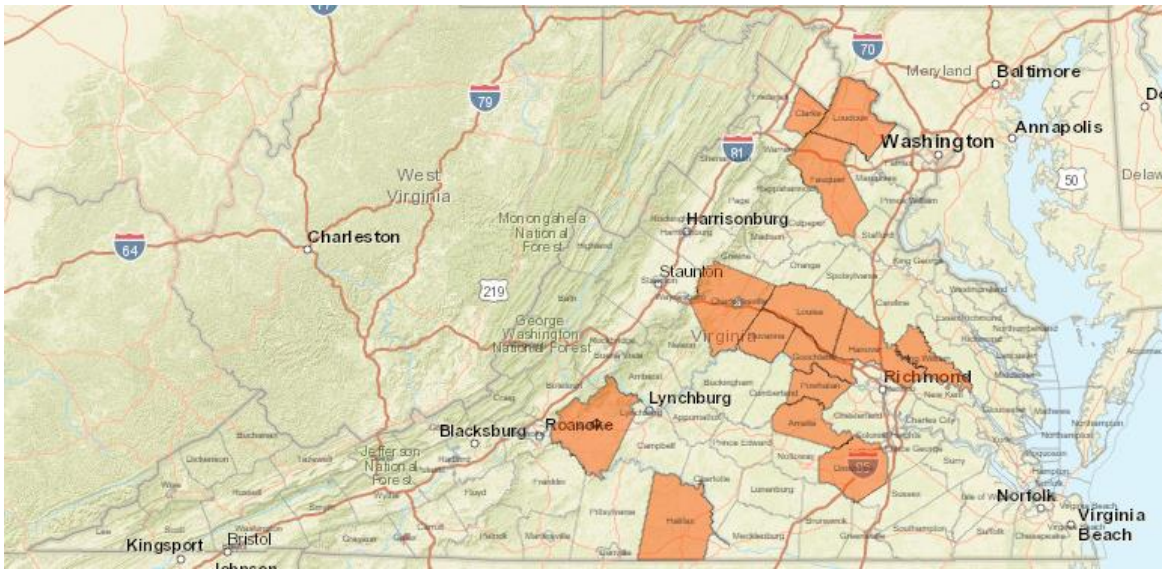
A statewide survey, RUOnlineVA, was developed and served as the initial step to provide Virginians an opportunity to log their need for Internet service. The goal of the initiative was to identify, for the Governor and other policy makers, where broadband is needed most in the Commonwealth.

The RUOnlineVA initiative was officially announced by Governor McAuliffe on May 24, 2016 and closed on August 15, 2016. Notice of the initiative was distributed across the Commonwealth with the assistance of many supporting organizations, including; VACO, VML, VDOE, VAPDC, periodic press releases from CIT, local organizations, schools, local governments, libraries and outreach to newspapers requesting coverage. RUOnlineVA received

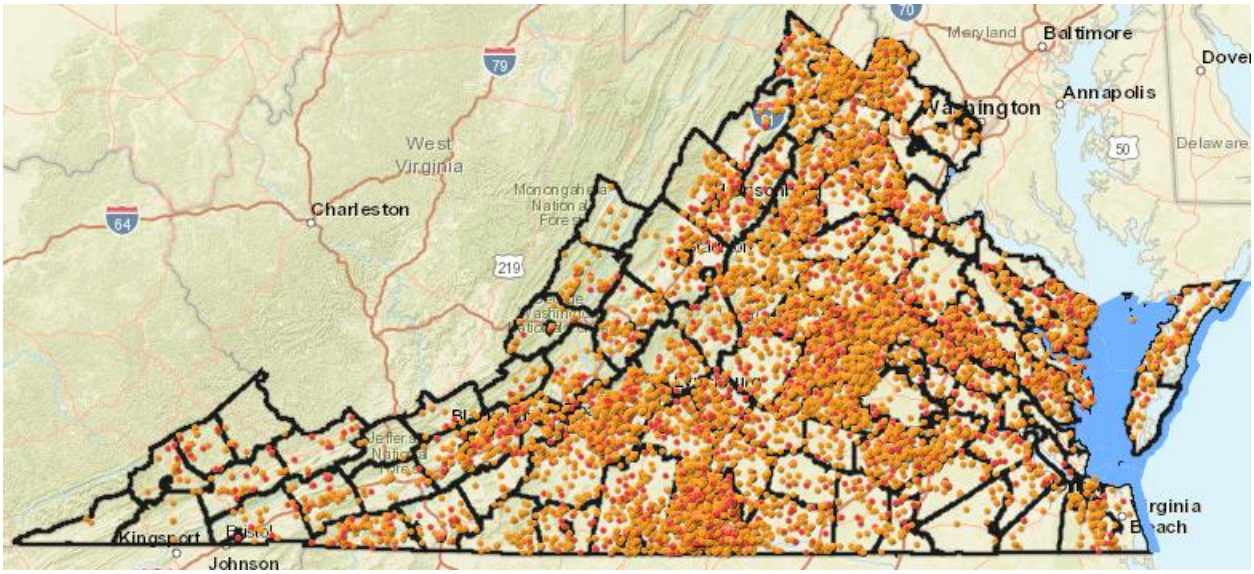
national attention from organizations such as Government Technology Magazine and SpeedMatters.Org.

Halifax County - RUOnlineVa data collectors at WalMart

The RUOnlineVA initiative received more than 15,000 responses from residents and businesses. Data was collected from 129 localities; however, only 14 localities generated enough responses when compared to total homes (census data) to be statistically significant. Therefore statewide assumptions should not be made based on the data. However, reasonable assumptions can be made regarding the 14 counties that generated significant data.



Map showing the most responsive localities



State view of RUOnlineVA responses

The analysis of the RUOnlineVA responses will be used to stimulate broadband policy and funding discussions, and to provide localities and service providers with insight into the areas of unmet demand. **The RUOnlineVA data should play a role in the Commonwealth's overall strategy to promote broadband investment and target available funding to meet the current demand as well as prepare the Commonwealth for the future.**

In addition to valuable information that can be used by local and state government officials, the RUOnlineVA campaign has also served in helping to bridge the gap between the Internet service providers and the citizens. A number of providers have been working with CIT to address inquiries about the lack of service reported within claimed coverage areas. The addresses along with maps from several locations around the state where clusters of data indicated unmet demand within or close to claimed coverage areas were sent to the respective service providers to find out what it would take to get service to those addresses. The providers were highly responsive, so much so that one inquiry resulted in the identification of a forgotten backhaul that could play a role in connecting new customers.

The RUOnlineVA report is being reviewed by the Secretary of Technology. Once it is released it will be available at http://wired.virginia.gov.

Libraries

Starting in the fall of 2014, CIT has partnered with the Library of Virginia and Virginia Tech's Center for Geospatial Information Technology (CGIT) to conduct Internet speed test campaigns throughout the Commonwealth to track and analyze connectivity at Virginia's libraries. For the 2016 assessment, data was leveraged from the Universal Service Administrative Company

(USAC) and the 2015 Library of Virginia survey to provide a more comprehensive look at Virginia's libraries from a broadband perspective.

The areas of focus were cost of access, Internet download speeds, latency, technology, digital literacy training and workforce training. A summary of some of the key findings is below.

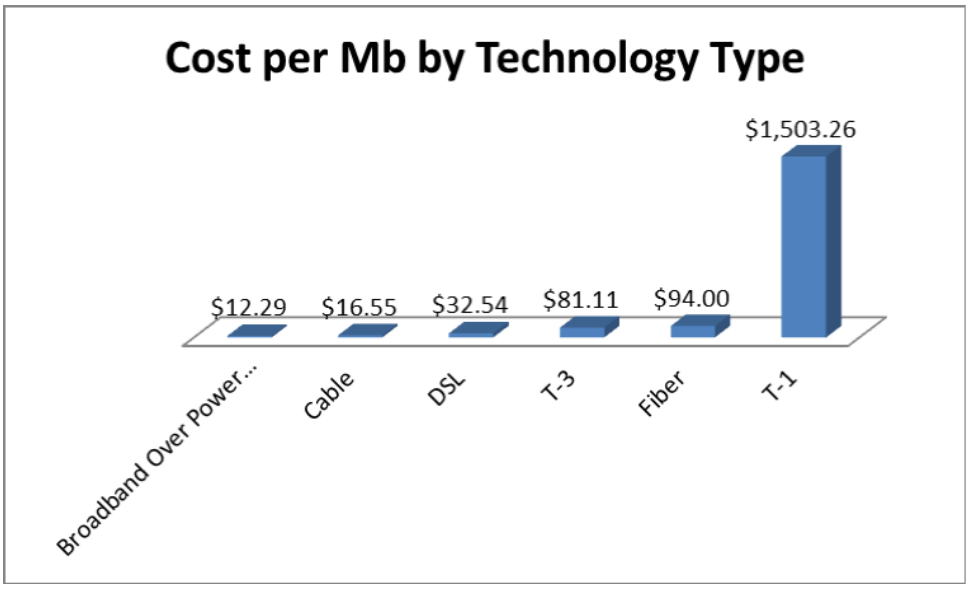
Cost of Access

In this year's assessment more information was gathered regarding what libraries pay for their connectivity to be able to perform a comprehensive cost analysis. In 2015 the Library of Virginia included additional survey questions about the cost of Internet services to libraries and connection characteristics. The information helped to determine whether libraries across the state are receiving the connectivity characteristics they should for the amount they pay.

The median cost per megabit for all libraries was $22.26. Annually, Virginia libraries spend over two million dollars on Internet related services. There are approximately twice as many rural library systems as there are urban. Annual costs for rural libraries are approximately 87% of annual urban costs; $972,084.72 versus $1,155,218.76 respectively.

62% of libraries purchased download connections that meet the Federal Communications Commission (FCC) designated broadband definition (25Mbps/3Mbps). However, of those who took the speed test to measure what speed they are actually getting, only 30% of the branch libraries met the current FCC broadband definition.

51% of libraries purchase fiber services, 33% cable, 9% DSL, 2% broadband over power line, and 1% T-3. 4% of library systems purchase very old and expensive T-1 services.



Digital Literacy and Workforce Training

The lack of digital literacy is known to be a primary barrier to broadband adoption. The goal of digital literacy training is to help patrons understand the basics of computer uses; how to use a computer, how to access the Internet, how to perform basic Internet searches, how to protect themselves and their identity online and more.

About 50% of libraries offer digital literacy training while about 74% offer workforce training (professional, educational training).

The 2016 Virginia Library Assessment report can be found here: https://www.wired.virginia.gov/about/wired-news

Virginia Broadband Mapping and Planning Tools

Virginia Broadband Availability Map

In an effort to consolidate and improve upon Virginia's broadband tools and resources, in the fall of 2016 the Virginia Broadband Availability Map found a new home within the Integrated Broadband Toolbox. Along with the move came the ability to view RUOnlineVA data, population density, vertical assets, and other themes all in comparison to broadband availability. The new features were added to better assist state and local officials in the broadband assessment and planning process.

The Virginia Broadband Availability Map is part of CIT's ongoing effort to provide technical assistance to local governments and state agencies to expand broadband capacity and access and improve utilization.

It is important to note that the National Broadband Map is now unfunded and out-of-date. Because of this it has become even more critical to maintain and update the Virginia Broadband Availability Map.

The new map can be found at https://broadband.cgit.vt.edu/IntegratedToolbox/.

Planning Tools

CIT and CGIT are implementing a number of products developed under the state broadband initiative into an Integrated Broadband Toolbox (Integrated Toolbox). This activity began in 2012 as the "Advanced Broadband Toolbox" and concluded with CIT-NTIA funding in Feb 2015. Enhancements have continued including incorporating dynamic updating capabilities for the MapBook Portal as well as a broadband survey (SurveyCardinal) and a speed-testing tool (DataCardinal) available in both browser and mobile platforms. The Integrated Toolbox includes statewide digital terrain and surface models, a map book creator (Broadband Map Books), Virginia's inventory of vertical assets (VAIT 2.0), and spatially referenced broadband policy information (Virginia Broadband Policy Database).

The Virginia Broadband Policy Database application allows users to select a point on a map that represents a potential wireless tower or equipment installation site, and then obtain a report on the national, state, and local policy guidelines or restrictions that may be applicable for that location. This information is of critical importance in planning the placement of wireless towers or other wireless equipment installations. This tool can now be found as a stand-alone tool (http://www.projects2.cgit.vt.edu/BroadbandPolicy/) and also within the Virginia Broadband Availability Map and Integrated Broadband Planning and Analysis Toolbox released in September 2016 (https://projects.cgit.vt.edu/IntegratedToolbox/).

A state-wide Vertical Assets Inventory Toolkit (VAIT) was developed and brought online in May 2012 and is updated on a regular basis. The VAIT serves as a repository of location information for structures that have the potential to serve as wireless broadband transmission sites. The aim of this solution is to assemble a database of both traditional sites (e.g. radio transmission towers), and non-traditional sites (e.g. silos, tall buildings, water towers, etc.) which may be suitable as candidate locations for the installation of wireless broadband transmission equipment in order to facilitate the integration of broadband and information technology into state and local economies.

VAIT 2.0 (https://projects.cgit.vt.edu/VerticalAssets/) was released in early 2015 to include dynamic daily updates from current FCC data and a more intuitive user interface. The VAIT tool includes federal and locally-sourced assets through regional campaigns and partnerships including the Virginia Municipal League (VML) to include VML-insured water towers in the database. Asset locations can also be displayed within the Virginia Broadband Availability Map and Integrated Broadband Planning and Analysis Toolbox as an interactive layer to compare locations vs other themes/layers. CGIT worked with several localities to refine locations of their vertical assets in order to get better data precision above and beyond what the FCC provides.

Part of CGIT's capability is an RF propagation tool that calculates generic coverage estimates for various wireless broadband technologies including fixed wireless, 3G, 4G, LTE, and LTE Advanced. The model generates RF propagation coverage estimates for planning purposes as well as modeling current service provider coverage. Estimates for received signal strength are provided in a GIS format that allows for ease of integration and analysis with other statewide spatial data. Currently this service is provided on an as-needed basis. During FY 16-17 CGIT performed RF propagations for several localities in Virginia and delivered reports summarizing recommendations on how to improve current broadband coverage based on existing and potential vertical asset locations.

Additionally RF propagation models have been used by the broadband team to estimate wireless coverage for Wireless Internet Service Providers (WISPs) who did not have the technical capability or staff to provide their coverage estimates for the state and national mapping initiative. This allows a more complete representation of the broadband coverage in Virginia and puts these WISPs "on the map" for discovery by businesses and individuals. These services are

currently available to any WISP who would like an unbiased coverage map and results can be included in the Virginia Broadband Availability Map and Integrated Broadband Planning and Analysis Toolbox.

For better feedback and engagement with individual jurisdictional needs in Virginia CGIT developed SurveyCardinal - a browser based survey that helps CIT identify broadband needs across the state. This tool is optimized for both desktop and mobile devices. This tool was leveraged heavily this past year in collecting over 15K survey responses for the Governor's campaign (RUOnline VA - http://technology.virginia.gov/ru-online-map/) to help characterize where broadband coverage is most needed in Virginia.

In order to obtain consistent, unbiased internet speed data CGIT released DataCardinal to measure internet speed tests across Virginia. Results from this test can be viewed spatially and is available on desktop and Android devices. This tool, in conjunction with SurveyCardinal was put to the test this year in performing a speed test campaign in conjunction with the Library of Virginia (LOVA) in order to capture internet speeds of libraries across the state. Over 400 responses were obtained to give LOVA a detailed view of the broadband capability of its branches.

Building upon the successes of the broadband mapping program, CGIT currently hosts the Broadband Map Book Portal that resides within the Virginia Broadband Availability Map and Integrated Broadband Planning and Analysis Toolbox. A Map Book consolidates the various data layers from Virginia's interactive broadband availability map for each county as well as to create new views of related information into a format suitable for broadband planning initiatives. To date, each county, city, planning district and congressional district map book products consist of the following predefined broadband themes: Cable Wireline services, Copper Wireline services, Reported Dead Zones, DSL Wireline services, Fiber Optic services, Fixed Wireless services, 4G Wireless Services, Mobile Wireless services, DataCardinal Speed Test results, Community Anchor Institutions, RUOnline Results, Vertical Assets locations, Community Anchor Institutions, and Population density by Census tract.

The current suite of tools is available at http://www.cgit.vt.edu/broadband.html.

Telework

There are no new telework initiatives to report for 2016. However, throughout the year, both the Secretary of Technology's office and CIT have received a number of inquiries from citizens regarding broadband and telework. Many of these citizens stated their employer was issuing a mandate to telework and if they were unable to do so due to lack of Internet access they would be out of a job. This appears to be a growing trend and highlights the need for reliable broadband throughout the Commonwealth.

Broadband Advisory Council

The Broadband Advisory Council was established as an advisory council, within the meaning of § 2.2-2100, in the executive branch of state government. The purpose of the council shall be to advise the Governor on policy and funding priorities to expedite deployment and reduce the cost of broadband access in the Commonwealth. The council was created from a recommendation from by the Broadband Roundtable (established by Governor Kaine in 2007) and was codified during the 2009 legislative session (HB2423).

The council is comprised of 14 members: four delegates; 2 senators; Secretaries of Technology, Commerce and Trade, and Agriculture and Forestry; and representatives from Virginia Cable Telecommunications Association (VCTA), Virginia Telecommunications Industry Association (VTIA), Center for Rural Virginia, Virginia Chapter of WISPA, and local government. The council members are:

Delegate Kathy Byron (Chair)
Senator Frank Ruff (Vice Chair)
Delegate Jennifer Boysko
Delegate James Leftwich
Delegate Randy Minchew
Senator Charles Carrico
Secretary Karen Jackson
Secretary Maurice Jones
Secretary Todd Haymore
Ray LaMura, President of VCTA
Duront Walton, Executive Director of VTIA
Christy Morton, Executive Director of the Center for Rural Virginia
Jimmy Carr, CEO All Points Broadband
Jane Dittmar, Chair of the Albemarle County Board of Supervisors

Staff: Caroline Luxhoj (CIT), Sandie Terry (CIT), Jean Plymale (CIT), Jeff Sharp (DLS)

The Broadband Advisory Council met on June 8, 2016 in Roanoke. The council heard presentations regarding DHCD's new broadband infrastructure program, BVU's latest activities, HB912, broadband challenges related to local governments, and received an update regarding Secretary Jackson's activities.

The Broadband Advisory Council met on September 22, 2016 in Richmond. The council received updates regarding DHCD's new broadband infrastructure grant program, the wireless infrastructure group, the RUOnlineVA campaign, and presentations regarding rural telehealth and USDA's broadband funding programs.

State Broadband-Related Legislative Activities

HB912 - Department of Transportation; installation of broadband conduit on public highways.
Patrons:
J. Randall Minchew (chief patron)
Lamont Bagby (chief co-patron)
Terry G. Kilgore (chief co-patron)
Ronald A. Villanueva (chief co-patron)
Hyland F. "Buddy" Fowler, Jr.

Summary: Allows the Department of Transportation to permit broadband service providers to install conduit capable of housing fiber optic cable to provide broadband service on public highways.

SB 329 - BVU Authority; alters Board powers and duties, change in membership, conflict of interest policy.
Patron:
Charles W. Carrico, Sr. (chief patron)

Summary: BVU Authority; Board powers, officers; broadband; FOIA. Reduces from nine to seven the number of directors on the Board of Directors (the Board) of the BVU Authority (the Authority) and alters the methods of their appointment and their powers and duties. The bill removes the current membership of the Board, comprising six citizens of Bristol, Virginia, two Bristol City Council members, and one member of the Board of Supervisors of Washington County, and institutes in their place a board of seven directors, comprising (i) one citizen of each of the following localities with its appointing authority: the City of Bristol, appointed by the Speaker of the House of Delegates; the City of Bristol, appointed by the Board; Scott County, appointed by the Speaker of the House of Delegates; and Washington County, appointed by the Senate Committee on Rules, and (ii) one member of the governing body of each of the localities of the City of Bristol, the Town of Abingdon, and Washington County, appointed by their respective governing bodies. The citizen of the City of Bristol who is appointed by the Board is required to be engaged in business and may be appointed initially by the Bristol City Council.

Upon the sale of the Authority's broadband service, BVU OptiNet, the bill reduces the Board to five by removing the Abingdon Town Council member and the Scott County citizen.

The bill changes the operation of the Board by altering certain requirements regarding bylaws, eliminating the Board's authority to appoint an attorney, requiring an annual vote to retain independent legal counsel, and barring Board members from receiving financial compensation for service. The bill alters the authority of the Board president by eliminating his power to enter into long-term employment contracts with Authority employees. It also limits a president's term of service to a renewable term of three years and bars any severance agreement for the president amounting to more than one year's base salary. The bill requires that any decision of the Board related to water or sewer systems be made by a majority vote of the three Board members representing the City of Bristol and the Board member representing Washington County.

The bill clarifies that the Authority is prohibited from making charitable donations, contracting with or becoming a wireless service authority, or contracting with a locality to have it acquire property for the Authority by eminent domain. The bill requires the Authority to take certain actions in relation to any economic development project that uses funds allocated under an agreement with the Tennessee Valley Authority.

The bill requires the Board to adopt certain policies related to travel, expenses, and conflict of interests, to file statements of economic interests, and to undergo annual training on conflict of interests law. The bill eliminates several Authority-related records and open meeting exemptions from the Freedom of Information Act.

The bill changes the Authority's broadband-related powers, allowing it to offer and operate broadband and cable television service only in specified areas. The Authority's first broadband priority is to be the construction of wired broadband infrastructure in unserved areas, and its power to apply for grants for broadband projects is defined in conjunction with that priority. Any broadband networks the Authority builds are to be operated on an open-access basis.

The bill directs the Auditor of Public Accounts to examine the accounts of the Authority by July 1, 2016, and contains an emergency clause.

Broadband-Related Activities at the Federal Level

Connect America Fund Phase II

In January 2015, the FCC moved forward with its second phase of the Connect American Fund (CAF). The CAF came from the 2011 reforms of the Universal Service Fund. In the first phase of the program, the FCC invested more than $438 million to bring broadband to 1.6 million people with no fixed broadband option.

In the second phase, the FCC is offering approximately $9 billion over the course of five years to expand broadband in rural areas at a minimum download speed of 10 mbps. The funding is offered to price cap landline telephone service providers to expand digital subscriber line (DSL)

service in high cost areas. The service providers had the option to decline the funding in which case the funding will be made available to other providers through a competitive bidding process.

There was $46 million available to the Virginia incumbents (Verizon, CenturyLink and Fairpoint). CenturyLink and Fairpoint have accepted the funding available to them. With the funding CenturyLink will provide broadband to 49,000 households and businesses and Fairpoint will provide broadband to 2,440 households and businesses, all in high-cost markets in Virginia.

In May 2016, the FCC adopted a framework for the Phase II auction where all eligible entities can bid to receive support to offer voice and broadband service meeting the Commission's requirements for a ten-year term.

In August 2016 the FCC released a preliminary list of census blocks eligible (available at https://www.fcc.gov/reports-research/maps/caf-2-auction-preliminary-areas/) for the Connect America Fund auction. That auction will award funding to help cover the cost of bringing service to areas that cannot get broadband today or can only get low-speed broadband.

BroadbandUSA Community Connectivity Initiative

In March 2016 the NTIA announced the Community Connectivity Initiative. The initiative provides communities tools to support and accelerate local broadband planning efforts. These tools include a Community Connectivity Framework, an online self-assessment tool, and a report and recommendations based on the results of the self-assessment.

Community Connectivity Framework - provides a robust structure to engage local stakeholders in conversations about broadband access and community value.

Self-Assessment Tool - enables local teams to record their findings and integrate those assessments with national datasets on broadband and community.

Report and Recommendations - upon completing the self-assessment, communities receive a report that combines input from the self-assessment with other data sources. The report suggests actions for consideration and includes reference data that allow communities to compare their community connectivity with others.

FCC Incentive Auction

In August 2015, The FCC adopted the Incentive Auction bidding procedures public notice for the first ever incentive auction. This Incentive Auction is a voluntary, market-based means of repurposing the 600 MHz broadcast TV spectrum by encouraging licensees to voluntarily relinquish spectrum usage rights in exchange for a share of the proceeds from an auction of new licenses to use the repurposed spectrum.

The auction began March 29, 2016. Bidding in Stage 1 of the auction began on May 31, 2016 and the first stage concluded on August 30, 2016. Stage 2 began on September 13, 2016 and concluded on October 19, 2016.