Improving Broadband Access and Utilization in Virginia

Recommendations for Locality-led Broadband Initiatives in Virginia

6/2/2015

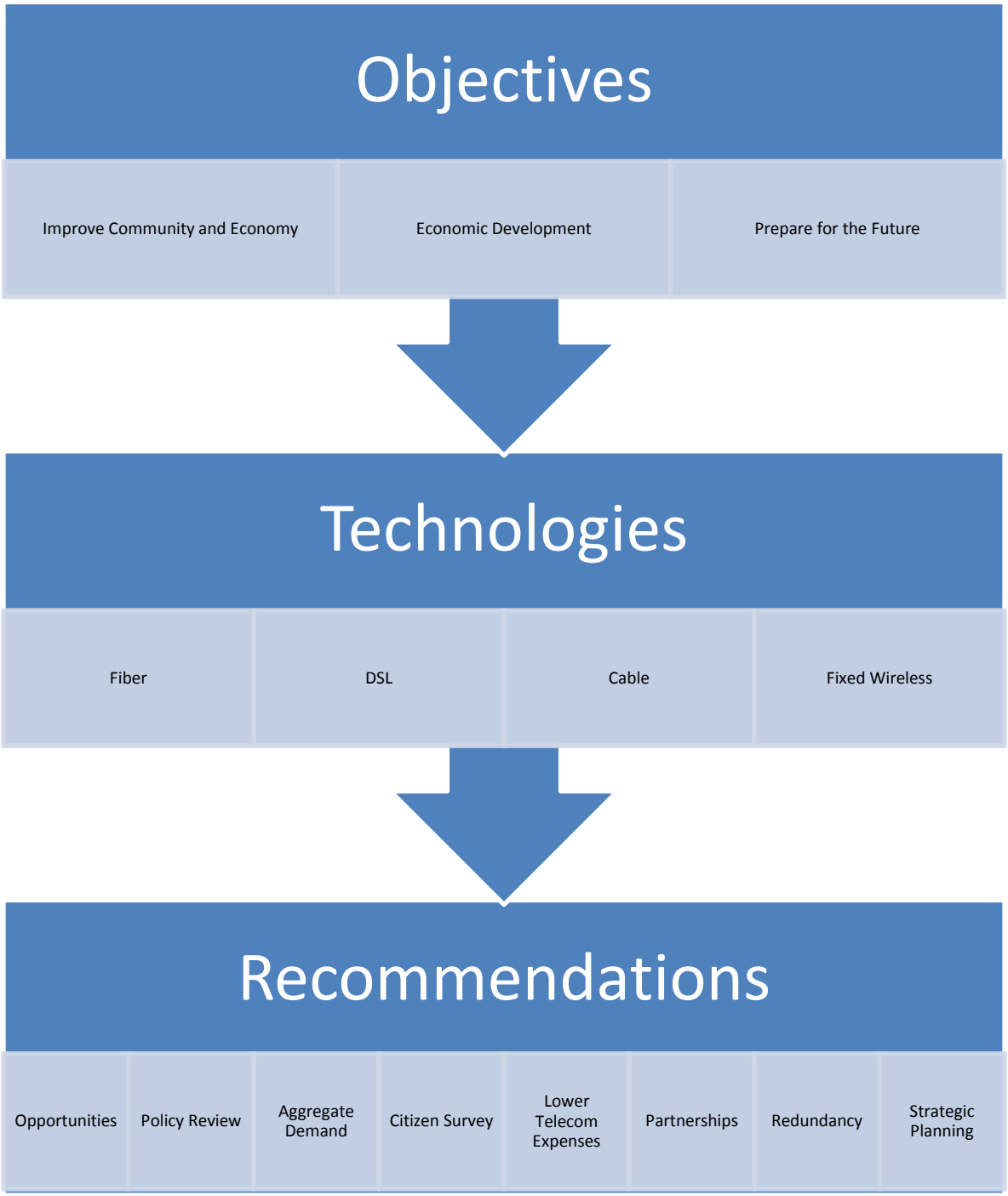
CIT
CENTER FOR INNOVATIVE TECHNOLOGY

Table of Contents

DOCUMENT OUTLINE 3
EXECUTIVE SUMMARY 4
THE NECESSITY OF BROADBAND 6
BROADBAND OBJECTIVES FOR EVERY COMMUNITY 8
Improve the Community 8
Economic Development 8
Libraries 8
Prepare for the Future 9
BROADBAND TECHNOLOGIES 10
Fixed Broadband Technologies 11
Fiber 12
DSL 12
Cable 12
Fixed Wireless 13
RECOMMENDATIONS 14
Opportunities and Funding 14
Citizen Survey 14
Aggregate Demand 15
Policies and Processes Review 15
Lower Costs of Broadband Deployments and Leverage Assets 16
Partnerships 17
Redundancy 17
PC Refurbishment 18
Strategic Planning 18
APPENDIX A – COMMUNITY MODELS 20
Utility Owned Fiber 20
Bristol Virginia Utilities (BVU) 20
Danville's nDanville Network 21
Rural Coop 22
Citizens Telephone Cooperative 22
Public-Private Partnerships 23

Franklin County 23
King and Queen County 25
Authority or co-op owned open access fiber network 25
Eastern Shore Broadband Authority 25
Lenowisco 26

DOCUMENT OUTLINE



EXECUTIVE SUMMARY

CIT was the recipient of Virginia's state broadband initiative funding through the American Recovery and Reinvestment Act in 2010. Through that funding, CIT and partners worked over the past five years to improve the mapping of broadband coverage as much as possible within the rules set by the National Telecommunications & Information Agency (NTIA) and to build resources to assist localities in expanding broadband access and improving utilization. Additionally we continue to work closely with the Secretary of Technology and the Broadband Advisory Council to address state policies and legislation that can facilitate broadband deployments throughout the Commonwealth.

The purpose of this document is to leverage the knowledge and resources gained over the past five years and provide recommendations in order to help facilitate locality-led broadband access and utilizations efforts. This document was designed to be applicable to all localities in Virginia and therefore has breadth not depth. Localities should consider and discuss all information and recommendations contained in this document. Ideally the county board or city/town council will discuss broadband and come to agreement on the role they want their local government to have in regards to broadband access and adoption, define and prioritize their broadband goals and ultimately let these decisions drive the development of a strategic broadband plan. The CIT broadband team is available to discuss the details of this document and assist localities in pursuing the recommendations.

The following table serves to recap the recommendations detailed later in this report and highlights the opportunities to be realized by each.

RECOMMENDATION	OPPORTUNITY
Conduct a Broadband Citizen Survey	An opportunity for the citizens to provide information that will highlight areas that have unmet demand (people that need access today and cannot get service), one view of the impact of broadband on K-12 education and businesses, insight into barriers to adoption of technology and the Internet, and insight into citizens' utilization of broadband. • Is cost of access a barrier? Are there provider subsidies (Comcast Essentials, etc) that are not being leveraged? Is a community PC refurbishment program necessary to provide computers to lower income families? • Is digital literacy a barrier? Does the library need to provide more classes? Should classes be held at different days/times? • Are parents engaged with the schools via online applications and social media? Do parents need more training? Are the schools leveraging digital learning technologies and are the students able to leverage these technologies from home? • Are businesses (including home businesses) leveraging the Internet to grow their businesses? Do businesses need mentoring to realize the benefits of broadband?
Aggregate Demand	Form a community stakeholder group with representatives from local government, schools, libraries, healthcare providers and public safety. Leverage the group meetings to better understand the broadband demands for the locality based on Community Anchor Institutions' (schools, healthcare, public safety, etc.) strategic technology plans. The locality can use this information to build a strategic plan that positions the community for the future. • Aggregated demand gives the community more 'buying power' and can lower costs for all organizations. • This plan may include discussions with providers to share the aggregated demand and determine how their build-out plans will meet that demand or what additional infrastructure is needed to ensure the demand is met.
Discussions with Internet Service Providers	Learn from the providers what particular county ordinances, fees or processes are viewed as unfavorable to broadband deployments – how can the locality make deployments cheaper,

	easier and quicker? Include discussions regarding areas that lack access and learn which providers are willing to partner to address the needs. • What opportunities exist to expand service into some of the dead zones and areas that appear to be lacking capacity? • Should the locality pursue a partnership with a fixed wireless provider to serve those areas or provide an alternate service provider to the citizens/businesses? • Which providers will make good partners? Work with those partners to address areas of need and share economic development opportunities to ensure adequate service is available. Share development plans with partner providers to determine how the developed areas will be served with broadband.
Economize Telecom Expenditures	• Can contracts between entities (schools and county?) be combined to lower costs? • Can the money saved be leveraged for broadband infrastructure to expand services/capacity? • Are there ways to leverage Internet access to lower telecom costs?
Adoption & Awareness	Every community needs support programs to get beyond the barriers to adoption of technology and Internet applications to be able to fully realize the benefits of broadband. • Support PC refurbishment services to keep electronics out of our landfills and provide low-cost or no charge computers to needy families. • Support and market our libraries' efforts to provide digital literacy training for citizens/businesses that lack the skills necessary to leverage Internet applications.
Strategic Planning	Utilize the information contained in this document and learned from the citizen survey, provider meetings and community demand aggregation stakeholder meetings to define future strategies to meet the needs of today and tomorrow.

THE NECESSITY OF BROADBAND

Access to and adoption of reliable broadband provides a locality the opportunity to grow in almost every arena. Broadband impacts all areas of community life including local government, healthcare, education, economic development, and public safety. A community's ability to attract and retain economic development and its overall quality of life is dependent on infrastructure.

For local governments, broadband allows for cost efficiency, accountability and the ability to host services online. Social media provides an excellent vehicle for communication with citizens and civic engagement. Local governments must prepare to communicate with the younger generations through the communication channels they use. Technology has evolved community communications beyond the traditional public, educational and government ("PEG") access TV stations. The funding for these stations is decreasing due to changes in the technology infrastructure and over-the-top video. As stated by someone in the government telecommunications space, ***"without a locally-granted cable franchise, the likelihood that local funding will be available for traditional, "silo-ed" P, E and G access operations is significantly decreased. Communities that have taken a more modern business model approach – using the collaborative CMC [community media center] mode – are better situated to attract additional funding."1***

Broadband enabled healthcare helps to reduce cost and medical error and extends aid to people who would otherwise be unable to receive it in person. Additionally, online patient portals make it easier for patients to stay up to date on their health thereby assisting in critical health decisions. CIT, in partnership with Broad Axe Technologies, has conducted several annual health information technology ("HIT" available online http://www.wired.virginia.gov/broadband/initiatives/health-it/) assessments of healthcare providers in Virginia. In 2014, the assessment included representation from all major hospital systems in the commonwealth and increased participation by pharmacies and labs indicating the increasing role of HealthIT in medication safety and reporting lab results. Numerous studies have proven the impact of HealthIT resulting in a higher quality of care and improved coordination of care while decreasing overall costs. The increase in HealthIT adoption is driving increased demand for greater broadband bandwidths.

Every level of education benefits from broadband utilization including digital textbooks in the classroom to digital learning at home. Students without access to broadband after school hours are often unable to complete homework assignments and schools that are unable to use broadband-dependent technologies are unable to keep up with those that can. Adults who wish to further their education but are confined to the home for medical reasons, family, or otherwise can utilize online courses.

Broadband not only benefits a locality's economic development but has become essential to attracting and growing businesses. Broadband facilitates development of a skilled labor force and allows a locality to compete for and retain these skilled workers. Additionally, it allows businesses to deploy telework strategies which assist in employee retention, improved quality of life and reduced traffic congestion.

[1] From WATOA (Washington Association of Telecommunications Officers & Advisors) article: http://www.watoa.org/docs/Newsletters/WATOASpring2012.pdf)

In terms of public safety, broadband supports greater communication between first responders and with the public. Next generation 911 is the future for public safety and it allows citizens to send text messages and videos to emergency centers. Localities can leverage broadband to more efficiently alert its citizens of emergencies. Public safety's ever increasing dependency on broadband requires 911 centers to have broadband capacity and redundancy to ensure communications are not interrupted should a fiber or cable be cut.

Broadband may be the only unifying infrastructure within a locality and it will only become more and more essential in the future. With visible impacts in every department, localities that lack reliable broadband will fall farther and farther behind the digital divide.

BROADBAND OBJECTIVES FOR EVERY COMMUNITY

Improve the Community

According to a study published by the National Agricultural and Rural Development Policy Center [2](NARDeP), broadband, when adopted by a large portion of the population, promotes economic growth within communities. The study said that counties with a 60% or higher adoption rate had higher income growth and lower unemployment rates when compared to counties with 40% or lower adoption rates. Additionally the study found that broadband access alone was far less important to economic growth than adoption.

It is necessary for localities to focus efforts and partnerships on expanding broadband access to all citizens. A locality should prioritize efforts based on unmet demand – meaning first build to those who need broadband today and do not have access. However, it is also necessary that a locality work to increase its citizens' technology adoption so everyone, including the community, may realize the benefits of broadband access.

Economic Development

Every community today understands the need for broadband to support economic development. Broadband access is a requirement for getting companies to move to or establish themselves in a community. Additionally, in today's economy there are numerous home-based businesses and many rural localities that do not require business licensing are unaware of just how many home-based businesses exist. Another important economic outcome of having broadband access is the ability for citizens to find and apply for employment.

Surprisingly many surveys of businesses conducted in Virginia and other states across the nation indicate there are still many small to medium businesses that are not leveraging broadband. Economic developers have learned the value of mentoring programs for entrepreneurs to ensure they grow their startups and we must provide support for the small to medium businesses to ensure they are leveraging the Internet to expand their market and grow their businesses.

Libraries

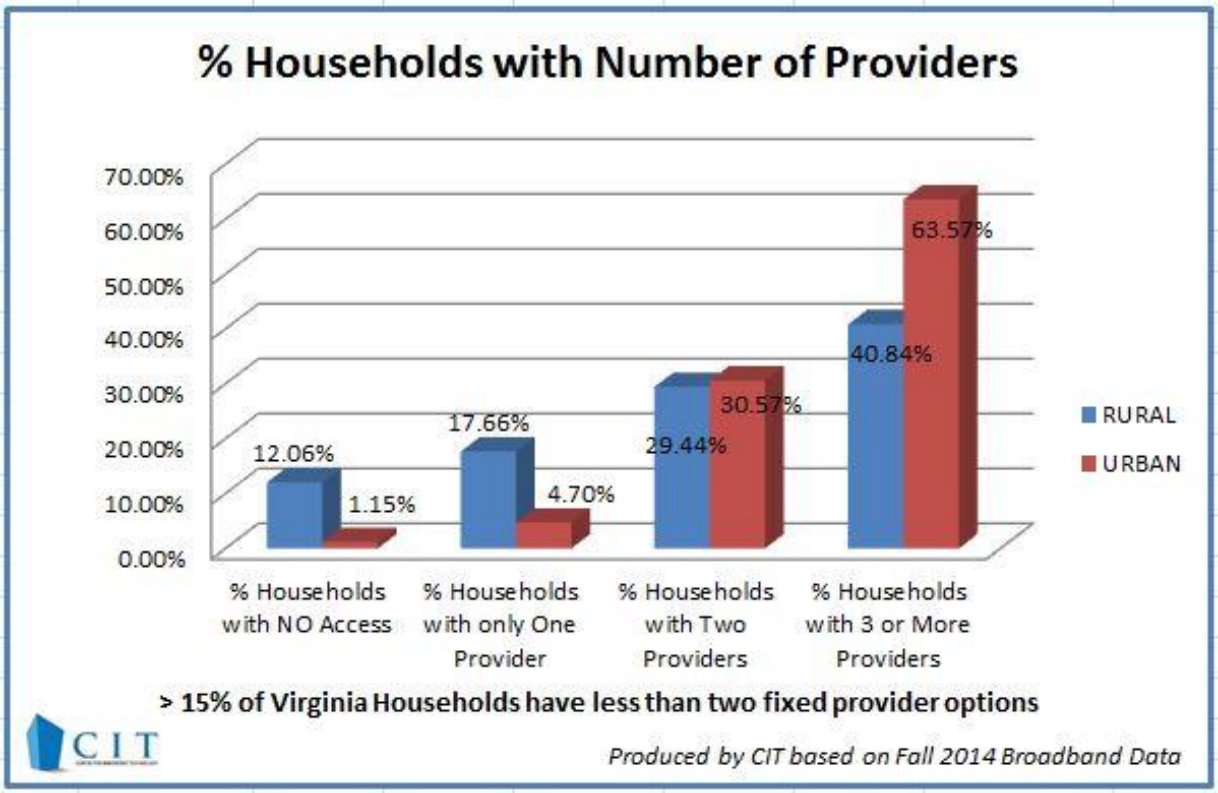
At the end of 2014, CIT performed an assessment of Virginia libraries (http://www.wired.virginia.gov/wp-content/uploads/News-Events/2015/2014-Virginia-Library-Assessment.pdf) by working with the Library of Virginia to conduct a statewide library speed test campaign and including broadband related questions in their annual survey. We merged the survey question responses with the speed test data to complete the analysis. Most of the analysis segregated rural and urban libraries as urban libraries typically have much greater access to broadband at cheaper prices.

[2] Broadband's Contribution to Economic Health in Rural Areas: A Causal Analysis http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2239876

Libraries have a significant role in providing digital literacy training which impacts technology adoption and in providing public access computers to citizens that may not have broadband access or a computer at home. Additionally several libraries report providing workforce development service. Libraries have transitioned to become key partners in the "digital readiness" of communities. It is important for every locality to support the libraries and facilitate their ability to provide digital literacy training and Internet access for anyone that does not have access at home.

Prepare for the Future

Innovations like Apple's iPad and iPhone have pushed technology adoption exponentially. We cannot imagine what the next few years will bring in technology especially considering the 'gigabit' communities that are fostering entrepreneurs and innovation. The "Internet of Things" is going to drive broadband access demand and require greater capacity. As mentioned earlier, HealthIT is quickly pushing demands for greater bandwidth and as in-home monitoring and assessment applications are deployed that demand for bandwidth is going to push into residential areas. Every region, and every locality, needs to ensure their connection to the Internet world is redundant (two or more paths and providers) and provides the capacity needed to support their move into the future. We must consider today's use of networks we build for tomorrow as those networks must be sustainable and affordable and often this is a difficult balance. We cannot predict how much capacity we will need 5-10 years from now. Consider in a family of four and everyone is leveraging Internet access for education, telecommuting, running a home-based business and may have almost every home device connected to the Internet leveraging technology in ways we have not imagined. That world is not far from us and we will need capacity and redundancy. Today we discuss redundancy for public safety, local government, schools and health care facilities. We need to be considering these same services for our businesses and soon our residences. We know how dependent we have become on being able to reach anyone anytime by mobile phone and email. We will become so dependent on future applications we will want redundancy at our homes and that means more than one technology delivering that service and not from just one provider.



BROADBAND TECHNOLOGIES

There are several technologies that exist today capable of delivering Internet service. We refer to broadband service as either being "fixed" or "mobile". Fixed broadband is service delivered to a fixed location by either wireline or wireless technologies. Mobile broadband is service that is delivered to a device as long as that device is within range of one of potentially many network transmitters. The simplest example of fixed service would be cable service which delivers Internet as well as video and telephony. An example of mobile service would be cellular service to a mobile phone. Mobile service is important to everyone in today's world as business may be conducted at anytime from anywhere and while it is necessary, this document is primarily focused on fixed broadband services to support homes, businesses, healthcare, education and public safety (even though the latter is ever more dependent on connectivity to mobile devices). The Virginia Broadband map is available online and contains all reported broadband coverage allowing each type to be turned on/off providing focus on the location of the various types of service. Additionally, the broadband team provides web-based broadband planning tools (http://www.cgit.vt.edu/broadband.html) that include access to easily printed maps of this data and vertical assets (towers).

The following community graphic is intended to provide a representation of the various technologies and the differences between fixed and mobile.

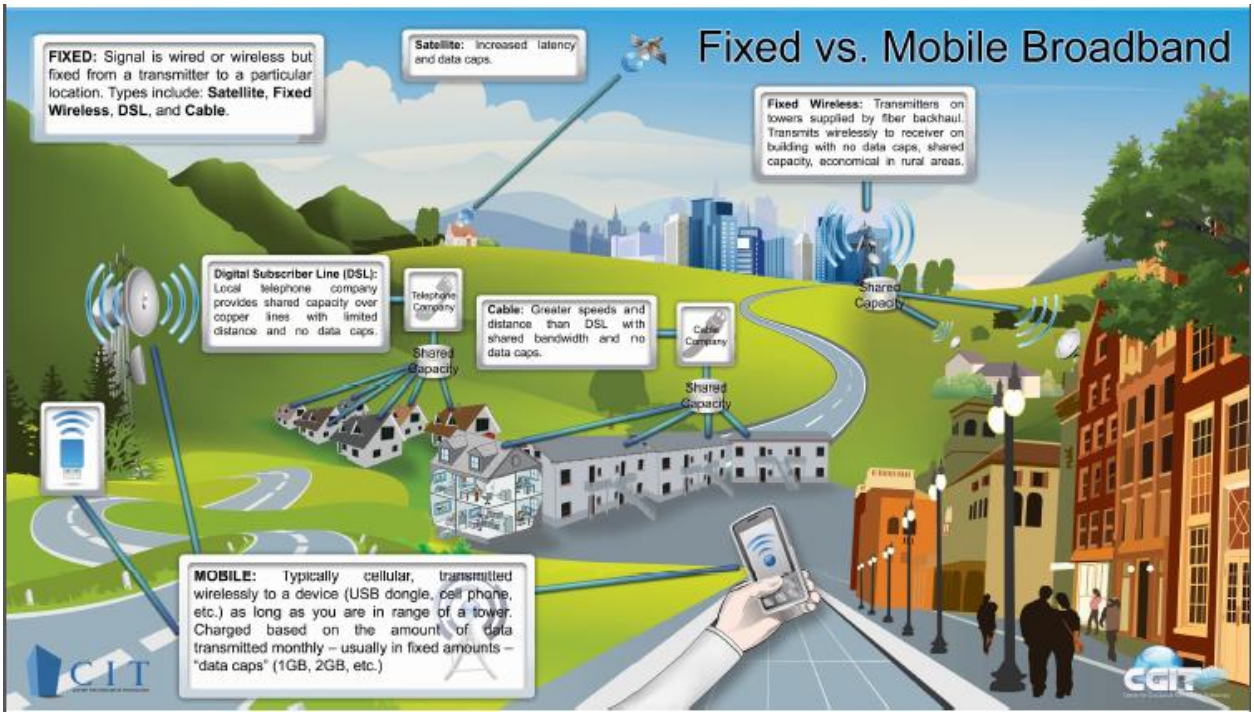


Figure 1 Fixed versus Mobile Broadband in a Community

Fixed Broadband Technologies

There are many different technologies that can deliver fixed Internet services. These include

- Fiber Optic – providing the fastest and most scalable service (speeds greater than 100Mbps).
- Digital Subscriber Lines (DSL) – service from the local telco provider with limited speeds and limited scalability (typically speeds of 1.5Mpbs to 10Mbps).
- Cable – providing cable modem for Internet Access at satisfactory speeds but not as scalable and some include a cap on monthly data usage (typically 3Mbps to 100Mbps).
- Fixed Wireless – providing speeds equivalent and now often exceeding that of cable or DSL at competitive prices, less costly and faster to deploy than wired services and has the ability to transmit radio signals 35+ miles (speeds of 3Mbps to 25Mbps depending on the equipment and distance).
- Satellite – the newer satellite technology is capable of providing speeds equivalent to some of the wireline technologies (speeds of 6Mpbs to 25Mbps), however, there is still a latency issue affecting some applications and most plans include a cap on monthly data usage.

As much as we all would like to have the fastest service as provided by fiber, it is not economically feasible to deploy fiber in rural areas where there are miles between homes or housing developments

and potentially difficult terrain to navigate. It is more realistic for non-metropolitan communities to accept they may need all or most of these technologies to be able to provide Internet service to all of their constituents. Equally important to understand is all of these technologies rely on a fiber backbone somewhere in the network.

Fiber

Fiber is absolutely the best solution to support our future demand, applications and the most cost effective long term solution for areas of dense population. Fiber networks are expensive on the front end (the initial build) but will last longer, provide greater bandwidth and less costly over time.

DSL

Every community has telephone infrastructure (primarily copper) in place serving every home as telephony service has been regulated by the federal government for many years to ensure everyone had this communication service available. The build out of this infrastructure in even the most rural areas has been subsidized by a federally managed Universal Service Fund (USF). The subsidies were paid to the telco carriers in high-cost areas to offset the capital expenditures to make the service sustainable. However, in recent years the USF has undergone changes to move some of the funding towards broadband deployments (Connect America Fund (CAF)) and to fund some rural broadband experiments in an effort to determine the most cost effective way to deploy broadband in these areas. Those experiments are now underway across the country but it will most likely be many years before results are published. One impact of re-routing some of the funding in the original USF is a reduction of subsidies to the incumbent rural telephone companies, leaving them with aging infrastructure and less subsidy funding to upgrade the equipment to expand DSL services.

Cable

Cable build-outs are typically based on cable franchise agreements with the local government and those agreements usually stipulate required build based on the number of homes per mile. When viewing a map of cable service in rural localities the coverage is centered in a town or the most urban areas because of this requirement. Additionally, these franchise agreements were based on the cable company providing cable TV service and not broadband. Cable, as with fiber, is costly to deploy in rural areas where the cable must be deployed many miles between homes or residential developments. Every provider is going to consider the cost to deploy the required infrastructure versus the potential return on investment which is based on the number of homes or businesses along the network. Another important point when considering cable service, many localities realize franchise fees associated with the cable TV services delivered through the agreement as well as support for public, education and government (PEG) channel support. As we are seeing the move to viewing streaming videos via NetFlix, Amazon, Apple and others, cable providers are seeing a reduction in TV subscribers. This change is going to impact local revenues and PEG support in the future. Communities are going to have to prepare for these changes and consider leveraging new technologies to support the communications currently provided by PEG channels.

Fixed Wireless

Fixed wireless technology is the most economical and easily deployed last mile solution and is well suited for rural and/or challenging terrain. This technology leverages radio frequencies – licensed or unlicensed – to transmit signals between towers and to antennas placed on businesses and residences. These networks are referred to as point-to-multipoint as one transmitter can deliver service to many customer sites. Fixed wireless technology can deliver high throughput over reliable and scalable networks. Providers have a "head end" location that supplies their wireless network with multiple fiber Internet service providers for redundancy. This fiber-fed Internet service is then distributed across the wireless technology and can span 25-30 miles for backhaul (tower to tower) and up to 15-20 miles for customer sites (tower to business/residence). This technology is not affected by weather but does depend on line-of-sight (LOS) or near-line-of-sight (nLOS) to a transmitter. Tree canopy and hills can disrupt signal, however, new WiMax technology now has the ability to shoot through and around the more frequent challenge of tree canopy.

RECOMMENDATIONS

Opportunities and Funding

As explained in the introduction, the purpose of this document is to share knowledge, resources and recommendations in order to help facilitate locality-led broadband access and utilizations efforts. Since this document is not specific for each community, every locality should consider each recommendation and take action where applicable.

It is important for a locality to develop a strategic broadband plan before pursuing funding to ensure any funding obtained is meeting the needs and priorities of their community. CIT provides funding information as related to broadband infrastructure (details available online as the last component of our Broadband Toolkit http://www.wired.virginia.gov/toolkit/) and we send notifications through the Planning District Commissions, VACO and VML when new opportunities arise. Projects across this nation have proven the value of broadband investment and one example in Virginia is Mid-Atlantic Broadband Communities Corporation (MBC) which was initially funded by the Tobacco Commission. MBC invested $100 million to build 1500 miles of fiber and that investment has resulted in generating over $1billion in return in regards to jobs created and private sector investments. There are countless other benefits for a community depending on not just access but on utilization – improved economy, employment opportunities, education, healthcare and public safety. For all of these reasons we provide recommendations that will improve utilization and help citizens that may not be online to adopt technology and improve their lives.

Broadband awareness and adoption ("digital readiness") will ensure a community realizes the benefits of Internet access and will increase the number of subscribers ("take rate") which ultimately helps make the business case for broadband access expansions. If a locality implements these programs, shares this information with the providers and partners with the providers it can have a positive impact on the business case and ultimately on expanding access and capacity.

Citizen Survey

A citizen survey will capture not only unmet demand but provide insight into utilization which can focus awareness and adoption efforts to ensure the community is able to garner all the benefits of broadband access ("digital ready"). CIT has developed a survey (http://www.wired.virginia.gov/broadband/broadband-survey) that, when leveraged by localities, will tabulate answers to questions regarding type of user, bandwidth requirements, price sensitivity, satisfaction with existing service, information technology training, and workforce availability. CIT can provide a printable version as well as ideally the survey should be direct mailed to capture every citizen, including those that do not currently get online.

Depending on the information garnered from the citizen survey, the locality may find a need to increase awareness and adoption through community programs. CIT has built an online broadband adoption resource to guide communities through this process based on successful case studies from across the nation and our own pilot project in Virginia conducted in 2014. These online resources (http://www.wired.virginia.gov/broadband/broadband-adoption/) include guidance on various community programs including resources for course content.

Aggregate Demand

Demand (existing and projected growth) for broadband services is an often overlooked but is a very important element in the broadband deployment equation. It is important to have a "total need" of all community anchor institutions ("CAIs") within the locality and to consider their strategic technology plans as these plans will stipulate future broadband requirements. How are the schools, libraries, local governments, first responders and medical facilities going to leverage Internet applications and technology in the next three to five years? Since CAIs do not move and do not stop buying service they are key in demonstrating current and future demand and they increase a locality's buying power when negotiating with providers for pricing and expansions. The CAI total demand can also be used as the "carrot" to entice a provider to address other underserved areas that may not be as profitable and to ensure there is adequate capacity for the future.

The locality should build a community of stakeholders which include CAI representatives and business leaders and host stakeholder meetings or create an online forum in order to understand their needs and better capture the current demand. In addition to understanding the demand better, a strong stakeholder community can help to drive a broadband initiative.

It's important to consider all unmet demand (people that want broadband today and do not have access) in a locality, this provides prioritization of areas for planning broadband access expansions. CIT, in partnership with Virginia Tech's Center for Geospatial Information Technology, is developing a website for capturing that unmet demand and to support targeted build-out campaigns (only building to demand). Any locality will be welcomed to leverage this tool to support a campaign to determine where the density in unmet demand exists and we will provide maps of the resulting data. This type of data can be used in conversations with providers about expansions to ensure they meet their business case and build to the demand. Please contact CIT if you are interested in leveraging the tool and we will provide access as soon as it is complete.

Policies and Processes Review

Broadband infrastructure investment is only made when there is enough return on investment to make the infrastructure sustainable when deployed by the public sector and enough to deliver a reasonable profit when deployed by the private sector. The cost of the infrastructure includes not just the materials but the labor and fees associated with the construction and deployment. Local governments can affect

these costs in regards to associated fees and time (time is money) required to get the approvals and permits. The majority of local ordinances, permitting fees and processes were defined well before broadband was even a consideration.

If treated like any other economic development initiative, a locality can help accelerate broadband expansion through the use of incentives and local investments, such as

- Access to right-of-ways and easements,
- "Dig once" opportunities,
- Installation of open access conduit,
- Streamlined permitting
    - Streamlining the permit application process includes the information that is required, when an application is considered "complete" for processing and how extensive any "visualization" requirements need to be.
- Consider permit fees based on an "at cost" fee structure, rather than a "flat fee".

A locality should meet with providers to discuss the county's permitting processes and fees and determine what modifications may have the biggest impact on providers' cost to deploy. Changing the math increases the possibility for faster, economically-sound expansion of broadband service throughout the locality.

CIT has created a Broadband Policy Assessment Tool (http://www.wired.virginia.gov/broadband/resources/) and associated guide in order to make the review and adjustments of existing policies easier for all local governments. The assessment tool functions as a guide for localities to quickly assess existing ordinances and fees to identify opportunities to lower costs of broadband deployments. It's important to note that Virginia is a Dillon rule state, meaning local governments have limited authority. CIT will be working with the state on some of these policies but there are still changes local governments can make to these policies.

Lower Costs of Broadband Deployments and Leverage Assets

The biggest hurdle localities face when attempting a broadband build out is how to fund it. Resources are often spread thin so it is critical that any money spent towards broadband expansion is done so in the most efficient way possible. There are a few key ways the county may be able to lower the cost of a broadband expansion project including aggregated demand (discussed earlier), leverage existing assets, and reallocation of current expenditures.

Leveraging existing assets belonging to the community, or that are publicly "influence-able" can have a drastically positive effect on the amount of financing necessary to complete a network build-out as well as having the potential to extend the reach of the deployment with little/no incremental cost. Localities should map their assets – towers, conduit, and fiber – and keep the data up to date so it is always available during any broadband planning activity.

A locality can potentially "buy down" the cost of deployment by performing a "telecommunications audit" to determine exactly how much is actually being spent on telecom expenditures and seek ways to economize these expenditures and reallocate those funds. More information on lowering the cost of broadband deployment can found in the Virginia Broadband Toolkit (http://www.wired.virginia.gov/toolkit/).

Partnerships

After the locality has made itself an attractive partner through policy review, demand aggregation and documenting the unmet demand it should begin to engage local broadband providers. By doing this, the locality can learn of future build out plans as well as level of interest in partnerships. Close collaboration and cooperation with service providers can change the economics of broadband deployment. As mentioned earlier, most underserved localities in Virginia need some of all the broadband technologies and incumbent providers own the infrastructure that needs to be part of the plan.

Conduct a provider meeting to discuss your efforts, any discussed or planned policy changes and the locality's goal(s) for both broadband access and realizing the benefits (awareness and adoption). Partnerships will not likely be built during a public meeting but the providers willing to work with the locality will step up and one-on-one meetings can determine how each partner can contribute to resolving the access issues and discovering what the locality can do to assist the providers in those expansions.

Engage provider partners on economic development opportunities as they are always seeking community anchor institutions and businesses in their customer mix to improve revenues and long-term sustainability. Any large planned developments should be discussed with the providers during the plan approval process to ensure there is some way to deliver broadband to the new areas and to give the providers the opportunity to potentially deploy infrastructure during the construction phase as this lowers their costs.

Redundancy

Much of today's current fiber deployments are led by the private sector and based on delivering capacity to the densest population areas. Every locality should have redundancy to reduce the potential for communications outages should a fiber plant be cut during some construction or other event. Additionally, the locality should ensure they have enough 'up-stream' fiber into the area to provide capacity for today and for the future. The locality may find they could obtain redundancy by providing some of their publically owned fiber in combination with one or more private providers – giving the providers redundancy as well. Every 911 center should have redundant up-stream Internet connections either through their own smaller ring of fiber or by leasing service from multiple providers that have different paths into the center.

PC Refurbishment

One of the main contributors to the Digital Divide is a lack of access to affordable computers. In most localities there are citizens living within a broadband-accessible area that cannot take advantage of the access because they cannot afford a computer. At the same time local governments and schools typically ship computers out of communities to be disposed of properly. Localities can keep community resources within the community by establishing a pc refurbishment program.

In order to establish a pc refurbishment program, the schools would create a class or club which would be led by someone with computer hardware knowledge. The local government, schools and potentially local businesses would donate the used computers for the students to refurbish. Once refurbished, the computers could be donated to local organizations or low-income families.

The locality may want to consider working with Virginia STAR. The *Virginia Student Training and Refurbishment Program* (Virginia STAR or VA STAR) is a state-wide program that teaches students to refurbish surplus computer hardware from government agencies and private companies. The refurbished computers are donated to families, organizations, and school districts in need and the students can earn industry-standard certifications. For more information, visit their website http://vastar.org/ .

Strategic Planning

Localities need to have a strategic broadband plan that identifies areas for future deployments and partnerships with the providers to leverage funding strategies and provide solid business cases for broadband services expansions. Once the locality has a strong understanding of their assets and current and future demand, a plan can be developed to expand and fill gaps. It is very important to have a plan even if the locality is not committed to taking any action at this time as there may be future opportunities to meet needs during a separate project or a broadband funding opportunity may surface that the locality would want to leverage. A strategic plan can include recommendations based on some of the actions this document includes – such as findings from a citizen/business survey – in addition to including preliminary engineering and costs for any needed infrastructure.

The first step in strategic broadband planning is to identify the locality's broadband goals and define the role the locality wants to hold in any broadband initiative. Does the locality want to expand broadband access for all citizens? Expand access and bandwidth to CAIs? Create an environment that stimulates economic development and presents an attractive environment for businesses and entrepreneurs? Having a prioritized list of goals will help the locality work more efficiently towards their plan. In terms of the role, the locality can lead expansions based on their understanding of the needs and potentially build infrastructure to facilitate those expansions. Alternatively, the locality may not want to invest in infrastructure and leave all expansions to the private sector and facilitate these through information sharing. Finally, the locality may want to take a more active role and form public-private partnership(s)

with private provider(s) and prioritize areas for expansion and share assets. Appendix A includes several community models providing insight on the various roles other local governments have taken on to advance broadband access in their community.

The next step is to identify a champion. A well-informed, passionate and persistent local champion is essential to any community initiative. This person or group will drive the initiative and rally the support of community stakeholders and the private sector to expand broadband access, awareness, adoption and utilization while demonstrating the broadband service demand that exists in the region. These efforts will help make the business case for the providers and ensure the population leverages the available service to improve their lives.

Localities are eligible to apply for a Community Development Block Planning Grant (CDBG) offered by The Virginia Department of Housing and Community Development (VDHCD) to assist in the costs of developing a strategic broadband plan. More information on the CDBG can be found at http://www.dhcd.virginia.gov/index.php/community-partnerships-dhcd/79-community-development-block-grant-cdbg-planning-grant.html .

APPENDIX A – COMMUNITY MODELS

Utility Owned Fiber

Bristol Virginia Utilities (BVU)

Bristol Virginia Utilities is a national model and the first city in the nation to build a fiber-to-the-home (FTTH) network. BVU began planning their fiber network in the late 1990s followed by deployment of fiber-to-the-premise (FTTP) in 2001 reaching 6,000 customers in just the first two years. The initial customers were municipal buildings, their own electrical substations and schools. BVU was the first municipal utility in the nation to build a fiber network delivering 'triple-play' – phone, Internet and cable TV. BVU transitioned over the years from being owned by the city to being owned by an authority (2010) and are continuing expansion including smart-grid technology through some BTOP and Tobacco Commission funding. It is important to note that BVU's initial goals were -- as with most municipal fiber networks – to lower telecommunications services prices and support their electric utility.

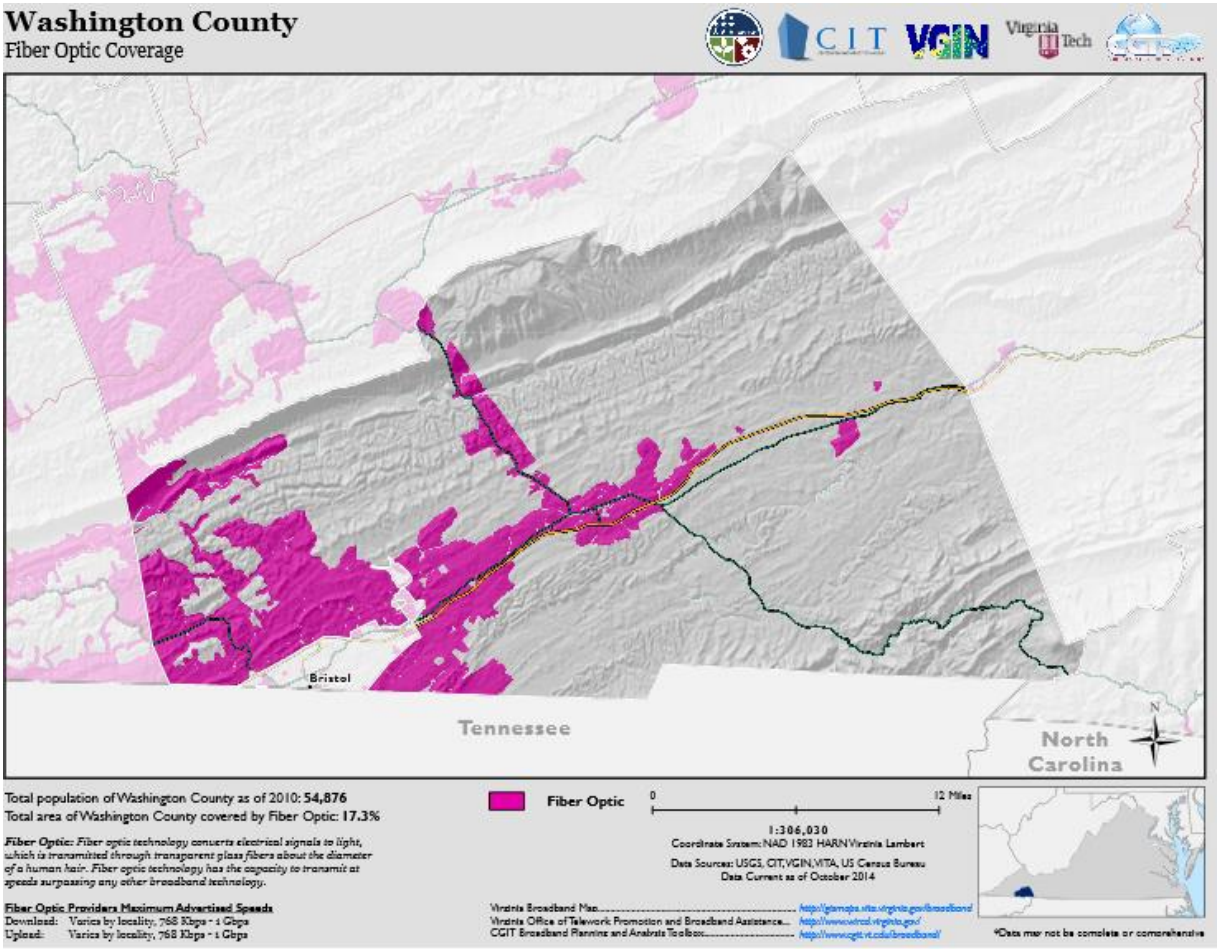


Figure 2 Washington County Fiber Service

Danville's nDanville Network

In 2004 Danville Utilities began building fiber to connect approximately 120 local government and the public school system buildings. Since inception they have expanded to connect approximately 100 businesses and then in 2011 began a residential connection pilot. This network is an open-access network allowing private sector providers to sell services to the connected businesses and citizens – the city does not sell services except to providers to use the network. For comparison, below are maps of the nDanville fiber network and cable and DSL coverage from the Virginia Broadband map. As expected, Danville has very good cable coverage.

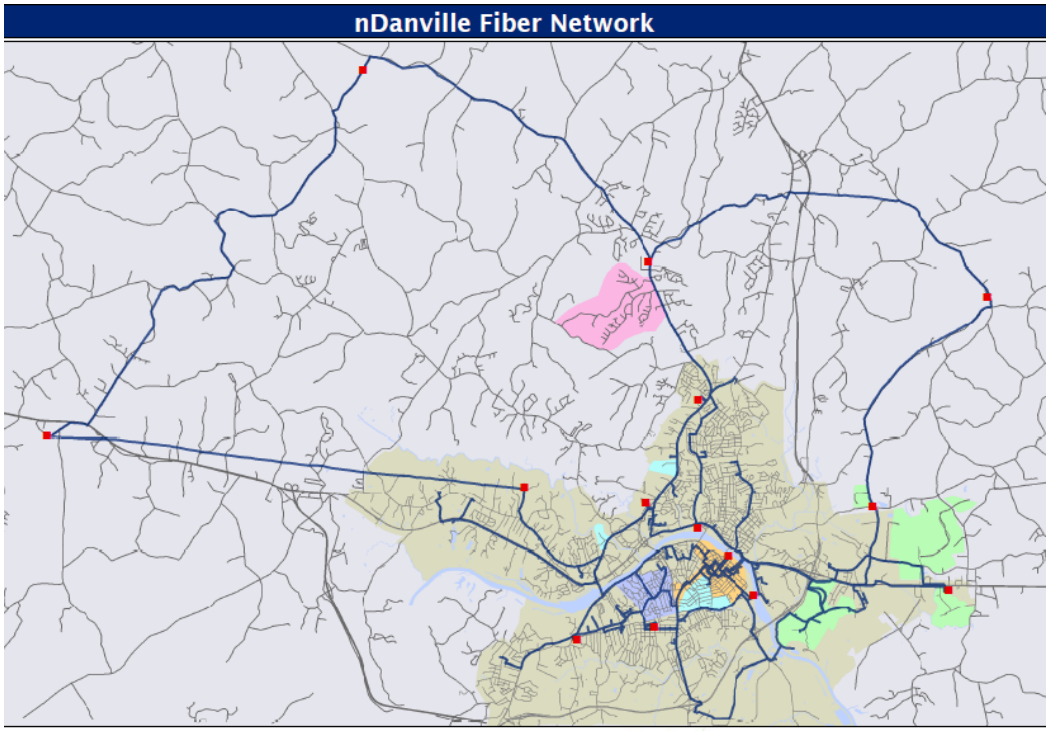


Figure 3 nDanville Fiber Network

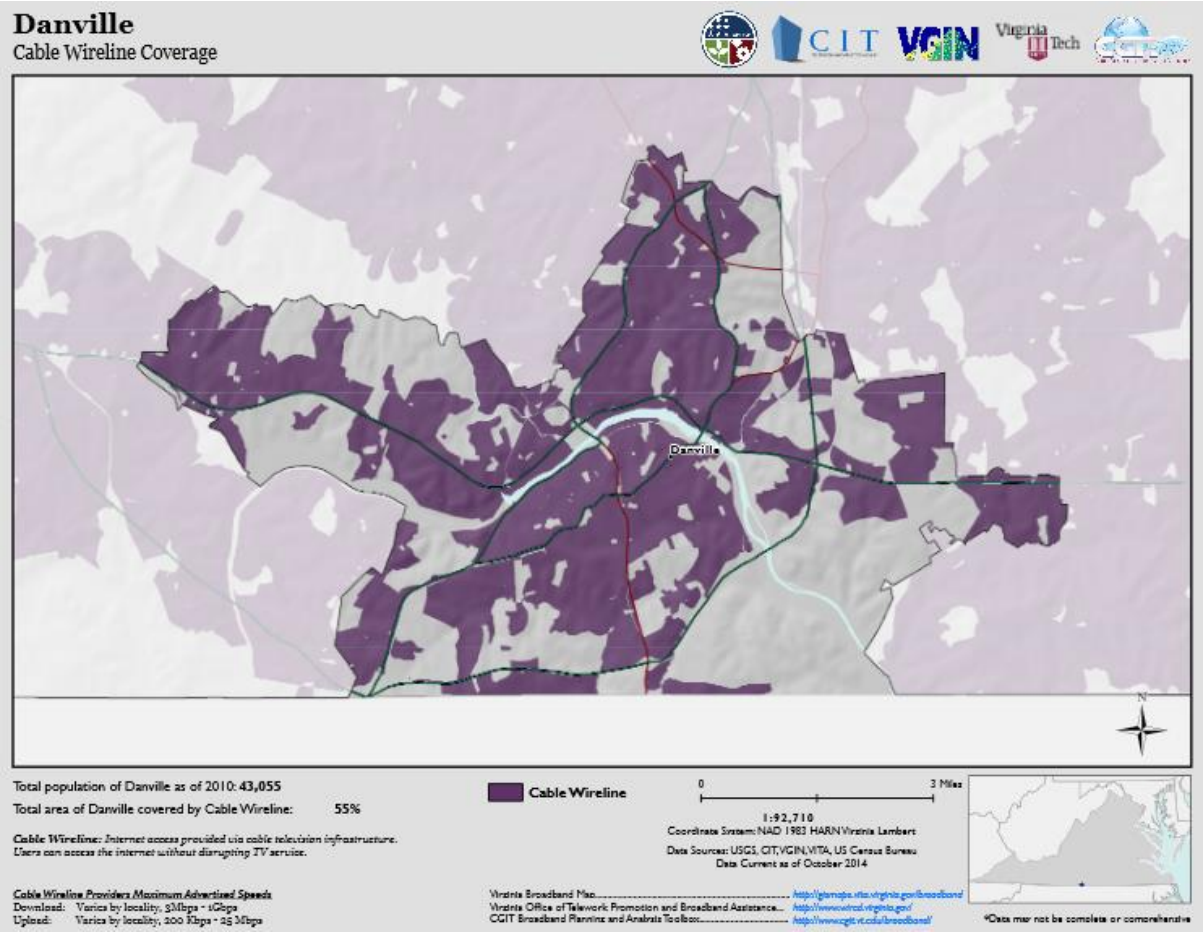


Figure 4 Danville City Cable Coverage

Rural Coop

Citizens Telephone Cooperative

Citizens Coop is based in Floyd and began in the early 1940s as a telephone coop. They have continued to expand through the years offering, in addition to telephone service, VoIP, IPTV video, DSL and FTTP serving 7 counties in southwest Virginia. Additionally, Citizens operates a 248 mile regional open access fiber network in 6 counties – serving 8 industrial parks. In 2010 Citizens received a BTOP award to extend the open access fiber network an additional 186 miles through 7 counties connecting industrial parks and community anchor institutions (CAIs). Notice in the map below that Floyd is very well covered with DSL service which is very rare for a rural county.

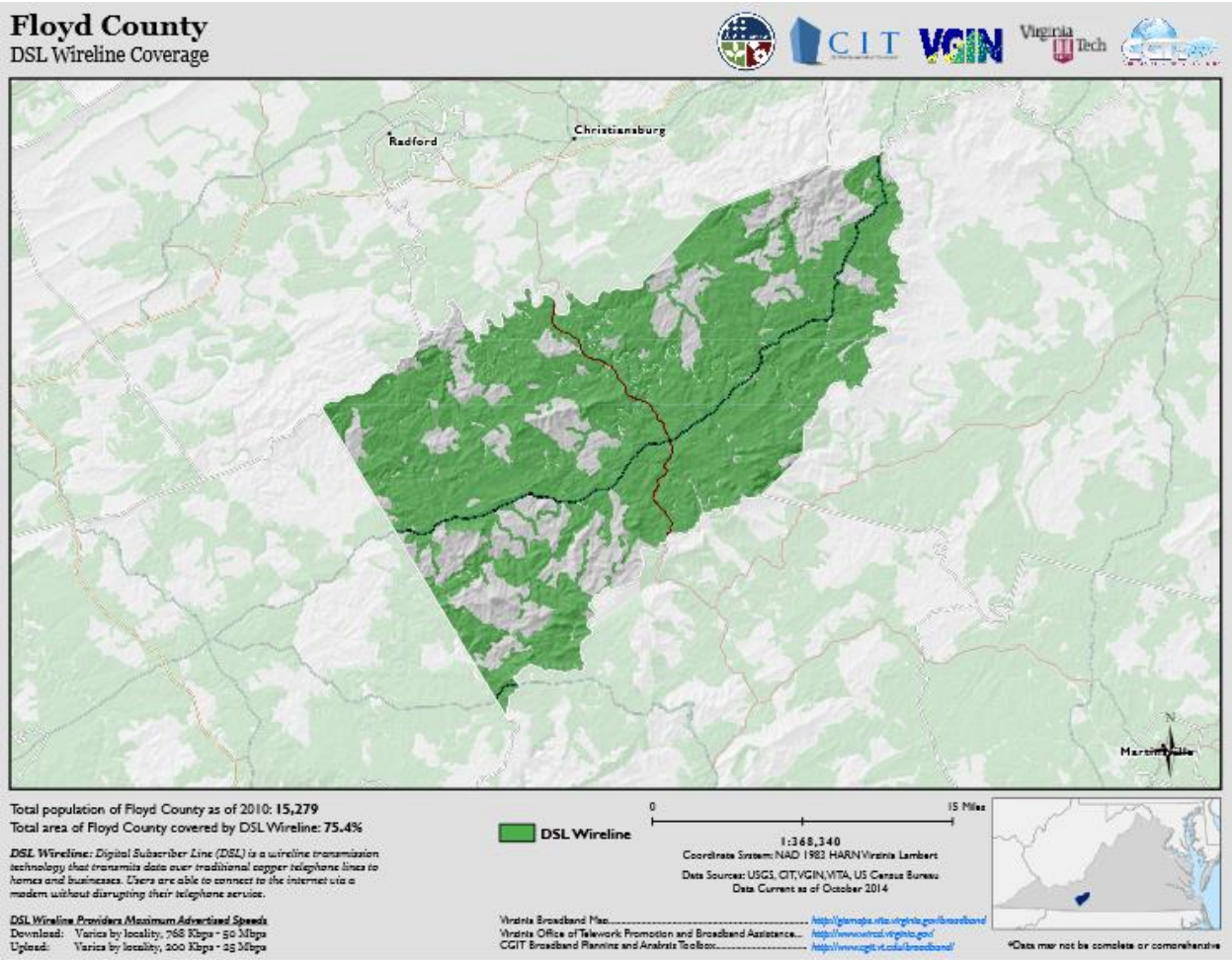


Figure 14 Floyd County DSL Coverage

Public-Private Partnerships

Franklin County

Franklin County is 721 square miles in the foothills of the Blue Ridge mountains – too large and challenging terrain to attempt fiber builds to serve the entire county. The size and terrain challenges make it difficult for private providers – local telco and cable – to make the business case to extend their fiber builds.

Franklin County formed a public-private partnership with a wireless Internet service provider (WISP) in 2005. That partnership was based on the county providing access to all county-owned vertical assets (towers, water tanks, building rooftops, etc.) in exchange for Internet service. The county invested very little from general county funds (approximately $36000 initially) in addition to $50,000 of a Homeland Security Grant to connect all 16 fire and rescue stations. The invested money was used to cover new tower infrastructure upgrades, some receiver equipment and pre-pay for services from one commercial

tower. This partnership arrangement allowed the WISP low-cost entry to build a fully redundant and robust wireless network throughout the county serving the local government, citizens and businesses. The WISP has continued expanding the network over the years and upgrading equipment as wireless technology advanced – serving hundreds of businesses and thousands of residences. The local government built a wide-area-network (WAN) through this wireless broadband network easing support and management of technology through all government agencies. The government was able to reduce telecom expenditures 36% over two years by deploying a voice-over-IP solution to all government facilities through this wireless network.

The following coverage map was recently produced by the WISP providing the Virginia State Broadband Initiative team with tower locations and equipment specifications which were used to model the wireless signals. This current process does not include tree canopy or building obstacles but our state broadband initiative is working to include this data in future models to continually improve the accuracy of mapping wireless coverage. The map below is somewhat overstated in coverage but only in regards to those type of obstacles in particular locations.

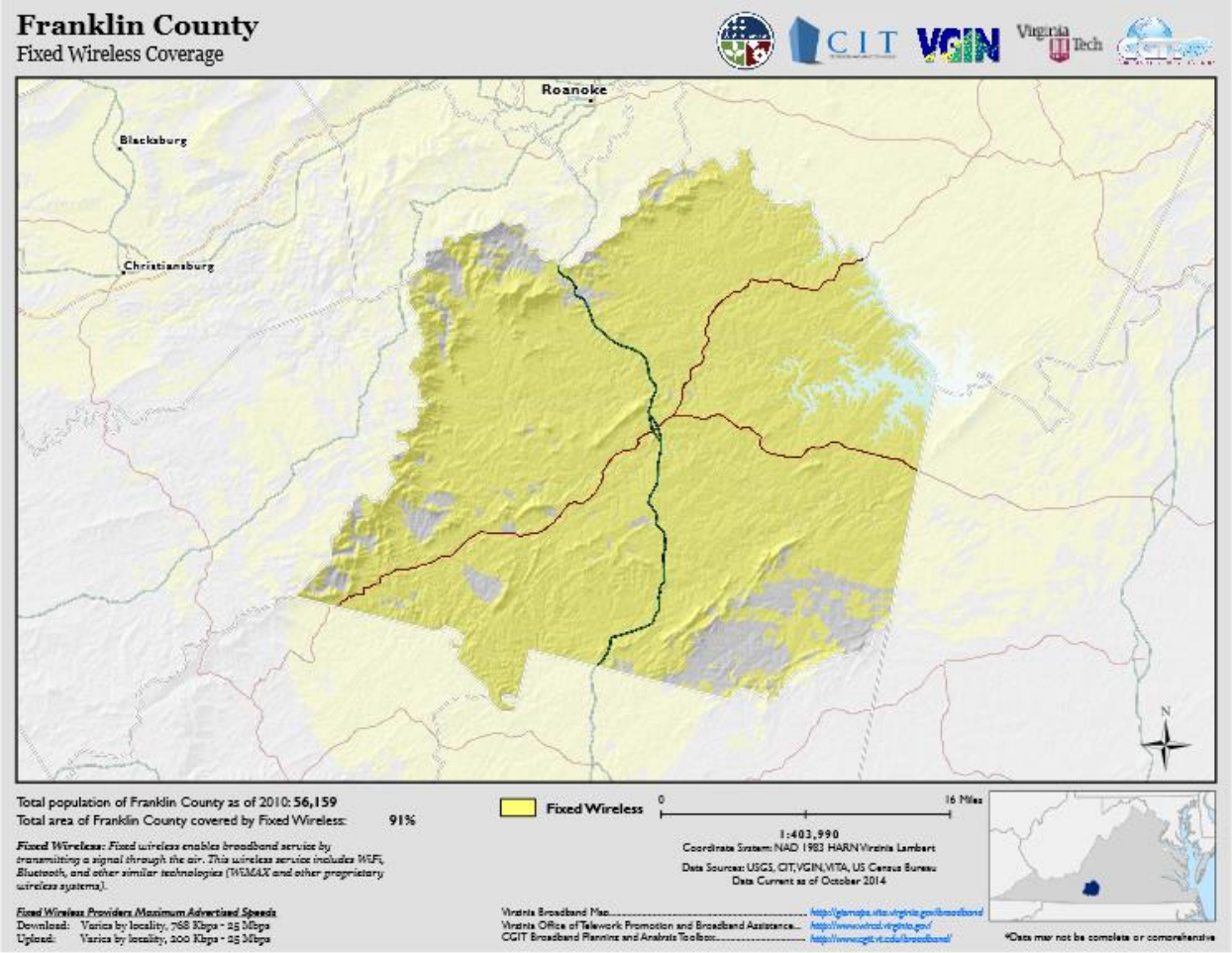


Figure 15 Franklin County Fixed Wireless coverage map

King and Queen County

King and Queen County is a small and rural locality that had virtually no broadband access. The county had built four towers to support their public safety radio system and leverage those towers and a public-private partnership to deploy a fixed wireless network serving the county community anchor institutions, citizens and businesses. This partnership is structured differently from Franklin County in that the county purchases the upstream bandwidth and all equipment while the private partner designs, maintains and operates the network and provides the customer service. The partnership includes a sliding revenue sharing model that provides greater revenues to the county in the earlier years to allow the county to recoup their investment and then to the private partner in the latter years.

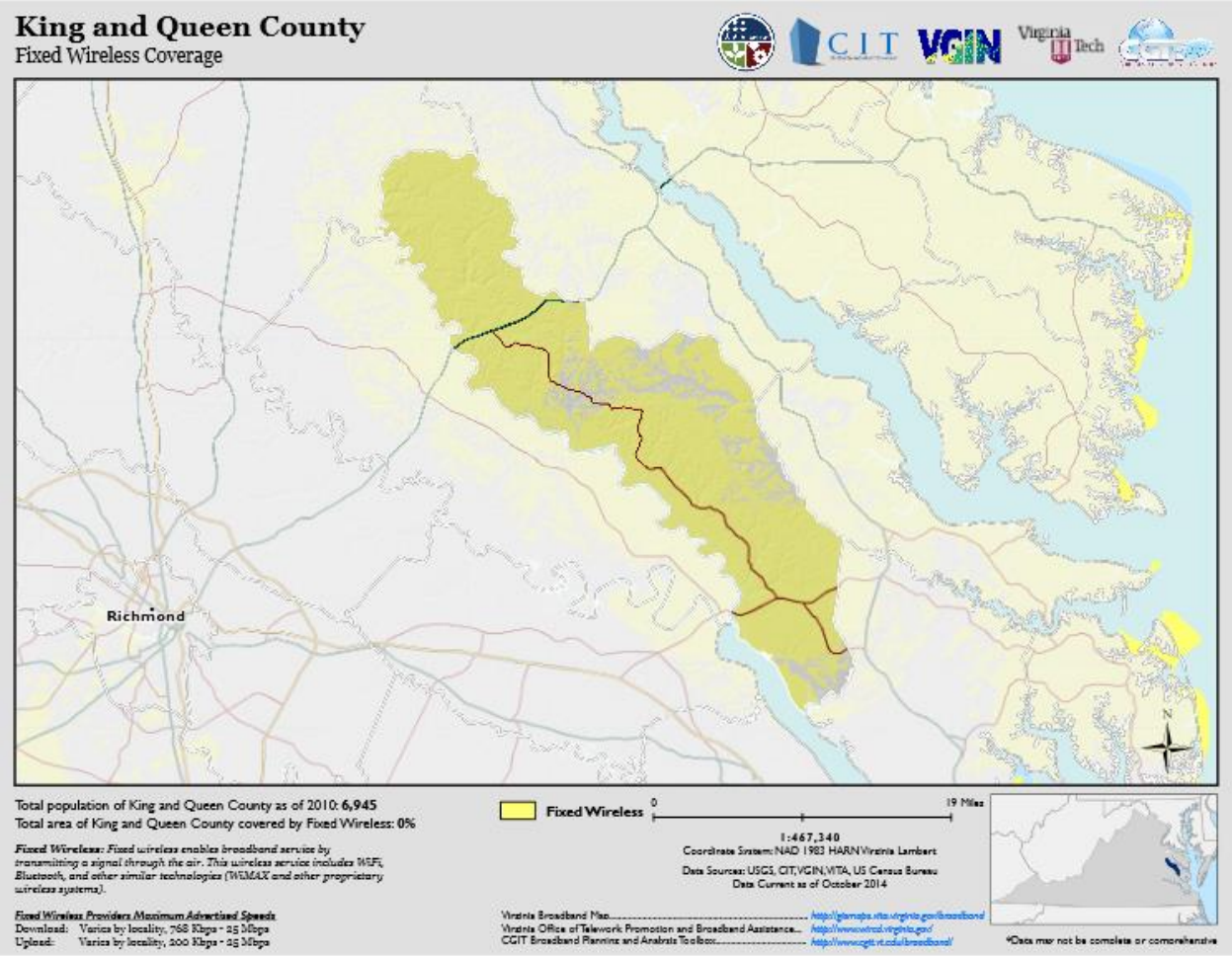


Figure 16 King and Queen County Fixed Wireless Coverage

Authority or co-op owned open access fiber network

Eastern Shore Broadband Authority

Northhampton and Accomack counties formed the authority in 2008 and began construction of an open-access fiber backbone connecting community anchor institutions. Funding was through DHCD,

EDA and congressional earmark in addition to county contributions. Few details will be repeated here since this authority is a close neighbor of the Middle Peninsula. The Virginia broadband map shows provider service coverage areas and as such, does not map open access fiber backbone. The Virginia broadband map view does show the eastern shore having good DSL coverage and a bit of cable coverage on Chincoteague.

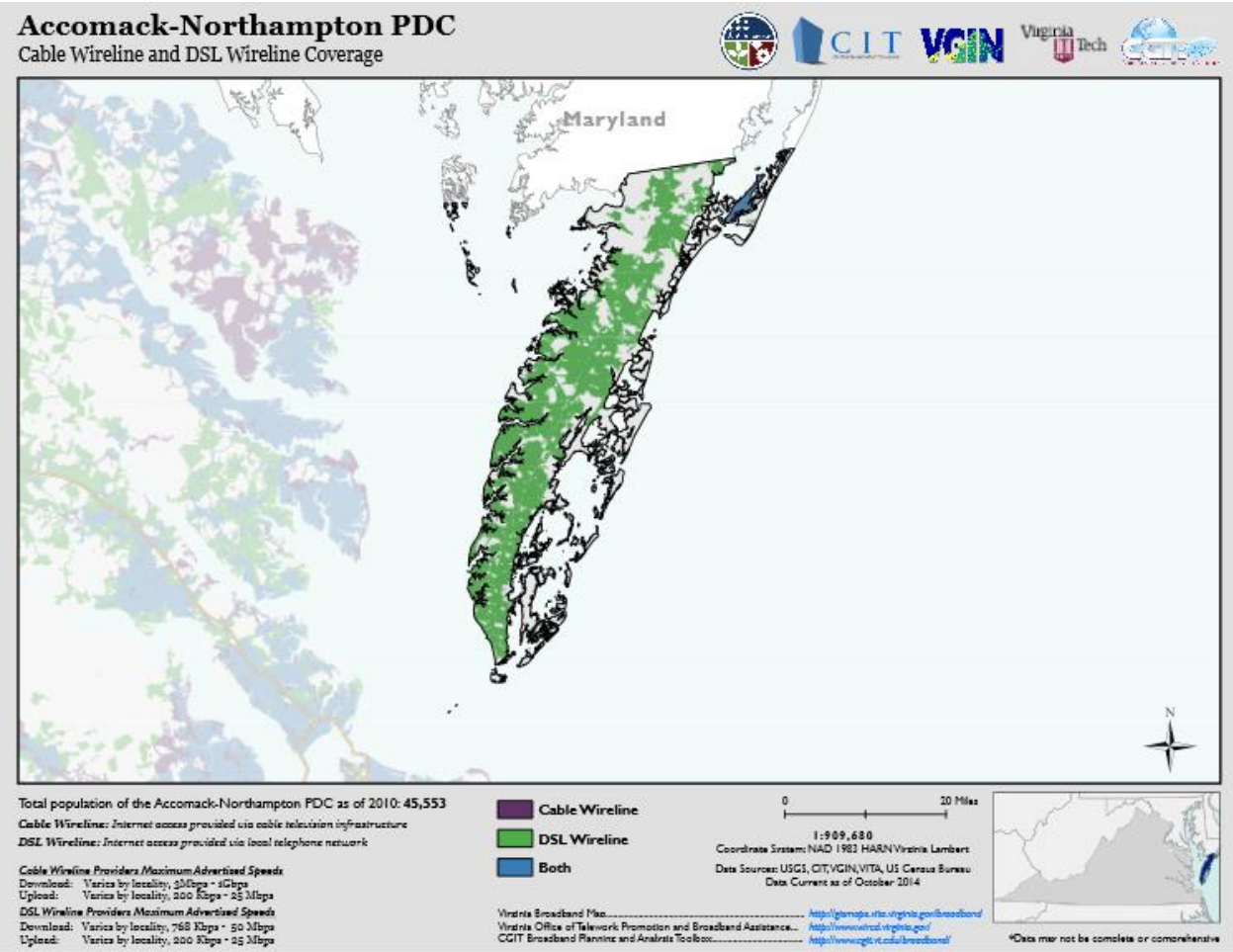


Figure 17 Eastern Shore DSL Coverage

Lenowisco

The LENOWISCO Planning District Commission partnered with private firm Sunset Digital in 2001 to deploy a fiber network throughout the counties of Lee, Scott and Wise and including the city of Norton. Funding was received primarily from the Tobacco Commission and by the end of 2009 they had deployed over 350 miles of fiber connecting over 800 FTTP subscribers. The planning district commission owns the network while Sunset Digital designed, built and operates the open access network in addition to providing Internet service.

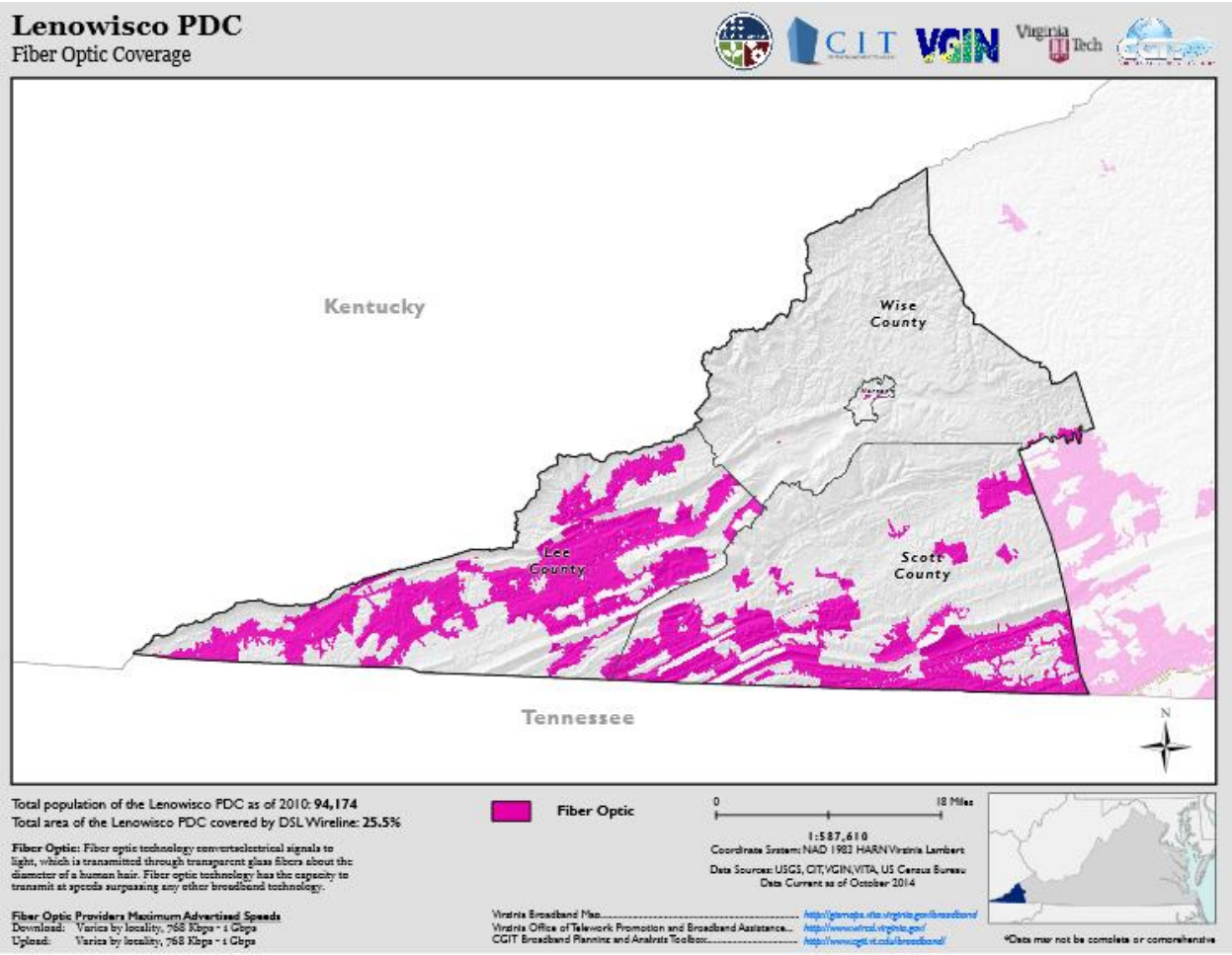


Figure 18 LENOWISCO Fiber Coverage