CONNECTING ANCHOR INSTITUTIONS: A BROADBAND ACTION PLAN

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Table of Contents

Preface

Community anchor institutions (CAIs) need open, affordable, high-capacity broadband connections to the Internet to accomplish their mission and serve the public. High-speed Internet access is essential for learning and education, workforce development, creativity and collaboration, telemedicine, civic engagement, access to e-government services, and a host of other individual and community needs.

Anchor institutions – schools, healthcare providers, libraries, public media outlets, public housing, community centers, community colleges and other institutions of higher education – serve as the gateway to the community. Deploying open, affordable, high-speed broadband connectivity to anchor institutions stimulates economic growth, promotes digital equity and encourages residential broadband adoption.

Unfortunately, the broadband needs of anchor institutions often do not receive the attention they deserve. The broadband industry and policymakers often focus on small businesses and/or residential users and overlook the broadband needs of community anchors. Many schools, libraries, and health clinics, especially those in rural areas, simply cannot afford the broadband connections they need.

Connecting Anchor Institutions: A Broadband Action Plan was developed by the Schools, Health & Libraries Broadband (SHLB) Coalition to provide ideas and actionable policy recommendations for government leaders at the federal, state, and local levels to address the broadband needs of anchor institutions.

The SHLB Coalition is a broad-based organization of anchor institutions, commercial companies and non-profit broadband providers, foundations, public interest groups, and others that work together to develop and support policies to improve broadband connectivity for anchor institutions and their communities in all regions of the country – urban, suburban, and especially rural.

The SHLB Coalition believes that deploying broadband networks to serve anchor institutions is a cost-efficient and vitally-important investment in our nation's future. Deploying broadband to anchor institutions can improve broadband access to millions of people (students, low-income and elderly people, migrants, etc.) who may not otherwise have access to the Internet. Anchor institution personnel train people about broadband services and technologies, thereby stimulating broadband usage and demand. Furthermore, high-capacity, middle-mile, broadband networks serving community anchor institutions are "jumping off points" to serve surrounding residential and business consumers.

This **Action Plan** is the first component of our national **Grow2Gig+ Campaign**, the SHLB Coalition's effort to make gigabit speeds for anchor institutions a national priority. It is a call to action that brings together policymakers, educators, library and health care leaders, technology experts, and network builders to lead the way.

We want the **Action Plan** to encourage further research and examination of CAI broadband needs and solutions. On our part, we intend to post additional information, research, and case studies on the Action Plan website (www.shlb.org/action-plan) and we invite you to contribute your information and join the discussion.

The SHLB Coalition is grateful to a number of parties who generously provided their time and expert insights in preparing this **Action Plan**. We interviewed the following leading authorities in preparing **Connecting Anchor Institutions: A Vision of Our Future**. These include Susan Crawford, John A. Reilly Clinical Professor of Law at Harvard Law School and Co-Director of the Berkman Center; Dr. S. Dallas Dance, Superintendent, Baltimore County Public Schools; Sari Feldman, former President, American Library Association, and Executive Director, Cuyahoga County Public Library; and Douglas Levin, Founder and President, EdTech Strategies, LLC.

We are thankful for the dedicated work of the SHLB Broadband Action Plan Steering Committee: Larra Clark (American Library Association); Adrianne Furniss and Kevin Taglang (Benton Foundation); Bob Collie, Lillian Kellogg, and Rex Miller (Education Networks of America); and Susannah Spellman (Internet2/USUCAN).

We give special thanks to the authors who contributed to the SHLB Broadband Action Plan: Amelia Bryne, Kelleigh Cole, Joanne Hovis, Tom Koutsky, Blair Levin, Christine Mullins, Angela Siefer, and Gina Spade. In addition, thank you to the following people for making the project possible: Theresa Stroisch (Brooktana), who served as expert Project Manager; Amy Robinson and Jeff Sharp for their valuable communications and public relations advice; and Emily Olson, SHLB's Director of Operations, for her top-notch oversight of this project.

We look forward to your support to ensure that community anchor institutions all across America have open, affordable, high-capacity broadband.

John Windhausen, Jr.
Executive Director
SHLB Coalition

Foreword

We just passed the 20th Anniversary of the Telecommunications Act of 1996. In a moment of bipartisanship rare in Washington DC these days, observers on both sides of the aisle praised the Act for reiterating and re-invigorating the national commitment to "universal service," the idea that all in our country must be connected to core communications services. Not only did the Act earn praise for ensuring high-cost areas and low-income individuals are connected, the Act took an additional, innovative step – mandating that schools, libraries, and rural health care facilities similarly have the support they need to connect to modern communications networks.

Such principles and mandates are essential; unfortunately they are not enough to ensure that the vision becomes, and stays, real. Changes in markets and technologies present both opportunities and challenges to our universal service goals. As we realized in writing the National Broadband Plan in 2010, for example, the Act's mandate to connect classrooms and libraries would fall short without support for Wi-Fi, a service not generally available in the earliest implementation of the Act. Just as the country needed Congress to adjust communications policy for the 21st Century, schools, libraries, and health care facilities need someone to make sure our communications policies continually "course correct" and ensure that the network facilities are upgraded to meet the needs of today and the future.

Fortunately, for the past seven years, the Schools, Health & Libraries Broadband (SHLB) Coalition has stepped in to play the vitally important role of advising policymakers how to connect anchor institutions, high-speed broadband, economic development, and universal service. SHLB has led the efforts to modernize our approach to broadband policy and made sure the voices of these critical public facilities are heard, often rising above the din of loud voices that too often characterize DC debates. As schools, libraries, and health care providers become—as is true for nearly all services—more and more dependent on the commons of collaboration we call broadband, SHLB's voice becomes even more important to the future effectiveness of the institutions and the communities they serve.

The SHLB Coalition's **Action Plan** is just the latest example of its ongoing influence. This work builds upon and puts "meat on the bones" of Goal #4 in the National Broadband Plan, to bring gigabit connectivity to anchor institutions across the country. Indeed, SHLB is trying to do for community anchor institutions what Gig.U has done for university communities. SHLB has accomplished great things. But its legacy, with your support, will be to bring the limitless opportunities of modern communications to all anchor institutions and the entire country.

Blair Levin
Former Executive Director of the U.S. National Broadband Plan
Senior Non-Residential Fellow, Brookings Institution Metropolitan Policy Program
(For identification purposes only)

Executive Summary

The future belongs to those with access to high-speed broadband. In the 21st century, anyone seeking to launch a business, exchange medical records, conduct a research project, obtain a college degree, engage in community activities, or create his or her own path will need both a high-capacity Internet connection and the digital skills necessary to navigate the online world. Community anchor institutions (CAIs) – schools, libraries, healthcare providers, community colleges, public media, public housing, and other community organizations – are the key institutions that enable universal access to broadband. CAIs make essential broadband Internet services available to those who are most in need and ensure that the benefits of the Internet are widely available to everyone—promoting digital equity and opportunity for all.

To fulfill this mission, every anchor institution needs to have open, affordable, high-capacity broadband that is scalable and adaptable to the growing information needs of the 21st century. Many broadband policies and plans focus on the needs of business or residential consumers without recognizing the significant, and sometimes unique, broadband needs of anchor institutions. Anchor institutions are the third leg of the stool for a healthy community. Connecting every anchor institution to a high-capacity broadband network is a cost-effective way to ensure that every community and every individual has high-speed access to the Internet.

Providing CAIs with high-capacity broadband – wireline and wireless – has many benefits: it stimulates economic growth, promotes individualized learning and STEM education, reduces the cost of healthcare through telemedicine, and expands community services. CAI broadband also promotes residential broadband adoption. Libraries and schools, for instance, offer digital literacy training for students, parents, and community members. Including CAIs in network deployment plans can improve the long-term economic viability of the network because CAIs serve as "anchor tenants." Building open, middle-mile networks to anchor institutions also promotes competition. Networks built to CAIs with open interconnection policies provide "jumping off" points that allow competitive broadband providers to extend service to the surrounding community.

Connecting Anchor Institutions: A Broadband Action Plan offers policymakers at all levels of government – as well as those directly involved in the adoption and deployment of broadband – a roadmap for improving the broadband connectivity of anchor institutions. The opening paper, **A Vision of Our Future**, describes the critical importance of high-capacity broadband to education, community services, health, civic engagement, digital equity, and economic growth. It also identifies key data points showing that many CAIs lack adequate broadband today and explains why improving anchor institution broadband is an urgent national priority.

The **Action Plan** then provides **ten policy papers**, written by a variety of experts, focusing on key issues that must be addressed to ensure that anchor institutions have the open, affordable, high-capacity broadband they need to serve their communities. Each policy paper summarizes the issue, provides examples, recommends steps that policymakers can take to address the problem, and provides resources for further research. In other words, the policy papers provide a playbook for achieving the goals set forth in the introductory vision paper.

While the papers address ten different topics, three common themes emerge from our analysis:

Sharing

Sharing, aggregation, partnerships, and collaboration were common solutions identified by several of the papers. Public-private partnerships are often the best model to bring parties together behind a comprehensive broadband strategy. Eliminating silos and aggregating many users on a single network reduces per-unit costs and makes network deployment and use more affordable.

Competitive Options

Promoting a variety of technological and competitive options can provide enormous benefits to anchor institutions. Because CAIs come in all shapes and sizes and are located in all types of environments, policymakers need to be careful not to adopt a "one-size-fits-all" strategy. Some CAIs may choose to purchase lit fiber, dark fiber, Wi-Fi, cellular, cable, or other technologies. Some may prefer to engage a traditional broadband provider, a competitive provider, a municipality, or a research and education network, and others may choose to build their own broadband networks. It is important for CAIs to have the opportunity to choose the technologies and providers that best meet their particular needs, even if that means self-provisioning.

Funding

Deploying broadband networks can be expensive, and additional investment from both the private and public sectors will be needed to meet anchor institutions' connectivity goals. Funding can be provided in a variety of ways – directly to CAIs, to network providers, or to non-profit organizations that redistribute the funding to others. Often, the biggest barrier to acquiring high-capacity broadband can be the up-front deployment costs. Grants, loans, and private sector capital can be important tools to fund network build-out and also reduce ongoing monthly service charges.

Each of the ten policy papers is summarized briefly below.

1. **Broadband Needs Assessment and Planning for Community Anchor Institutions:** *Governments should identify anchor institution broadband needs and develop plans with stakeholders, broadband providers, and other partners to attract additional investment to fill broadband gaps.* By Kelleigh Cole

    Conducting an inventory of the locations and speeds of existing broadband networks for CAIs – and identifying gaps in broadband coverage – can help target investments to areas most in need. This paper urges policymakers to gather detailed, granular information about the availability and use of high-capacity broadband services needed by CAIs, rather than relying on outdated or generic claims that an area is already served by existing providers.

2. **Wi-Fi and Wireless Networking for Community Anchor Institutions:** *By supporting robust Wi-Fi and wireless networking for community anchor institutions, policymakers can help enable a wide range of 21st century Internet applications for improved education, learning, and medical care.* By Amelia Bryne

    Because of surging demand for Wi-Fi connectivity, many CAIs do not have the capacity and coverage to offer enterprise-grade, ubiquitous Wi-Fi access. Emerging technologies can provide new kinds of wireless connectivity between buildings and to communities. Recommendations include continuing E-rate support for internal connections, making more unlicensed spectrum available, sharing CAI wireless networks with the surrounding community, and providing CAIs with technical advice to ensure they are using wireless most efficiently.

3. **Partnerships, Sharing, and Community Anchor Institution Broadband:** *Joint procurement, aggregated purchasing, and coordinated planning can significantly reduce the costs of providing high-quality broadband to anchor institutions.* By Joanne Hovis

    Aggregating the buying power of different types of CAIs through statewide or regional procurement is a tested best practice that can enable anchor institutions to achieve lower per unit pricing, higher bandwidth, and better service quality. Broadband policies and programs should promote, rather than limit, cross-sector, aggregated purchase of high-capacity broadband.

4. **Promoting Competition for Community Anchor Institution Broadband Services:** *Policymakers can improve anchor institution broadband by fostering competition, lowering prices, and promoting open interconnection and shared use of broadband networks.* By John Windhausen, Jr.

   Competition breeds greater investment, more jobs, lower prices, and higher quality customer service. Yet many CAIs still only receive one or no responses after issuing a request for service. Policymakers can promote competition for CAI broadband by ensuring that broadband networks are open to interconnection, reducing prices of wholesale services, and promoting network sharing.

5. **Broadband Infrastructure Policy and Community Anchor Institutions:** *Streamlining access to rights-of-way and effectively managing public land can expedite the deployment of high-capacity broadband to anchor institutions.* By Tom Koutsky

   Numerous studies document that rights-of-way management policies can dramatically impact the cost and speed of broadband deployment. This paper recommends "dig once" policies, installing empty conduit for competitive providers, permitting CAIs to use dark fiber, standardizing lease agreements for all providers, implementing asset inventory databases, improving wireless tower siting policies, and simplifying rights-of-way approval processes.

6. **Community Anchor Institutions Served by Government and Non-Profit Fiber Networks:** *State and local government networks can often provide anchors with high-quality bandwidth at affordable rates.* By Joanne Hovis

   Local governments, research and education networks, and other non-profit providers have been serving anchor institutions for decades. Because of their non-profit status, these providers often focus on long-term and community-based goals and can pass through cost savings to their CAI customers. Key recommendations include expanding the availability of municipal and non-profit networks, promoting the use of shared networks to serve multiple CAI sectors, and allowing municipal and non-profit providers to build excess capacity for use by commercial companies.

7. **Broadband Subsidies for Community Anchor Institutions:** *Community anchor institutions need financial support so they can afford to purchase high-capacity broadband services.* By Gina Spade

   Studies show that CAIs often cannot afford to purchase the broadband capacity they need to serve their communities. Policymakers can address CAIs' financial constraints with direct subsidies to CAIs, encouraging them to work together in planning joint procurement of broadband services, and expediting review of consortium applications for funding that can yield cost savings.

8. **Government Funding for Broadband Network Providers Serving Community Anchor Institutions:** *Providing government funding to broadband network providers serving CAIs encourages economic development, expands educational opportunity, improves health care services, and promotes digital equity.* By Amelia Bryne

   Governments can provide funding directly to broadband providers to deploy robust broadband networks for anchor institutions when the commercial market is not able to do so. Recommendations include creating competitive grant programs, promoting public-private partnerships, considering non-traditional financing such as preferential tax treatment and loan guarantees, and allowing non-traditional providers to participate in broadband funding programs.

9. **Rural Broadband Programs and Community Anchor Institutions:** *Governments should explore funding, network sharing, and service obligations to ensure that rural and tribal community anchor institutions have affordable, high-capacity broadband.* By Tom Koutsky

   Rural broadband networks require significant investment to cover high deployment costs and ongoing operations. More than 39 percent of rural Americans lack adequate access to broadband service, compared to

only 4 percent in urban areas. In the absence of a sustainable business model for rural broadband deployment, policymakers should provide enhanced financial incentives to attract private sector investment. Policymakers should permit open access and interconnection to facilitate the entry of new providers and implement service obligations to ensure recipients of government funding provide CAIs with high-capacity broadband.

10. **Community Anchor Institutions and Residential Broadband Adoption:** *Community anchor institutions are essential partners to increasing broadband adoption.* By Angela Siefer

    Residential broadband adoption has stalled – about one-third of American homes still do not subscribe to landline broadband service. CAIs can help increase residential broadband adoption in many ways. CAIs can provide digital literacy training, educate consumers about government programs to promote broadband adoption, lead community planning efforts, and, in some cases, provide wireless broadband services directly to consumers. For these efforts to succeed, however, policymakers must provide CAIs and their community partners with locally customized resources to meet the needs of specific populations.

This **Action Plan** does not contain all the answers, but offers a menu of ideas and seeks to stimulate greater discussion, research, and most importantly, action.

Over the next few years, policymakers and influencers at all levels will determine whether the country will be divided between digital "haves" and "have-nots," or whether we capture the benefits of the Internet for all. Open, affordable, high-capacity broadband enables CAIs to do what they do best—allow every student, patient, patron, and person to reach their potential in our increasingly digital world. It's time for action.

CONNECTING
ANCHOR INSTITUTIONS:
A VISION
OF OUR FUTURE

by Christine Mullins

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

> **Christine Mullins** is a writer and independent consultant. For 24 years, she was the executive director of the Instructional Technology Council of the American Association of Community Colleges, which represents higher education institutions that teach via distance education.

1   Broadband Needs Assessment and Planning for Community Anchor Institutions

2   Wi-Fi and Wireless Networking for Community Anchor Institutions

3   Partnerships, Sharing, and Community Anchor Institution Broadband

4   Promoting Competition for Community Anchor Institution Broadband Services

5   Broadband Infrastructure Policy and Community Anchor Institutions

6   Community Anchor Institutions Served by Government and Non-Profit Fiber Networks

7   Broadband Subsidies for Community Anchor Institutions

8   Government Funding for Broadband Network Providers Serving Community Anchor Institutions

9   Rural Broadband Programs and Community Anchor Institutions

10   Community Anchor Institutions and Residential Broadband Adoption

Introduction

The future belongs to those with access to high-speed broadband. Investing in broadband deployment to our nation's community anchor institutions ensures that the benefits of the Internet are widely available to everyone, promoting digital equity and opportunity for all.

In 2026, the United States will celebrate its 250th anniversary as a country and leader of modern democracy. As we look toward our future, preparing our nation for technological transformation is one of our most urgent national priorities.

The information and communications technologies (ICT) revolution is bringing enormous change to almost every facet of our education system, culture, society, and economy. To remain globally competitive, economically vibrant, educationally progressive, civically engaged, and culturally rich, the United States must ensure that all of our nation's community anchor institutions (CAIs) – schools, community colleges, libraries, healthcare providers, and other community and cultural institutions – are connected to high-capacity, high-quality broadband Internet networks.

Broadband connections will pave the way to technology breakthroughs and advancements, but we must first lay the infrastructure so everyone can benefit.

KLAUS SCHWAB,
Founder and Executive Chairman,
World Economic Forum

Why is ensuring high-capacity broadband for CAIs so vitally important? Our future could go in one of two directions: our society could be controlled by the digitally fortunate who have the technological know-how and high-capacity broadband access to master the information economy; or all Americans, enabled by high-capacity broadband access, could develop the Internet-based skills to launch their own businesses, conduct their own research, and follow their own path, competing, collaborating, and sharing information across all cultures and interest groups.

Anchor institutions are vitally important to ensuring that the Internet is available to everyone, and high-speed broadband connections are the key to making the Internet accessible to people of all ages, income levels, and demographic groups. For this reason, the National Broadband Plan called for anchor institutions to have at least one gigabit-per-second (Gbps) broadband connectivity by 2020.[1] While the U.S. has made progress toward that goal, achieving it will take more concerted work, as shown by the following:

- According to EducationSuperhighway, 23 percent of school districts and 41 percent of schools do not meet the minimum goals for Internet access, which leaves 21 million children without enough bandwidth for digital learning.[2]

- 42 percent of public libraries have a broadband connection slower than 10 Mbps.[3]

- Median subscribed download speed for rural libraries is one-fourth the speed of urban libraries.[4]

- Anchor institutions in rural and high-cost areas face extraordinary challenges in obtaining adequate broadband capacity. The costs of deploying fiber to schools in more rural regions of the US can be two to three times higher than the average cost of deploying fiber to schools in metro or suburban areas.[5]

- The gap between metro and non-metro health care facilities having at least a 50 Mbps connection grew by 34 points from 2010 to 2014. There is a similar gap in broadband connectivity for upload speeds, which affects transfer of Electronic Medical Records (EMR) and Health Information Exchanges (HIEs).[6]

In short, over the next few years, policymakers will need to decide whether to make the investments needed to ensure that anchor institutions have affordable, high-capacity broadband connections. And these decisions will determine whether the country will be divided between digital "haves" and "have-nots," or whether we capture the benefits of the Internet for all people.

CAIs can provide essential access and bridge this gap. CAIs can be the gateway to the digital community by offering equitable access to broadband-dependent services and teaching the skills needed to make best use of them. Deploying open, affordable, high-capacity broadband to CAIs in every community can expand educational opportunities, extend access to vital healthcare, keep people civically engaged and connected, and stimulate economic growth, while also promoting residential broadband adoption.

Schools, libraries, healthcare facilities, community centers, public media, and public service organizations can aggregate limited community resources over shared broadband networks and extend our digital lifeline—so even more end users can access the opportunities the Internet offers. Broadband connections will allow CAIs to expand on their public mission, scope and support—to do what they do best—so every student and citizen can reach their potential and be a full participant in our increasingly digital world. In a highly-connected environment, students and library patrons will be able to meet virtually with their teachers, professors, and outside experts online—to learn, explore and engage in research to address our most intractable problems. Medical specialists will be able to use high-resolution video to evaluate and monitor the health of patients who are physically located miles away, to ask questions, run diagnostic tests, and follow up on visual clues.

High-capacity broadband connects anchor institutions to their communities and to the world in the following ways:

- High-Capacity Broadband is the Foundation of 21st Century Learning and Education.

- High-Capacity Broadband Allows Libraries to Expand Community Connections and Services.

- High-Capacity Broadband Allows Patients to Benefit from Remote Healthcare.

- Deploying High-Capacity Broadband to Anchor Institutions Ignites Economic Development.

- Combining Anchor Institutions with Broadband Elevates Civic Engagement.

- Connected Community Anchors Promote Digital Equity.

High-Capacity Broadband is the Foundation of 21st Century Learning and Education

This is truly an exciting time for education in this country. The U.S. has an opportunity to transform its Industrial Age school systems to Information Age school systems that provide each student with individualized instruction, resources and support. Broadband services impact all levels of the educational process – classroom instruction, school administration, and homework. All schools, regardless of location, need access to high-capacity broadband in order to take maximum advantage of this technological revolution.

This digital transformation is well on its way. K-12 schools across the country are adopting 1:1 programs (providing a computing device to each student) and implementing "bring your own device" programs (utilizing the technology students already own). These programs enable more personalized, equitable, relevant, and cost-effective education for students.

One of the most recognized examples of this digital shift in education is in the Mooresville Graded School District (Mooresville), located north of Charlotte, North Carolina.[7] Mooresville has a comprehensive 1:1 program for its students in grades 4-12 and a robust broadband infrastructure to support it. The district has also worked to ensure equity by offering programs where every student, regardless of his/her ability to afford it, has broadband Internet access at home. As a result, Mooresville has shown positive gains in many benchmarks for educational improvement. These measurable outcomes include improved test scores in reading, math, and science; increased attendance and graduation rates; and lower spending to realize these gains compared to other North Carolina school districts. The district's graduation rate improved from 80 percent in 2008 to 91 percent in 2011.[8]

None of these educational gains would have been possible without having access to high-capacity broadband. The success of the Mooresville experience is having an impact across the country, as more and more school districts are replacing textbooks with digital devices. According to a 2014 survey sponsored by Amplify, nearly 71 percent of school district leaders said that a quarter or more of their schools have adopted mobile technology, up from 60 percent in 2013, and that 82 percent of school district leaders are highly interested in implementing 1:1 initiatives, if their budgets allow.[9]

Mobile Technology Moves to the Classroom

Research shows that mobile technology's substantial presence in schools is expanding and will only continue to grow in the next few years.

71% of districts surveyed in **2014** reported that at least a quarter of their schools have adopted mobile technology,

up from **60%** in **2013**.

67% of those with no mobile technology at present said they were very or somewhat likely to adopt it in the next **1-2 years.**

Amplify

Dr. Dallas Dance, superintendent of Baltimore County Public Schools, describes providing every student with access to broadband connections and new technologies as a moral imperative. Dr. Dance says, "In our future connected world, the new high-tech tools and pedagogies students in the wealthiest school districts enjoy must be available to every American, no matter where they are located. Students everywhere should be able to engage in the robust learning experiences that capitalize on the efficiencies of digital communications."

Four years ago, the State Educational Technology Directors Association (SETDA) issued a landmark white paper called "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs."[10] This study recommended the following broadband standards for the future of K-12 education, which were adopted by the FCC two years later:

1. For the 2014-2015 school year, at least 100 Mbps per 1,000 students/staff for Internet access and at least 1 Gbps per 1000 students/staff for wide area network (WAN) connections; and

2. For the 2017-2018 school year, at least 1 Gbps per 1,000 students/staff for Internet access and at least 10 Gbps per 1,000 students/staff for WAN connections.

Network deficiencies exist in both the Internet access and District WAN connections

Percent of Schools

- Not Meeting Current Goals: 81% / 63%
- Not Meeting Five Year Goals: 99% / 63%
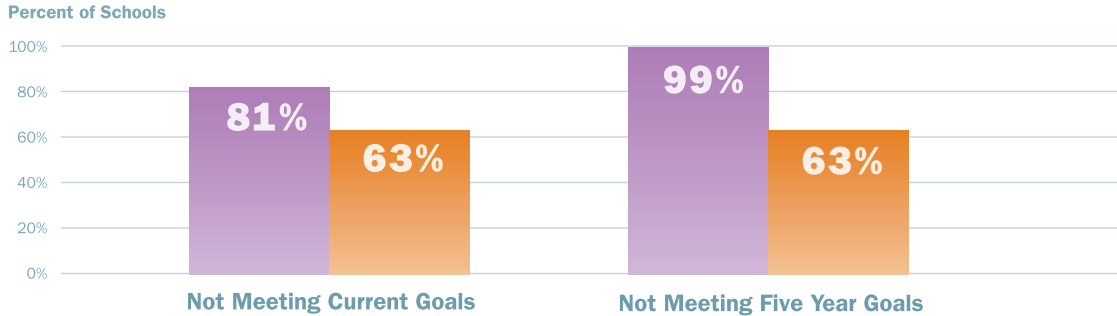
Education Superhighway

To ensure broadband access for students and educators, SETDA also recommended the federal government, states, and districts take responsibility for ensuring easy access to robust broadband connectivity outside of schools including, but not limited to, the home and such publicly-accessible institutions as libraries and community centers.

Unfortunately, not all schools have been able to meet these standards. Twenty-three percent of school systems indicated to the Consortium for School Networking (CoSN) that none of the schools in their system can meet the 2014-15 school year SETDA broadband connectivity goal of at least 100 Mbps per 1,000 students/staff.[11]

Thanks to the Federal Communication Commission's (FCC) decision in 2014 to increase funding for the E-rate program, many schools are now upgrading their broadband infrastructure and capacity to meet greater demand. While the FCC's decision is extremely important, funding is just one component of the comprehensive, holistic approach that is needed. Ensuring that these technologies deliver an improved educational experience requires leadership, teamwork, and a strategy for success.

At its best, technology allows us to extend our human presence so students can interact with, and begin to understand and empathize with, others who are located across the community, the country and around the world, as they encounter new viewpoints and perspectives. Susan Crawford, Professor at Harvard and former official in the Obama Administration, believes the killer app for broadband will be "human interaction." In an ideal educational environment, high-capacity Internet connections allow students not just to go on virtual field trips and record their scientific findings, but allow them to record interviews with scientists, offer personal commentary, and facilitate new types of video presentations to stream to their teachers and fellow students in other states and countries.

New Education Paradigms Need High-Capacity Broadband

High-capacity broadband infrastructure will allow schools to incorporate new or enhanced learning opportunities and technological applications—such as open educational resources, distance learning, and flipped learning.

- Open Education Resources (OER): State governments, school districts, and college students spend millions of dollars annually to purchase printed textbooks that are often out-of-date as soon as they come off the press. Educators have discovered that—by leveraging the prevalence of smartphones, mobile devices, and laptops—they can help their communities and students take advantage of free and low-cost eTextbooks, and other OERs. Some materials are already freely available and many have a Creative Commons copyright license that allows educators to use and adapt the learning materials

as they wish. Most recently, the use of OER for K-12 use has been adopted by 14 states across the country with others expected to join the shift from print to digital education resources.[12]

- Distance and Online Learning: Distance and online learning is increasingly popular. Many students would not be able to pursue their educational goals otherwise. Distance education transcends physical constraints, allowing access to courses from high-caliber teachers, curriculum, and institutions that are not locally available.[13]

- Flipped Learning or Flipped Classroom: The flipped classroom is a relatively new teaching approach where lecture and homework are reversed. In a flipped classroom model, students view lectures online at home and classroom time is reserved for activities, tutorials, or discussions to enhance and ensure subject mastery.

These are just a few of the new learning paradigms enabled by high-capacity broadband. Emerging technology-based learning opportunities—such as educational games, simulations, and virtual and augmented reality—are being developed to engage students' imaginations and tap their creativity. These new learning approaches not only promote self-discovery; they also allow students to interact in fun, unexpected, and meaningful ways with their teachers, professors, other students, and with the subject matter itself.

Connected Schools Create a Modern Workforce

The most critical component of the nation's economy is skilled human capital, and demand for highly-skilled workers appears to exceed supply.[14] Increasingly, schools need to develop a sophisticated, flexible and highly-educated workforce with the knowledge and 21st century technological skills needed to lead the information economy. Workers also need continual job and professional development training to enhance their competencies, update their professional licenses, and learn additional skills to pursue new or advanced career opportunities. Businesses require digitally-skilled and knowledgeable employees, who have the ability to think on their feet, communicate, collaborate, and quickly take advantage of evolving customer demands, technologies, and opportunities. With the growth of cloud-based workforce training courses and the emergence of online entrepreneurs, ready access to high-speed Internet connections is a must.

America's future competitiveness depends, in part, on our students' abilities to master science, technology, engineering and math (STEM) skills. According to the STEM Education Coalition, 60 percent of employers are having trouble finding qualified workers to fill vacancies at their companies, even though STEM workers earn 11 percent higher wages compared with their same-degree counterparts in other jobs. Today, only 45 percent of high school graduates are ready for college work in mathematics, and only 30 percent are ready for college work in science.[15]

As far back as 2000, the Congressionally-mandated 21st Century Workforce Commission identified universal broadband access as a key to the success of workforce development – and identified anchor institutions as critical partners to provide technology access to underserved individuals and families.[16]

Schools and community colleges need access to fast broadband connections so these workforce-enabling community anchor institutions can address the shortfalls in 21st century STEM education and digital literacy. Creating "Information Age" environments in our schools and community colleges will require the highest levels of technological sophistication, and their success depends on the availability of affordable, high-capacity broadband networks.

High-Capacity Broadband Allows Libraries to Expand Community Connections and Services

Libraries Create Digital Creative Commons and Makerspaces

Stop by your local public library today and you will find a range of digital services and tools unimaginable even a decade ago. From videoconferencing capabilities to digital media labs to 3D printers, libraries enable people to create, collaborate and learn new digital skills. People also visit their local library to access vital lifeline services—to search online job openings, do schoolwork, file their taxes remotely, access online government services, conduct legal research, and explore our world. Many of these services or information sources are no longer offered in a print format. For all these reasons, library computer desktops are often full, laptops and tablets are checked out, and library Wi-Fi is intensively used—sometimes even after the physical library has closed.

> *Libraries are transforming into community hubs for digital content creation and collaboration. Having a high-speed and resilient Internet connection at each and every library is essential to ensuring a full range of services related to education, employment, entrepreneurship, empowerment and community engagement for all.*
>
> **SARI FELDMAN**
> **President, American Library Association**

Cuyahoga County Public Library (CCPL) in Ohio provides an exciting example of what a high-capacity integrated network can offer a community. Nearly all of its 27 library locations have a robust, one-gigabit, broadband connection.[17] This connectivity allows the library system to become a "creative commons"—a reliable, trusted environment where patrons can learn workplace skills, take GED and college prep courses, and obtain digital literacy skills, so they can navigate the new digital environment. Recently, during the open enrollment season for health insurance, the library became a place where many came to learn about their healthcare options and enroll online in insurance programs available through the Affordable Care Act.

According to CCPL Executive Director and American Library Association President Sari Feldman, "The mission of the Cuyahoga County Public Library is to be at the center of community life by providing an environment where reading, life-long learning and civic engagement thrive. That environment has to include high-speed broadband and skilled staff."[18]

Feldman further states that broadband technologies enhance the library's ability to provide a safe, face-to-face, and online meeting environment where patrons can meet new friends and colleagues to discuss and share ideas. For example, the CCPL writing center offers a creative space to meet other aspiring writers, take face-to-face and online courses, and even upload one's newly-created eBook to a digital platform to share via the Web. Feldman notes that "this trend toward collaborative learning will only continue to grow" in a more digitally-connected world, and libraries will play an integral role. Libraries are quickly broadening their impact in their community by serving as digital hubs for broadband access, digital services, and related training.

There are many examples of libraries incorporating technologies for young people into their programming. The Brooklyn Public Library (BPL) created a technology-centered program specifically designed for teens who can learn, for instance, how to create their own iMovies using a "green screen." According to Lisa Goldstein, the head of the Youth Wing at BPL's Central Library, "Teens are some of our most enthusiastic and adventurous users of technology, and tech programs for teens are essential. They not only train teens in the technologies that may be required for future educational and job opportunities, they educate librarians about what tech trends will endure, and which may not."[19] The Carnegie Library of Pittsburgh created a
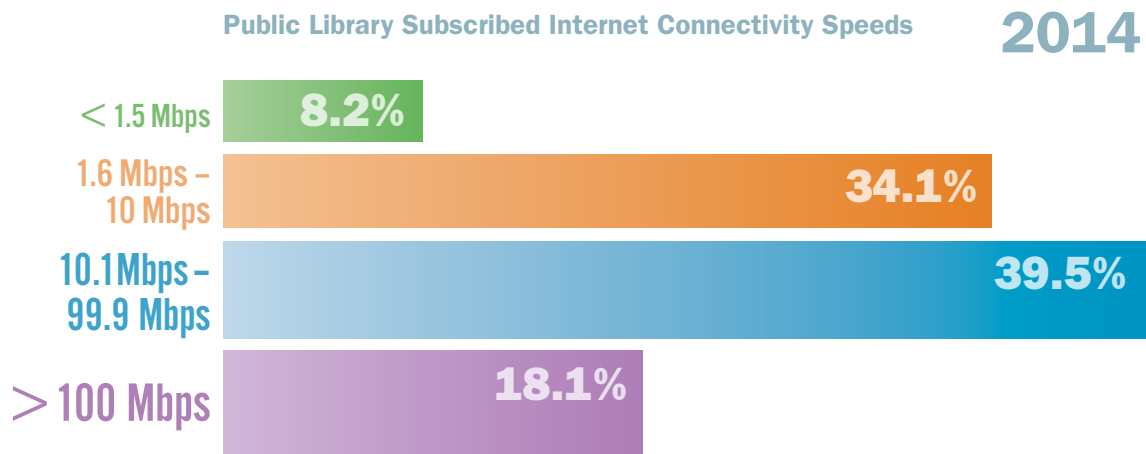
technology-based early learning and elementary outreach program, called BLAST (Bringing Libraries and Schools Together) to integrate a wide variety of technologies that support literacy and learning.[20]

John Palfrey, head of school at Phillips Academy, Andover, and founding president of the board of directors of the Digital Public Library of America (DPLA), believes that digital technologies can be designed to preserve the joys of serendipity libraries offer—such as when a patron or reader discovers a book they had not anticipated or expected to find on a nearby shelf, or sees a news article of interest on an adjoining page. DPLA brings together, and freely provides, materials and resources from libraries, archives and museums in an online format. DPLA and similar online repositories use technology to create inviting, dynamic "virtual shelves" of information for their users no matter where they are located.[21] It takes significant bandwidth to upload and share large digital collections, particularly photos, audio and video. These materials support access to rich cultural, historical and primary source material, including for educational purposes. In addition to providing this information to the general public, DPLA has programs to bring content to the K-12 and higher education communities.

Libraries are transforming themselves into hybrid spaces—where patrons can access analog and digital materials. Libraries will increasingly serve as content aggregators and point us to everything that is being digitized across the country—so the public can easily find information and knowledge. The DPLA and other emerging institutions like it allow users to tap into the innovation that is happening across the country.

As broadband connections proliferate, more libraries will be able to offer another type of makerspace— business incubators, where community members can use free office space, computers, 3-D or specialized printers, and other office equipment to get their new business started. Arizona State University (ASU), for instance, has rolled out a network of co-working business incubators inside public libraries, calling it the "Alexandria Network."[22] The initiative is led by ASU's Entrepreneurship and Innovation Group and is designed to create a statewide network of places for people to connect, collaborate and find valuable resources. Similarly, the John F. Germany Public Library in Tampa, Florida, offers "The Hive," a public community innovation center that offers kits for fabricating electrical and mechanical items, an A/V recording studio, and an arts center.[23]

Unfortunately, the lack of broadband connectivity at many libraries constrains their ability to innovate. Only about 58% of all libraries reported download speeds greater than 10 Mbps, with city libraries generally skewing on the higher end (about 36% with subscribed speeds of 100 Mbps or higher) and rural libraries generally skewing on the lower end (about 4% with speeds of 100 Mbps or higher). Nearly one-third of public libraries report that Internet speeds rarely or sometimes meet patron demand.[24]

Public Library Subscribed Internet Connectivity Speeds   **2014**

< 1.5 Mbps	8.2%
1.6 Mbps – 10 Mbps	34.1%
10.1 Mbps – 99.9 Mbps	39.5%
> 100 Mbps	18.1%

ALA/iPAC

High-capacity broadband connections allow libraries to experiment with offering new ideas and services to help their communities thrive. With high-capacity broadband at all public libraries, all community members will have access to such innovations.

Broadband Enables Libraries to Offer Virtual Field Trips and Promote Artistic Expression

As videoconferencing and telepresence systems improve capabilities and lower costs, more libraries are leveraging high-capacity broadband to increase experiential learning opportunities that are particularly valuable for young people who might be unable to travel. High-capacity broadband also allows libraries to partner with schools and museums to provide virtual field trips so students can explore the world of science and nature.

Kentucky's Jessamine County Public Library, for example, partnered with one of its local elementary schools to offer a virtual field trip for students and their families to the Texas State Aquarium located in Corpus Christi. The Texas State Aquarium has video cameras located around its facilities so the audience can see its exhibits live—and learn from an extremely knowledgeable docent. Most of these children will never have the opportunity to travel to Corpus Christi to see this exhibit in person. But, because of the power of high-capacity broadband, all of them were able to see and appreciate the wonders of undersea life.

The Cherryfield (Maine) Public Library, which serves a population of about 1,200, used its broadband network to allow 28 elementary students to view an exhibit at the Smithsonian in real time. Co-Director Cara Sawyer reports: "We were proud to be the first library in our area to partner with the Smithsonian Museums for interactive video conference programs. Without our high-speed Internet, there is no way we would even have a Tandberg Video Conferencing Device, never mind use it for such fabulous programming. The connection has also allowed us to use our Tandberg to connect with other library programs throughout the state."[25]

Today, most, if not all, major museums—from New York's Metropolitan Museum of Art to the Smithsonian's Air and Space Museum—offer a treasure trove of digital, interactive resources on their websites to online visitors and those who physically visit their exhibits. High-speed Internet connections also allow Americans from across the country to access unique video archive collections, such as the Shoah Foundation Institute for Visual History and Education, an online portal that hosts 53,000 video-based testimonies of survivors and witnesses of the Holocaust and other genocides. Universal access to these amazing digital resources enables our Nation's treasures, found across the country, to be shared virtually with young and old audiences alike, enhancing formal and informal education.

Broadband also enhances opportunities for artistic expression. As artists incorporate new digital technologies and creative media into their artwork, high-capacity broadband connections will become increasingly integral for showcasing ingenuity and imagination. Examples include collaborative musical and theatrical performances; master classes to students across the globe; and virtual auditions, rehearsals, and performances. Libraries also are using digital platforms to improve discovery and build audiences for emerging and/or local artists.[26] The Madison Public Library established the Yahara Music Library with Murfie Music, Inc., to share local music and support local musicians. The online collection includes music, artist and album pages featuring reviews, biographies, and information about upcoming shows, links to the musicians' websites, social media, and online stores.

High-Capacity Broadband Allows Patients to Benefit from Remote Healthcare

Technology is revolutionizing how physicians, specialists, and other healthcare professionals communicate with, and treat, their patients. Telemedicine offers a special lifeline to patients who reside in rural areas and cannot travel to and from the closest urban center where healthcare specialists tend to be located. Jonathan Bush, the co-Founder and CEO of athenahealth, shares, "What I think of as the real health care reform will be the virtualizing of health care. [A] radiologist can sit in front of a flat screen and crank out so much more work, so much better. Let's say a primary care guy says, 'You need to see a cardiologist, hold on a second' – beep! – 'Here's one!' The cardiologists will like it more because they'll make more money. The patients will like it more because they'll spend less money."[27]

Reliable, high-capacity broadband connections allow rural consumers to benefit from remote patient monitoring, exchange of electronic medical records, access to specialists in urban markets, all of which save money and improve healthcare quality for both patients and providers.

The cost savings of telemedicine will be significant for the government, which is footing a large part of our medical bills. A 2011 Center for Disease Control study showed that 80 percent of adults discharged from the emergency room (ER) said they sought ER care because they could not access a primary care provider. The report further identifies that almost 52 percent of adults outside a metropolitan statistical area utilized an emergency room because they had no other place to go.[28] The average cost of a visit to the emergency room costs $2,168, or 40 percent more than the average American pays in monthly rent.[29] In contrast, the average estimated cost of a telehealth visit is $40 to $50 per visit compared to the average estimated cost of $136 to $176 for in-person acute care.[30]

Johns Hopkins University has reported receiving a 19 percent savings from its "Hospital at Home" model, which it uses to remotely treat Medicaid and Medicare Advantage patients, as compared to costs to treat similar patients using traditional in-patient services. Hopkins attributed these cost-savings to shorter hospital stays, fewer labs and diagnostics, and earlier identification of acute issues.[31]

Telemedicine or virtualized communications require the best high-capacity, reliable broadband connections with high-resolution and often specialized audio and video equipment, so doctors can properly view their patients, access medical records and charts, use remote diagnostic equipment to make accurate prognostications, follow up with patients after medical procedures, and make other healthcare recommendations.

Electronic Medical Records Save Lives and Reduce Inefficiencies

Ready access to electronic medical records (EMR) is another benefit broadband technologies will bring to a connected society. An easily-accessible EMR system will make it easier for patients to work together with their healthcare providers to detect deviations, redundancies and on-going problems, collaborate with specialists on treatment options, track disease progression, ask pertinent questions, report adverse drug reactions, set up appointments, request refills and referrals, and report problems. Patients and their healthcare providers will be able to communicate more freely, and their relationship will transition from a series of episodic encounters to an on-going connection.[32]

In addition to providing easy computer access, efficiencies, and cost-savings, new technologies enabled by high-capacity broadband, can also enhance patient files with high-resolution images, audio, and video

materials. Patients usually visit multiple doctors, specialists, and other healthcare providers during a course of treatment as they address various ailments. Having complete access to all of their patients' records will help multiple providers reduce or prevent unnecessary or duplicative procedures, flag human or computer errors and discrepancies, and catch conflicting prescriptions that could have serious, negative side effects, potentially saving lives and reducing costly errors and inefficiencies. Imagine how much more effective paramedics could be when responding to a 911 call, if they could instantly access an accident victim's medical records, their health history, list of allergies, and a database that describes the latest, most-effective emergency treatment procedures.

Broadband Connects Rural Schools to Telemedicine

Monroe County Schools (MCS) is a small, rural school district nestled in the foothills of the Cherokee National Forest and the Smoky Mountains in East Tennessee. MCS is fortunate to have gigabit-speed connectivity at every location. Sonia Hardin, MCS' supervisor of health services, oversees a school-based health clinic at each school, where schools are located more than 50 miles apart. Hardin explains:

> With mobile videoconferencing, we now have our students sit in front of a computer and communicate via videoconferencing with our remote nurse practitioners. We have equipment we can hook up to the computer so that the nurse practitioner can visualize the inside of a student's ear or throat. The nurse practitioner is able to diagnose illnesses and prescribe treatments on the spot, just as if he or she were physically present. The video solution is hosted on a secure website, so we feel comfortable using it, and it's saving our nurse practitioners a lot of driving time.

Hardin has also discovered that the technology has created more of a team environment for her nurses. "Being in a rural county, our nurses sometimes feel like they are out there all alone," shares Hardin. "This technology makes them feel connected to each other. They know if they have a question or if there's a medical emergency, they can contact a nurse practitioner using videoconferencing."[33]

But Monroe is an exception. As depicted in the chart at right, the National Broadband Map shows a significant difference between metro and non-metro areas in the speeds at which health care facilities connect. High-speed connections (> 50 megabits per second) for health care facilities increased dramatically in metropolitan areas between 2010 and 2014, but only slightly in non-metropolitan areas. From 2010 to 2014, the gap between metro and non-metro health care facilities at that connection speed grew by 34 points.

Connection Speed Gap Between Metro and Non-Metro Health Care Facilities
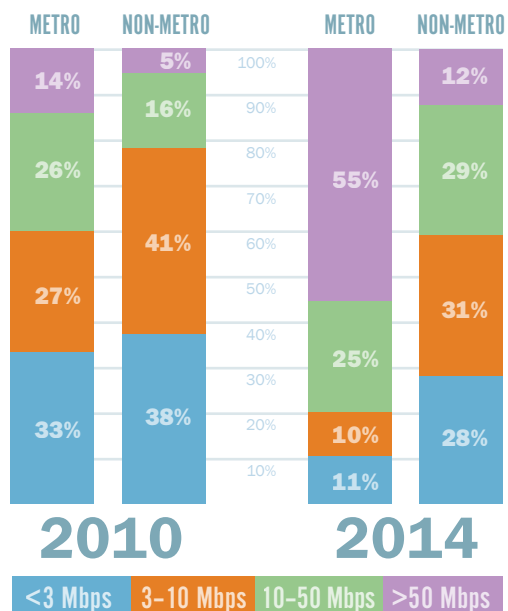
The Journal of Rural Health

High-Speed Broadband in Community Anchor Institutions Offers a Wide Range of Community Benefits

In addition to the specific benefits for education, information access, and health, CAI broadband can generate a wide variety of additional community benefits. Massachusetts Institute of Technology researcher William Lehr studies the economics and regulatory policies surrounding Internet infrastructure with a focus on mapping the communications value chain. He states,[34]

> Anchor institutions – our schools, libraries, hospitals, and cultural institutions – play a special role in maintaining the healthy fabric of society and our communities. Consequently, ensuring access to broadband by anchor institutions is critically important for enabling anchor institutions to achieve their mission goals and will help realize the benefits of broadband for our economy and society and for meeting the public obligation to provide universal access to broadband.

CAI Broadband is Essential for Economic Development

Deploying high-capacity broadband to anchor institutions not only expedites access for the entire community but also ignites economic development.

Anchor institutions can be part of a "success-based" build strategy in which fiber is deployed first to the anchor institutions, which serve as the "anchor tenants" of the network extending fiber to the rest of the community. The nDanville Fiber Network in Danville, Virginia, was the first municipally-owned, open-access, open-services network in the United States. Facing economic pressures from the decline of the tobacco industry, the fiber project was initiated in 2004 to provide the City of Danville, as well as three surrounding counties, with powerful, high-capacity broadband services. The first phase of the project connected all the schools, and the second phase connected the area businesses. The nDanville project has attracted Cray Supercomputers, which require very high-capacity broadband, and companies from Sweden, Germany, India and China.[35] Now in its third phase, the open-access nDanville network is facilitating the build-out of fiber-to-the-home by third-party fiber companies.[36]

Deploying high-capacity broadband to community anchor institutions will ensure the United States improves its broadband ecosystem and remains globally competitive and economically vibrant.

In Maryland, the Allegany County Board of Education drove the deployment of high-speed broadband to downtown Cumberland. The school district wanted to provide high-capacity broadband to its maintenance facility located in the downtown area, but the service was unavailable and costly to install. The district and city partnered and received grant funding from the Appalachian Regional Commission (ARC), which helps communities become more economically successful. ARC will pay 50 percent of the broadband network cost with the district and city splitting the balance. Nil Grove, the chief technology officer said, "Providing additional options for high-speed Internet service in Allegany County can only be a positive move for economic development and growth. The downtown area specifically will benefit from competitive pricing available to private entities with reliable and redundant high-speed service." Shawn Hershberger, the economic development coordinator for the city, adds, "It helps us toward the jobs we are trying to compete for and helps us keep the jobs we have here now." [37]

Several highly-recognized research reports show a positive correlation between broadband, anchor institutions, and economic development.

One 2011 study found that doubling broadband speeds for an economy can add 0.3 percent to GDP growth.[38] The study further concluded that the benefits of faster broadband include:

- Economic effects which include job creation, increased innovation, and productivity in business;

- Social effects which include better access to services, improved education opportunities via e-learning, and improved healthcare via e-health services; and

- Environmental effects which include dematerialization such as telecommuting or video conferencing, and more efficient energy consumption such as smart grids or smart homes.

The White House Council of Economic Advisers (CEA)[39] recently found that:

- Broadband Internet is associated with higher employment rates, especially in rural communities;

- Online job searches decrease the duration of unemployment spells; and

- People who searched for jobs online were re-employed 25 percent faster.

CEA also noted the importance of public libraries in providing the access needed for people to conduct online job searches. The report estimated that 30 million Americans used library Internet access to conduct job searches, submit online job applications, and receive job-related training in 2009.

Focusing on providing high-capacity broadband to CAIs will help ensure the United States improves its broadband ecosystem and remains globally competitive and economically vibrant.

Broadband Elevates Civic Engagement

Anchor institution broadband can also help to address the disturbing trend in political participation by America's youth. An April 2012 report[40] highlighted the dismal state of civics knowledge and engagement among youth directly related to income and education. According to another study, voter turn-out in the 2012 Presidential election among 18-29 year olds was only 45 percent, compared to 66 percent for voters age 30 and above.[41]

Internet access can have a direct effect on political participation. A study conducted in 2003 found that Internet access may enhance voter information about candidates and elections, and stimulate increased participation. The research suggested that Internet access and online election news significantly increased the probability of voting by an average of 12 percent and 7.5 percent respectively.[42]

The National Broadband Plan suggests that access to high-capacity broadband can inform communities and increase civic engagement by:

- Leveraging broadband-based technologies to modernize the delivery of government services and enhance democratic processes and ensure that they are accessible to all Americans;

- Increasing opportunities for citizens to participate in the civic life of their local communities and to engage their government through social media and broadband-enabled tools;

- Expanding opportunities to weave citizen-based innovation and collaboration into our government; and

- Create an open and transparent government.

Robust broadband networks can also generate new, innovative ways cities can converse with constituents—to offer a new mesh of interactive civic "touch points" for those who were previously excluded, says Harvard Law School Professor Susan Crawford. Imagine if cities could obtain ongoing feedback from the general population, not just once every two years. Such interaction could lead to a government that is more responsive to community needs and a more engaged, civic-minded citizenry.

John Palfrey, Head of School at Phillips Academy Andover, says libraries continue to be "essential to a functioning democracy" whether they are a large physical building in the middle of a city or an open, dynamic, online portal. Palfrey loves the bold letters carved above the entrance to the Boston Public Library, which simply state, "Free to All." In the heart of this vast civic space, the city's grand library is devoted to ensuring every Bostonian—regardless of education or ability to pay—can equitably access the information they need to be informed, engaged citizens in their community. Libraries and other anchor institutions are carrying this same philosophy online, and, by doing so, they foster an informed electorate that is a critical element to a functioning, thriving democracy.[43]

Community Anchors Promote Digital Equity

Community anchor institutions offer an important means for low-income families to access the Internet. According to a White House Fact Sheet,

> While nearly two-thirds of households in the lowest-income quintile own a computer, less than half have a home Internet subscription. While many middle-class U.S. students go home to Internet access, allowing them to do research, write papers, and communicate digitally with their teachers and other students, too many lower-income children go unplugged every afternoon when school ends. This 'homework gap' runs the risk of widening the achievement gap, denying hardworking students the benefit of a technology-enriched education.[44]

Community anchor institutions offer an important means for low-income and rural families to access the Internet.

The 'homework gap' affects low-income and rural schools the most. A recent report by CoSN noted that, "only three percent of teachers in high-poverty schools said that their students had the digital tools necessary to complete homework assignments while at home, compared to 52 percent of teachers in more affluent schools." While some families have no access, many have service that is too slow to utilize today's resources and tools. Whether un- or under-connected, CoSN suggests that "…the entire community shares an interest in advancing digital equity for all."[45] Similarly, a recent report by the Education Commission of the States notes that "Of individuals who live in rural areas of the U.S., more than half (53 percent) lack access to industry standards for broadband service speeds; by contrast, only 8 percent of urban residents confront similar limitations on broadband access."[46] Community anchor institutions offer an important means for low-income and rural families to access the Internet.

Tony Marx, the president and CEO of the New York Public Library, describes visiting a library in the South Bronx and finding a young boy sitting outside on the library steps, after hours, doing homework on his laptop because it was the only place where he could get free Internet access. Marx noted that close to three million New Yorkers cannot afford Internet service.[47]

Children in rural farming communities live in areas that Adrianne Furniss, the executive director of the Benton Foundation, calls "digital deserts" because they lack broadband services.[48] Megan Smith, Chief Technology Officer of the United States, said there is a lot of work to be done in rural areas: census data shows that there are still five million households with school-aged children who are not effectively connected to the Internet.[49]

Darryl Adams is superintendent of the Coachella Valley Unified School in California, where many of his students live in trailer parks and remote communities. He convinced the school district to outfit 100 school buses with Wi-Fi routers and solar panels, so students who commute 45 minutes to and from school can complete their online school assignments to bridge the homework gap. The district also parks its buses overnight in the most underserved communities because, "we wanted to ensure that students had 24/7 access to the Internet. Because learning does not stop at the end of the school day," Adams said.

Similarly, administrators of the Cuyahoga County Public Library system have installed repeaters on the sides of its library buildings so local residents can use CCPL's publicly-funded Wi-Fi hot spots. Executive Director Sari Feldman hopes to extend the reach of its broadband network to the residents of a nearby housing project. Baltimore County Public Schools has created opportunities for its students, parents and other community residents by creating a digital classroom in a neighboring community center for after-hours Internet access, GED and English language classes.

In addition to the examples noted above, Project Tomorrow's 2015 Speak Up National Data Findings reported that 35 percent of students go to school early or stay late to use their schools' Internet connections and 24 percent of students use their public library Internet connections.[50] As demonstrated by these examples and research findings, CAIs increasingly serve as community hubs that allow millions of Americans to gain access to the Internet. CAIs can promote digital equity by providing essential access to high-capacity broadband serving a diverse group of unserved and underserved community members.

Conclusion

Broadband is more than just a platform, it is a "meta-infrastructure" that makes all other infrastructures (such as education and healthcare) serve the public more effectively. While progress has been made, the U.S. still has a long way to go to meet the goal, articulated in the National Broadband Plan, that every American community have anchor institutions that enjoy affordable access to at least one gigabit-per-second (Gbps) broadband service by the year 2020.

Ensuring access to high-capacity broadband for anchor institutions should be a primary goal of broadband policies. Our federal, state, and local governments must adopt sound programs for public investment in broadband, including funding and adequate investment to bring robust broadband to anchor institutions.

The time has come to ensure all community anchor institutions have access to high-capacity broadband so that the benefits of the Internet reach everyone, keeping America globally competitive, economically vibrant, educationally progressive, civically engaged, and culturally rich.

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1

BROADBAND NEEDS ASSESSMENT and PLANNING for COMMUNITY ANCHOR INSTITUTIONS

Governments should identify anchor institution broadband needs and develop plans with stakeholders, broadband providers, and other partners to attract and target additional investment to fill broadband gaps.

by Kelleigh Cole

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

1   **Broadband Needs Assessment and Planning for Community Anchor Institutions**

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2   Wi-Fi and Wireless Networking for Community Anchor Institutions

3   Partnerships, Sharing, and Community Anchor Institution Broadband

4   Promoting Competition for Community Anchor Institution Broadband Services

5   Broadband Infrastructure Policy and Community Anchor Institutions

6   Community Anchor Institutions Served by Government and Non-Profit Fiber Networks

7   Broadband Subsidies for Community Anchor Institutions

8   Government Funding for Broadband Network Providers Serving Community Anchor Institutions

9   Rural Broadband Programs and Community Anchor Institutions

10   Community Anchor Institutions and Residential Broadband Adoption

Introduction

Broadband needs assessment and planning for community anchor institutions (CAIs) is one of the most critical steps that state and local governments can take to improve broadband connectivity and promote economic growth in their regions. Conducting an inventory of the locations and speeds of the existing broadband services for CAIs – and identifying the gaps in broadband coverage – can help attract new funding and target investments to the areas with the most need. Conducting an inventory among all CAIs can also facilitate meaningful partnerships and strategies to ensure that the entire community has adequate broadband connectivity. This paper provides an overview of the variety of tools and processes that government leaders can use to meet the broadband needs of schools, libraries, health care providers, and other anchor institutions and their surrounding communities.

Conducting an inventory of existing broadband services for CAIs can help attract new funding and target investments to the areas with the most need.

The National Telecommunications and Information Administration (NTIA) has recently issued an excellent community broadband planning toolkit that recommends how communities can evaluate broadband connectivity to homes, businesses, and institutions.[1] NTIA suggests the following six planning steps, regardless of the size of the project:

- Assemble a team to identify a community broadband vision;

- Assess communities' broadband-related resources, gaps, and needs;

- Engage local stakeholders;

- Choose appropriate technology;

- Select a business or organizational model (the framework for implementation); and

- Develop project plan(s), e.g. implementation and financial plans.

The following discussion draws particular attention to gathering the detailed data necessary to develop a broadband plan that serves CAIs' needs and to facilitate partnerships that can make the difference between a successful and unsuccessful project.

Starting Points for Understanding the Current Level of Broadband Connectivity

In 2010, the Federal Government created the State Broadband Initiative (SBI), which provided funding to each state and territory of the U.S. to map the availability of broadband networks and broadband subscribership across the U.S. That effort, administered by the NTIA, culminated in the creation of the National Broadband Map.[2] While the map is frequently cited and the quality of the data improved over time, the process of gathering and compiling the data was challenging. Questions have been raised about the consistency of the data across states and the accuracy compared to other data collections.[3]

NTIA's mapping effort came to an end in 2015 and responsibility for updating the map has been transferred to the Federal Communications Commission (FCC). Unfortunately, the FCC has not received additional funding to maintain the map.[4] The FCC continues to gather data through its annual reporting obligations on telecommunications carriers (Form 477), but these reports do not specifically ask for information about broadband connectivity for CAIs and instead is primarily focused on residential and business services.[5]

The FCC also makes information publicly available about the broadband services purchased by schools and libraries in the E-rate program.[6] The FCC has aggregated the data and published the average purchase prices for each state. While this information is useful, it does not provide the detailed data that an individual school or library will need to assess its particular location.

Although the FCC collects data for the National Broadband Map, it does not specifically ask for information about broadband connectivity for CAIs.

Some states are continuing to gather information about broadband networks, and it may be helpful for all state and local government leaders to find ways to continue this data collection. The information about these networks changes as providers enter and exit different geographic markets and upgrade available broadband services. Many SBI grantees began to work with local communities to conduct broadband planning within regions, counties, and cities and these efforts resulted in over 200 local broadband planning teams.[7]

Drawing from these existing resources, conducting needs assessments and broadband planning does not have to start from a blank slate.

Rigorous Needs Assessment is Essential

While the National Broadband Map and the FCC's data provide a useful overview, a community that wishes to develop a broadband plan should engage in a local, granular approach that evaluates detailed information in the specific geographic area. The current FCC mapping model does not allow providers to report data beyond the census block level, and thus, a block is considered "served" even if just one location in the area receives service. This can be misleading. The fact that a consumer across town has residential or small business broadband capabilities may be irrelevant to determining whether a particular school, library, or health provider has access to a high-speed connection at its specific location. And anchor institutions need much more bandwidth than a typical residential consumer. Even if a residential consumer is "served" by a residential-quality broadband service, the anchor institution in the same neighborhood may be "underserved" if it cannot obtain the high-capacity service it needs.

Each community should develop its own detailed needs assessment. The analysis can determine whether existing providers are well-positioned to serve the future needs of CAIs, or whether additional investment is needed. Policymakers will then be in a better position to attract or raise additional funding because they know the funding will be targeted to the areas most in need.

One way to determine whether or not anchor institutions have sufficient broadband available is to conduct a survey of the broadband providers serving that particular location to determine the level of services offered. For example, Northern Illinois University (NIU) commissioned a survey of anchor institutions' broadband needs to determine how the unmet needs could be improved.[8] The survey found a significant degree of dissatisfaction on all measures of existing Internet experience. "Connection speed" showed the biggest gap between the importance of the issue and actual experience.

Another example is the survey conducted by the Corporation for Education Network Initiatives in California (CENIC), the California State Library, and the library consortium, Califa, in 2014.[9] That survey concluded that the status of libraries' connectivity in the state was "dire" based on the following findings:

- *Three-quarters* of California's public libraries had low-speed connectivity of 20 Mbps or less – slower connectivity than what is found in most homes, even though each library must serve thousands of patrons and the operational activities of the library itself.

- *Two-thirds* of California's public libraries were using their connectivity at or over capacity – effectively rendering the connection useless for serving the public or operational activities. The proliferation of mobile devices, especially in underserved areas, made the situation even worse.

- California's public libraries were paying an exorbitant *$14 million* for this woefully inadequate connectivity, according to a conservative estimate of costs.

- *Less than half* of all jurisdictions were taking advantage of E-rate or California Teleconnect Fund (CTF) discounts that would help them shoulder these costs due to the administrative overhead required to apply. Only one-quarter were taking advantage of both.

This needs assessment led to the "Lighting Up Libraries" initiative to connect California's public libraries to the high-speed private broadband network operated by CENIC.[10]

There are a number of entities that work with state and local governments to support CAI broadband planning. One such provider, EducationSuperHighway, a non-profit organization focused on improving K-12 school broadband capability, is working with several state governors, school districts, and Internet providers on a process to identify districts that lack sufficient broadband access. For instance, EducationSuperHighway recently entered a partnership agreement with Governor Greg Abbott (R-TX) to assess broadband options and to upgrade Internet access in nearly 1,000 public schools across the state that currently lack access to high-speed fiber. This initiative is intended to help many schools attain fiber connections that are both scalable and affordable.[11]

Conducting assessments on both the connections to the CAI and the wireless capacity within the CAI is critical to undertaking an effective planning process. For instance, planning teams should collect data on the number of devices being used, the number of Wi-Fi access points per room, and the age of this equipment.[12]

One example is the "Utah School Technology Inventory." The Utah Education and Telehealth Network (UETN) commissioned Connected Nation to evaluate the availability of technology in Utah school districts.[13] UETN also published the "Utah Education and Telehealth Network WAN, Wi-Fi, Security and Content Filtering Roadmap" which evaluated infrastructure required for Utah schools' increasing technology needs.[14]

An Effective Planning Process Is Essential

While conducting a needs assessment is of paramount importance, there are several other critically important steps that must be included in a broadband plan. It is important to assemble local stakeholders, including anchor institutions and broadband providers, and to develop a financial plan for sustainability. These additional steps are discussed briefly below.

Identify the Community Anchor Institutions in Your Region

There are several sources for identifying the anchor institutions in a state or region:

- The National Broadband Map contains a state-by-state list of over 347,000 anchor institutions with their physical addresses.[15]

- The National Center for Education Statistics maintains a database of public and private schools, as well as colleges and universities.[16]

- Pubic libraries can be found by searching the Institute of Museum and Library Services (IMLS) database.[17] Additional information about other libraries can be found on the American Library Association (ALA) Library Factsheet.[18]

As for health organizations, researchers found 62,000 health entries in 2014 in the dataset for the National Broadband Map, but they note that the 62,000 figure probably understates the actual number of health entities, because some states reported several thousand while other states reported less than one hundred.[19]

Establish a Realistic Timeline for Serving the CAIs that Will Be Included in the Plan

Once the locations of the CAIs are identified and their needs are understood, planning teams should create a schedule for serving the CAIs with enhanced broadband access. This is easier said than done. CAIs located in underserved areas are often the primary focus of planning efforts, but these CAIs may be located in the most-rural, and thus most-costly, areas. Planning leaders may choose to focus first on areas with multiple anchor institutions to aggregate demand and encourage providers to enter into these markets. Serving these aggregated institutions first may also support the financial sustainability of the project. Once these networks are deployed, it will be easier to build off them to reach outlying and more remote locations.

Form Partnerships

Including strategic partners in the planning process is a critical component in aligning efforts. Planning teams should consider working with local businesses and other institutions that have funding available such as government, for-profit medical facilities, and public safety entities. The planning outreach should be comprehensive and include transportation, economic development, energy, and agriculture agencies in addition to CAIs and broadband providers.

Broadband planners should consider both current and potential broadband service providers as key partners in connecting CAIs. Holding meetings with providers to share information on deployment plans and barriers can also help develop an effective planning process. This strategy will reduce the costs of deployment and encourage capital investment in areas where providers could not otherwise make a business case.

Develop and Implement a Broadband Plan

Once the groundwork has been established by conducting the needs assessment and coordinating with stakeholders, it will be easier to put the plan together. But the broadband plan must be extremely well thought-out, as there are many factors that affect the long-term sustainability of the plan. NTIA's toolkit contains an excellent list of factors that should be included in the broadband plan:

- Identification of which CAIs will specifically benefit and what services will be provided to them;

- A competitively-neutral process to identify which broadband providers will be selected to build and operate the network;

- A financial plan that identifies costs and revenue streams, and a timeline for the project to become self-sustaining;

- An analysis of the political and regulatory landscape, including a review of government permits for use of rights-of-way, that will impact the feasibility of the project; and

- A plan for trialing and testing the network services along the way to address any shortcomings.

Recommendations

Developing and implementing a broadband plan is time-consuming, but absolutely essential. Failing to conduct a needs assessment of CAIs' present and future broadband services can lead to missed opportunities, unmet needs, or wasteful investment. Failing to include all stakeholders, including the broadband providers, in the planning process can make the difference between a long-lasting, sustainable project and a project that results in stranded assets. Perhaps the most important recommendation is for planners to gather detailed, granular data about the broadband assets in an area, rather than relying on generalized descriptions of whether an area is served, unserved, or underserved, especially because CAIs' broadband needs are very different from residential and business needs.

Here are some of the key recommendations for federal, state, and local policymakers who wish to develop a broadband plan for their regions:

● Funding should be allocated to states and local governments to continue to engage in broadband mapping of networks available to and used by CAIs. Efforts should be made to gather such information in a consistent manner to help state-by-state comparisons of results. National standards and a national repository for state and local broadband assessment data should be established to ensure data consistency and avoid duplicative efforts.[20]

● State and local governments should gather local, granular information about the availability and use of broadband services by CAIs, rather than relying on general industry claims. Such state and local planning efforts should include:

1. Identifying the CAIs in their region;

2. Surveying CAIs about their broadband needs and level of satisfaction with existing broadband services;

3. Evaluating the broadband services available to their local CAIs from existing broadband service providers;

4. Establishing a reasonable timeline for serving the CAIs that are most in need of additional broadband investment;

5. Working with partners and all stakeholders to consider aggregate solutions to maximize the efficiencies of shared networks and community needs;

6. Working with private sector broadband providers to understand where they plan to expand and how they can facilitate the broadband plan; and

7. Developing a broadband plan that includes financial models, a review of government and regulatory requirements, testing, and timelines for sustainability.

Resources for Further Reading

Several organizations have produced planning materials that may help communities evaluate their needs. Plans from these organizations can serve as a model for other communities.

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Note: A provider that reports deployment of a particular technology and bandwidth in a census block may not necessarily offer that service everywhere in the block. Accordingly, a list of providers deployed in a census block does not necessarily reflect the number of choices available to any particular household or business location in that block, and the number of such providers in the census block does not purport to measure competition.]

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12   EducationSuperHighway publishes a School Wi-Fi Buyer's Guide, an online tool for technology directors who want to make educated wireless equipment purchase decisions, but do not have the time it takes to conduct extensive research. The Guide is intended to help technology directors understand wireless features and functionality and create a requirements list to give them confidence when evaluating solutions from multiple vendors. See http://www.educationsuperhighway.org/buyersguide/

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2

WI-FI and WIRELESS NETWORKING for COMMUNITY ANCHOR INSTITUTIONS

By supporting robust Wi-Fi and wireless networking for community anchor institutions, policymakers can help enable a wide range of 21st century Internet applications for improved education, learning and medical care.

by Amelia Bryne

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

by Amelia Bryne. Trained in cultural anthropology and new media, Amelia Bryne is co-Director of DeepTech.org, a research consultancy that focuses on the social and environmental impacts of information and communications technologies. She has worked with the American Library Association Office for Information Technology Policy, the University of Helsinki, the Social Science Research Council, the Community Wireless Infrastructure Research Project, byDesign eLab, and other public interest research projects and institutions. Her research has been published in journals such as *Telematics & Informatics, Policy & Internet,* and the *Journal of Community Informatics.*

Introduction

For community anchor institutions (CAIs), robust broadband connections, teamed with Wi-Fi and other wireless networking, are the essential elements of a critical infrastructure. In schools, wireless connectivity enables students and teachers to access a variety of online learning resources and pivot towards the educational models of the future that help learners develop the skills to succeed in technology-integrated workplaces. Wireless can help libraries significantly extend their public Internet access capacity and spawn new community activities. In hospitals, these networks are key to supporting wirelessly-enabled medical devices, helping staff transfer patient data and assisting families in navigating the hospital, understanding medical conditions, and obtaining support.

Despite the importance of Wi-Fi and wireless networking, many community anchor institutions do not currently have the capacity and coverage they need. The technical and human elements involved in creating and maintaining wireless networks are often more complex than meets the eye. These elements include ensuring network capacity and quality in an environment of constantly-evolving technology, complying with privacy and security regulations, assessing different technology options, addressing funding challenges, and understanding how CAI wireless networks can help meet universal service goals.

This policy paper explores these core issues in detail and offers examples of successful policy interventions that have addressed these challenges. The second part of the paper suggests how policymakers at federal, state and local levels can support wireless networking in CAIs.

CAIs Need Technical Assistance to Deploy Enterprise-Grade Wireless Networks

For many CAIs, achieving sufficient, reliable wireless access in their facility remains an elusive goal. According to a recent Consortium for School Networking (CoSN) survey, more than one third (36 percent) of schools were not confident that their Wi-Fi could handle a 1:1 initiative (one device per student).[1] As of 2014, nearly 98 percent of public libraries across the country offered public wireless Internet access, but as demand for bandwidth has increased, connection quality at libraries that have not had the opportunity to add capacity has suffered.[2] Recognizing the critical need for robust wireless networks in schools and libraries, the Federal Communications Commission (FCC) prioritized "closing the Wi-Fi gap" in its recent reforms to the E-Rate program.[3]

For many CAIs, achieving sufficient, reliable wireless access in their facility remains an elusive goal.

Why do anchor institutions have inadequate Wi-Fi networks? For some institutions, like the Ligonier Valley School District in Pennsylvania, wireless network quality and capacity issues are, in part, a result of ad hoc networks that were built only as resources permitted.

> Despite growing demand, the district over time had acquired many unmanaged, autonomous wireless access points from different vendors. Dispersed across facilities without a comprehensive plan, the access points were designed for small business use rather than the enterprise-scale requirements of a large school district. As a result, the district, and especially the high school, suffered from spotty, unreliable wireless coverage and manually intensive troubleshooting and maintenance.[4]

Before the district completed an overhaul of the network, connecting to online applications often took a sizeable part of class time. These kinds of delays negatively affect teaching and learning:

Any classroom teacher will tell you that when the technology fails, it significantly impedes instruction because you have to spend more time making sure the students remain engaged. It is a distraction from the message. Teachers will shy away from integrating technology into their curriculum if they are not confident it will work.[5]

Managing wireless networks is an especially challenging endeavor because of the speed at which related technology is evolving, and the number of technical components that need to be considered and aligned for optimal performance. Wireless networks depend upon the quality of available wired networks, which have their own technical challenges. Beyond this, network engineers need to account for changes in physical wireless infrastructure (access points, etc.), as well as in technical standards (such as the new IEEE standard 802.11ac, which helps offer gigabit speed without the wire).

Managing wireless networks is an especially challenging endeavor because of the speed at which related technology is evolving.

The growing "bring your own device" (BYOD) trend poses additional challenges. At Houston Methodist Hospital, 60 to 70 percent of the hospital's clinical staff use their own devices – such as tablets – for mobile electronic medical record (EMR) access and other applications, and visitors bring devices as well. The result: the hospital's network needs to be able to support 10,000 wireless devices at any one time. Adding to the complexity, the variety and number of wireless-based devices with medical applications are growing quickly. The hospital evaluates three or four new devices each week. According to Armand Stansel, Director of IT Infrastructure Services at Houston Methodist,

> [M]ost medical device manufacturers don't have Wi-Fi expertise beyond basic wireless configuration … and they tend to use off-the-shelf components. It's up to us to determine if they comply not only with public standards [regulatory requirements regarding patient privacy and data security] but with our standards, as well.[6]

Considering how institutionally-owned devices interplay with wireless networks is a challenge for other types of institutions, as well. A donation of a fleet of laptops or tablets to a library may seem like a windfall, but depending on the device specifications, these devices may actually further burden an already taxed wireless network. Many lower end devices operate in the 2.4 GHz spectrum band for which there are currently only three non-overlapping channels (thus relatively easily clogged), while other devices are capable of operating in the 5 GHz band for which there are twenty-three available channels, each of which can carry more capacity than the 2.4 GHz channels.[7]

CAIs Face Procurement Challenges

Because of the technical complexity of designing and maintaining institutional-scale wireless networks, many CAIs – especially small ones – need to bring in outside expertise for at least part of the process. This can be helpful in two ways:

- A good technology partner can help reduce congestion with strategic placement of access points designed to respond automatically to spectrum issues, and can give advice on when technology upgrades are truly necessary.

- A high-quality, managed service can actively monitor a wireless network as well as integrate the privacy and security requirements of CAIs into network design.

Yet, getting the right help can be a challenge. Vendors have an incentive to sell institutions more technology than they may need – leading to "rip and replace" scenarios that are not as cost-effective as reworking existing equipment.

Each institution faces unique hurdles in setting up and maintaining wireless networks. Each institution faces unique hurdles related to the particular physical characteristics of its building(s), how and by whom the network will be used, and issues related to legacy network configurations. Across a state, for example, library, school, medical and other CAI buildings may have been built in a variety of eras with different materials. Some locations, such as public libraries located where fewer people have home broadband access, may have much higher Wi-Fi demand than others. Additionally, these CAIs may be starting out with many different wireless network setups.

Requests for proposals (RFPs) based on only very general information, combined with the difficulty of choosing the right technology partner, can lead to several issues. After a vendor has won a bid for a wireless network contract, its more-detailed assessment of the network may reveal the need for a more substantial budget. This can be difficult for public institutions that have applied for funding based on the RFP estimate. (When making use of the E-rate, for example, requests for additional funding can be a challenge.)

One significant way to improve the procurement of wireless network equipment is for state and local governments to offer due diligence support to anchor institutions. An action as simple as hiring an independent expert to conduct a needs assessment at the outset of an initiative can result in a better RFP and a more accurate proposal. E-rate rules restrict the involvement of potential commercial bidders early in the process to avoid unfair advantage, but state and local governments can provide some guidance on how to find relevant experts. Independent experts can also help those acting in procurement roles to analyze and choose the best proposal – a few thousand dollars invested at this stage of the process can help save many headaches and additional spending down the road. States might also provide more general support for this process by producing help documents with basic due diligence questions that CAIs should ask when considering working with a technology partner.

Policymakers can also assist CAI wireless network development by ensuring that district and state procurement contract processes are up to date. Arizona, for example, recently updated its procurement process to harmonize state contract terms with the FCC's E-rate program, to simplify applications for federal funding, and to offer support for the creation of buying consortia with the goal of lowering costs for diverse, participating institutions (e.g., schools, state and local agencies, non-profits, etc.).[8] Procurement guidelines could also note the importance of needs assessment. Involving the people who will actually be making use of the technology – such as doctors, teachers and librarians – in the design phase can help lead to more relevant network design and facilitate stakeholder buy-in.[9]

CAIs Face Funding Challenges

Community anchor institutions need funding to purchase wireless network equipment, as well as for maintenance and upgrades over time. Fortunately, the FCC recently decided to make available $5 billion in funding over the next five years for Wi-Fi and internal broadband connections for schools and libraries in the E-rate program.[10]

Additionally, E-rate funding can now be used to pay for managed wireless services. According to the FCC, managed Wi-Fi services:

can provide substantial benefits and cost savings to many schools and libraries, particularly small districts … without a dedicated technology director available to deploy and manage advanced [networks] quickly and efficiently.[11]

While schools and libraries now have the potential to obtain E-rate funding for wireless networks, other anchor institutions, such as community colleges and community centers, are not eligible for E-rate funding. These CAIs may need assistance to access other sources of funding, whether public or private.

The E-rate program alone cannot solve all the funding needs of schools and libraries. Mooresville Graded School District in North Carolina is one example of a district that has needed to find creative solutions to fund its wireless network because its E-rate discount rate is relatively low. Among other things, Mooresville has tapped the power of community partnerships – receiving an investment of $250,000 from Lowe's Home Improvement, whose corporate offices are located in Mooresville. The school district also uses the proceeds from an educational technology conference to help pay for professional development. And, in 2015, Mooresville passed a large bond referendum that will provide funds for education technology in future years.[12]

Expanding Wireless Access Is a Critical Component of Internet Equity

Ultimately, communities without adequate access to broadband – including robust Wi-Fi networks in CAIs – are increasingly at risk of being left behind. According to the Council on Foreign Relations, if communities do not have "adequate ubiquitous broadband to support mobile education applications, then their local school districts won't be able to make that pivot, which will quickly create an educational and ultimately an economic disadvantage for the community."[13]

Community anchor institutions can also play a role in extending wireless Internet access to residents in the surrounding community who lack sufficient access.

This concern drove Idaho state officials to choose to offer a statewide, managed wireless contract to all public high schools. Idaho wanted all students to have equal access to technology, independent of where they lived, with the knowledge that some school districts in the state have extremely limited resources. The state contracted with Education Networks of America (ENA) to "ensure that each high school has the same quality of service for its local [wireless] network." Idaho also used bulk pricing discounts. The state pays about $21 per student, per year, for a managed Wi-Fi contract with ENA, which supplies wireless network services to all public high schools in Idaho that have opted into the contract (now more than 80 percent of schools).[14]

Globalstar, a low Earth orbit satellite constellation for satellite phone and low-speed data communications, has proposed a service that could help to relieve some Wi-Fi congestion in anchor institutions. Globalstar has offered to provide Terrestrial Low Power Service (TLPS) over a combination of licensed and unlicensed spectrum. TLPS would enable use of Channel 14 in addition to the existing Wi-Fi channels 1, 6 and 11 operating in the 2.4 GHz band. While TLPS could be helpful to some anchor institutions, especially those that encounter congestion in the 2.4 GHz band, the precise terms and conditions under which TLPS will be made available on a retail basis are not yet known, and there are some important public interest considerations that must be taken into account when combining licensed and unlicensed spectrum. Nonetheless, Globalstar has offered to provide 20,000 access points free of charge to schools, libraries and health providers, and TLPS could offer an additional option for anchor institutions.

CAIs Can Provide Wireless Internet Access Capabilities to the Community

Community anchor institutions – notably public libraries, but also community centers, schools, and others – can also play a role in extending wireless Internet access to residents in the surrounding community who lack sufficient access. Some institutions also partner with companies to help their constituents obtain broadband at home. Libraries provide public access wireless networks, and libraries and schools are experimenting with loaning community members (students, patrons, etc.) cellular-enabled devices. Among others, public libraries in New York, Kansas City, Chicago, and Seattle have piloted loaning thousands of wireless hotspots for up to a year to patrons who do not have broadband at home and who are taking part in library programs and adult learning programs.[15]

Community anchor institutions have also played roles in developing municipal and community wireless networks. Through unused TV "white spaces," anchor institutions may be able to extend basic wireless Internet access to the wider community. The low-frequency, white space spectrum makes it possible for wireless Internet signals to extend over much greater distances – up to 10 kilometers – and penetrate more easily through buildings, vegetation, and other barriers.[16] The Gigabit Libraries Network has worked with several libraries to test the use of white space technology to provide wireless Internet access to their neighborhoods.[17] This technology is still on the cusp of success, but federal policymakers have the potential to make more white space spectrum available in the future.

Albemarle County, Virginia, school officials are in the process of installing a broadband wireless network so that students across the county's 726-square-mile area can access the Internet from wherever they are. Albemarle is creating its own wireless service because commercial companies were unwilling to make the investment to serve these rural consumers. The school system is partnering with police and fire departments. Vince Scheivert, the school district CIO, says "We're extending our network … into this broadband realm. [Students'] machines won't know the difference whether they're sitting at home or sitting in the classroom."[18]

Recommendations

To support robust, well-designed Wi-Fi and wireless broadband networks for community anchor institutions, federal policymakers can:

- Continue to provide E-rate funding that supports wireless networks and continue consulting with schools and libraries on what is working and what is not in terms of E-rate funding for Wi-Fi networks.

- Consider allowing E-rate-funded networks to provide off-hours access to local communities, e.g., through the use of white spaces and school buses with routers.

- Allocate more white space spectrum for unlicensed use by CAIs.

- Consider how privacy and security laws related to broadband networks (including Wi-Fi networks) impact CAIs, and ensure that these regulatory obligations are clear, purposeful, and not burdensome.

- Consider approving Globalstar's proposed TLPS in a manner that does not create interference to other users and operates under the right conditions to serve the needs of anchor institutions and the public interest.

- Increase the amount of unlicensed spectrum available for Wi-Fi use (e.g., sharing and use of the 5.9 GHz band).

State policymakers can:

- Consult CAIs about their wireless networking needs. If the state is acting in a procurement role for CAI wireless networks, the state should work to provide detailed RFPs that include specifications and use cases.

- Help CAIs hire independent wireless consultants that can assist with needs assessment.

- Produce or assemble due diligence-related help documents for CAIs and local procurement offices.

- Ensure that state procurement procedures and telecom policy are up to date.

- Support schools and libraries in applying for E-rate and other funding sources.

- Offer state-level funding for CAI wireless networks when federal funding is not available.

- Offer the possibility of statewide, managed wireless contracts to CAIs as one way to reduce costs and offer equal quality access across the state. Contracting with a single company for managed wireless (versus allowing contracts with several different companies) can offer the benefit of aggregate, comparable data on CAI wireless networks across the state.

Local policymakers can:

- Work with local CAIs to understand the benefits of strong wireless infrastructure.

- Include CAIs in broadband planning.

- Encourage district decision makers working in a procurement role to consult CAIs about their broadband and wireless needs, and provide detailed RFPs that include specifications and use cases.

- Assist CAIs with due diligence when selecting technology partners.

- Help CAIs to find creative funding solutions for wireless networks, such as local corporate sponsors.

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3

PARTNERSHIPS, SHARING, and COMMUNITY ANCHOR INSTITUTION BROADBAND

Joint procurement, aggregated purchasing, and coordinated planning can significantly reduce the costs of providing high-quality broadband to anchor institutions.

by Joanne Hovis

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Joanne Hovis is president of CTC Technology & Energy, where she heads the firm's work in network business planning, market analysis, financial modeling, policy, and strategy. Joanne advises cities and states regarding how to build strategy and opportunity for public–private partnerships in broadband. She led the CTC teams that developed first-of-their-kind partnerships for the Commonwealth of Kentucky, the City of Santa Cruz, and the Champaign-Urbana Big Broadband consortium. Joanne is a former president of the National Association of Telecommunications Officers and Advisors (NATOA) and serves on the boards of the Fiber to the Home Council, OneCommunity, and the Benton Foundation.

Introduction

Partnerships, aggregation, and coordination in securing broadband services are valuable tools for community anchor institutions (CAIs). Aggregating buying power on a regional or statewide basis is a tested best practice that can enable anchor institutions to achieve lower per unit pricing, higher bandwidth, and improved service quality. Policymakers should encourage anchors to consider joint procurement and coordination with entities representing other anchor sectors in their state or region. Aggregated procurement also encourages broadband providers to collaborate and bid with other providers—which could flatten pricing and reduce geographical disparities.

Description of the Aggregated Purchasing Model

Under the aggregated purchasing strategy, multiple anchors (such as school districts and/or libraries) on a regional or super-regional basis—or ideally, on a statewide basis with support of one or more state agencies—combine their request for proposal (RFP) processes to solicit and contract for Internet bandwidth and wide area network (WAN) connections, dark fiber, wavelengths, Ethernet, or any other service. (The RFP process established by the Federal Communications Commission (FCC) in its E-rate program is conducive to this model, but the strategy can also benefit CAIs that do not participate in E-rate.)

In this approach, the anchors cooperate to develop the joint RFP and select the vendor(s). Ideally, the buying group would be as large as possible and would include both rural and metropolitan-area anchors—thus enabling, on the one hand, rural communities to benefit from the substantial buying power of higher-volume urban districts and, on the other, enabling urban communities to benefit from the buying power afforded rural stakeholders by federal funding programs. Establishing a joint urban-rural consortium for the purchase of broadband services can also permit the CAIs to adopt a "postalized rate" pricing regime that allows rural CAIs to pay the same per-unit rate as the urban CAIs.

Policymakers should encourage partnerships, aggregation, and coordination in securing broadband services.

The FCC encourages consortium buying in both the E-rate program[1] (for schools and libraries) and in the Rural Healthcare program.[2] In the Rural Health Care Pilot program, originally adopted in 2007, the FCC found that "the flexible, consortium-based approach of the Pilot Program fostered a wide variety of health care broadband networks that enabled better care and lowered costs, . . . enabling smaller HCPs [health care providers] to draw on the medical and technical expertise and administrative resources of larger HCPs." As a result, the FCC has directed the Universal Service Administrative Company (USAC) to prioritize consortium applications for expedited review in both the E-rate and Rural Healthcare programs.[3]

Statewide or Regional Procurement

Aggregated buying is a best practice that has also been utilized powerfully at the state and regional level. A large-scale state or regional procurement strategy can leverage the collective buying power of several anchor institutions, which together represent a massive customer for commercial service providers. Significant leadership and organization are necessary to implement aggregated buying, including convincing stakeholders at the local level to participate. But the challenge can be overcome by pointing out the significant cost benefits. These benefits include:

- Lower per unit pricing across the full range of key services, including Internet bandwidth and WAN transport costs;

- Potential increased investment and improved services by private sector providers;

- Reduced (per CAI) administrative and processing costs; and

- Additional management expertise that could benefit participants with limited technology resources.

Lower Unit Pricing

An anchor institution, when acting alone, often is a relatively small purchaser, particularly in smaller communities in rural areas. Indeed, even if an anchor -- such as a school district -- is one of the bigger buyers in the region, it still has relatively modest buying power. Dramatically compounding this problem is the fact that, in many areas, there may be only a single broadband provider with the facilities to serve the anchors. As a result of the modest buying power and the effective lack of competition, rural and single anchors have little to no leverage to secure pricing comparable to that of larger buying groups or metropolitan area districts that may be fortunate enough to have slightly more competition.

In contrast, the aggregate of the communications purchases made by all anchors in a region or state is substantial—and in total likely represents one of the largest communications purchasing sectors in that area. Greater purchasing power can deliver better pricing because bidders offer lower per unit costs in order to secure the volume business opportunity.

The aggregated purchasing strategy is also likely to have positive impacts on commodity Internet bandwidth costs. The cost of bandwidth varies dramatically depending on location (i.e., it will be significantly less costly in Chicago or El Paso than in Peoria or Farmington) and the size of the total purchase (i.e., large bulk purchases of bandwidth will result in lower per-megabit costs than will smaller purchases). The ability of the broader anchor community to buy commodity bandwidth in bulk and then distribute it across a region or state to locations where it is needed can dramatically decrease the per-megabit price of that bandwidth.

One example of the cost savings from joint procurement is the recent initiative by the New Jersey Department of Education to engage in the cooperative purchase of broadband to improve Internet access to 219 schools in 145 New Jersey districts. The New Jersey Digital Readiness for Learning and Assessment Project is expected to generate average savings of 76 percent while increasing Internet capacity by 2.5 times.[4]

Increased Private Sector Investment

The opportunity to realize more revenue and improve long-term business opportunities can convince commercial providers to make additional network investments to serve consortium purchasers. The scale enabled by large group buying is likely to create a business opportunity so appealing to the service provider community that it may organize itself to build additional fiber and offer improved services. Service providers may also offer certain benchmarks for service and upgrade service levels in order to win such a large opportunity.

The new E-rate rules, which explicitly allow E-rate funding for special construction and dark fiber, also present new opportunities for aggregate purchasing. The prospect of receiving substantial ongoing E-rate subsidy for services, and the opportunity to obtain upfront payment for network expansion (particularly for fiber construction), amplify the business opportunity for service providers.

The development of new infrastructure would serve not only the anchor customers, but also many other users in the surrounding area. Indeed, fiber built to currently unconnected anchors can serve as a "middle-

mile bridge" into areas where the anchors are located—and then provide a means of extending service over time to business and residential customers. At the same time, the construction will have direct economic development benefits, as well as catalyzing long-term indirect benefits that flow from the new communications services.

Reduced Administrative and Processing Costs

Another significant benefit of regional, super-regional, or statewide procurement is lower (per anchor) net administrative costs, including RFP preparation, RFP review, contract negotiations, contract administration, invoice review and payments, and, very significantly, interaction with the E-rate administration. One of the E-rate program's biggest challenges is the considerable administrative cost involved at the local level. While the FCC has made efforts to reduce the administrative burden, some of the components of the E-rate application process have become more complex as a result of the significant E-rate rule changes in the two E-rate orders adopted in 2014, particularly for "big-ticket" applications. Collaborative purchasing leads to the opportunity to share the costs of an E-rate consultant or consultants, thereby lowering administrative costs for all participants in the consortium.

Bringing Additional Resources to Help

Consortia applicants can also benefit from shared management and technological expertise. Either the purchasing cooperative itself, or service providers, can provide management services to help even out the technological skill and capacity of the membership. This benefits all members of the purchasing group in that it makes sure that all members are able to benefit evenly from the purchase, installation, and management of connectivity for their organization. This benefit is particularly important for rural CAIs that may not have the resources to hire engineering and legal support necessary to ensure the application meets all the criteria for approval.

Several Case Studies Demonstrate the Value of Collaboration and Joint Purchasing

Alabama

In Alabama, a state consortium of 39 school districts and 16 public libraries released an invitation to bid (ITB) in February 2016 seeking providers of both lit fiber services and self-provisioned (dark) fiber.[5] On April 21, 2016, the Alabama State Department of Education, in its role as the Alabama K-12 Joint Purchasing Program administrator, announced its intent to award contracts to 11 broadband providers. The school districts and participating libraries may use the awarded contracts as an option and are not required by the Alabama State Department of Education to make purchases from these awarded contracts.[6] Craig Settles notes that "[t]his tactic of combining libraries and schools to pursue E-rate funding can garner significant money to offset broadband build-out costs, and as leverage to secure funds from various other sources."[7]

North Carolina

In North Carolina, the statewide research and education network known as MCNC leads aggregated transport purchases on behalf of all school districts—and has achieved not only exceptional per unit pricing and efficiencies, but also consistency of service among districts and greatly reduced administrative costs.

MCNC is an independent non-profit that operates the North Carolina Research and Education Network (NCREN). NCREN connects all K-12 school districts, community colleges, universities, and some non-profit health care sites throughout North Carolina "to each other, the Internet, and global research networks at very high speeds."

NCREN has built its own fiber optic network (funded in part with federal grants and in part with local contributions from the public and private sectors) to all Internet points of presence in the state and also to many of the school district buildings throughout the state. Where it has not built its own fiber, MCNC has leased dark fiber from the private sector (and in turn makes available to the private sector dark fiber within its owned footprint).

The state supports the participation of K–12 schools at the level of $20 million per year to fund the portion of the schools' costs that are not covered by the federal E-rate program. Among other benefits, this strategy maximizes the benefit of the E-rate program for North Carolina schools by increasing the level of services delivered to the schools and by eliminating the burdens of navigating the E-rate program by individual schools. (It is centrally managed by the North Carolina Department of Public Instruction.) In turn, the schools are obligated to utilize their savings on technology projects, such as providing devices and services to students and faculty, that are not covered by the E-rate program.

This program resulted from a study commissioned by the state that sought new strategies for realizing the potential of broadband for North Carolina schools. The study found each school district was contracting independently for its services. As a result, there was no economy of scale and a very low quality of communications between and among the schools. The study recommended connecting all the school districts to NCREN so they could communicate among each other, as well as to the outside world through the public Internet.[8] The study led to a detailed planning project and eventually to the very successful initiative to connect all school district buildings in the state.

The funding includes engineering services by MCNC staff to provide assistance to the school districts, to do network assessments, to support technology migration, and to plan how to realize the benefits of the broadband networks. There is no cost to the school districts, and the program ensures they receive centralized, trustworthy, third-party support. Among other accomplishments, the program has resulted in:

- A dramatic increase in the amount of federal E-rate money flowing into North Carolina;

- A rise in aggregate K-12 traffic from 959.7 Megabits in May 2009 to 58.37 Gigabits in May 2015;

- An increase in the median connection speed to 1 Gbps; and

- Connections for more than 100 charter schools.

The K–12 initiative has been so successful that the community college system, representing 58 colleges, elected also to move to NCREN and specifically asked for the same engineering support. (The state's libraries are eligible to connect, but unfortunately are currently not funded by the state to participate and receive no centralized support.)

The system has also created new business and new revenues for local phone companies, who are partners in the program. MCNC's connection is only to the school district location and then the local company provides the connectivity from the district building to the schools themselves. With the increase in use by the schools, these companies have seen the volume of business they are doing with schools increase dramatically, resulting in an outcome in which all parties benefit.

In the health care area, MCNC also operates the North Carolina Telehealth Network, which enjoys FCC discounts, and enables high-bandwidth services to non-profit health care facilities.

Nebraska

Network Nebraska-Education is a statewide education network, funded and controlled by the local school districts, education service units and colleges that opt into its services. The state authorized Network Nebraska-Education in 2007, allowing state and university staff to build and operate a state-wide backbone, as well as aggregation points. Network Nebraska-Education aggregates all of the network traffic of the state's schools and universities into two Internet purchases, one from Windstream and the other from Cogent Communications.[9]

Initially the network received a small three-year loan of $270,000 from the state, but quickly paid it back and became financially self-sufficient. Each entity that opts into the service pays a $200/month participation fee, as well as an interregional transport fee of $22/month for K-12 districts and $69/month for higher education institutions.

In 2013, the Nebraska Information Technology Commission found that the network decreased the average cost of wide area network (WAN) circuits by 39 percent over five years, and the unit cost of statewide Internet access by 98 percent over six years. Today, more than 97 percent of public K-12 schools use Network Nebraska-Education.[10] In addition, the CIO's office acts as a public consultant for school districts to help them take advantage of E-rate.

Indiana

The Indiana State Library (ISL) released a statewide RFP in 2005 to serve all libraries in the state. As a result of that RFP, ISL contracted with Education Networks of America (ENA), a managed service provider that offers aggregated broadband service to participating libraries throughout the state. ENA was also independently selected by the Indiana Department of Education and committed in its response to ISL to take advantage of opportunities to share resources and leverage its larger footprint to benefit both libraries and schools. With this approach, ISL benefits from economies of scale, comprehensive and equitable service, E-rate filing management, and procurement process savings. Because of these benefits, the contract with ENA has been extended through June 2018.

The managed network service provider model offers flexibility in service delivery for a collective buying approach. Managed service providers typically are not constrained by state and federal regulatory bodies in the manner in which they deliver service. Connectivity to end sites can be achieved by means of virtually any available technology, carrier, or network that provides the required service and reliability levels. Last mile or backbone connectivity in this model can be provided through traditional telecommunications circuits, fiber optic connectivity through municipal and non-traditional carriers, standardized and emerging wireless technologies, and existing or new-build fiber optic networks. A managed service provider can be vendor and technology neutral. This means everything from contract management to vendor changes and bandwidth upgrades is handled seamlessly, freeing CAI resources from conducting these activities. It also means the CAI is not locked into single service provider-specific contracts that limit the ability to employ innovative connectivity solutions.

Recommendations

Federal, state and local policymakers should take the following steps to promote collaboration and aggregation of purchasing of broadband services for anchor institutions:

- Local anchors, including school districts and library systems, should be encouraged to work collectively or take initiative to reach out to other CAIs to create partnerships. Many anchors are not accustomed to working in large consortia, but state and local policymakers should work extensively to build stakeholder support for this strategy because the benefits of consortium buying are so significant.

- States and local governments should create a "Broadband Purchasing Coordinator" position, or task the state CIO to serve this role, to encourage collaboration, thereby maximizing benefits to stakeholders.

- Government officials should engage in joint procurement of broadband services for urban and rural schools, libraries, health, government offices, and other anchor institutions to maximize the opportunities for cost savings and to give greater incentives to the private sector to build out new facilities in hard-to-reach areas.

- States should support anchor institutions' efforts to leverage buying power and navigate such federal funding programs as the E-rate and Rural Health Care Program. A state investment in planning, organization, and guidance – as well as centralized navigation of the federal funding programs – would not only enable remote and smaller anchors to achieve better broadband outcomes, but would also ensure lower per-unit pricing and bring greater federal funding to their states.

- The FCC and USAC should follow through on the stated policy of prioritizing consortium funding requests and should encourage and incentivize consortium bidding in every way possible.

- Policymakers should consider awarding contracts to managed service providers that work with a variety of facilities-based providers simultaneously and can centrally manage the provision and upgrade of service to CAIs.

- States should consider asking for E-rate bids for both lit fiber and dark fiber and consider how aggregate acquisition of shared dark fiber networks (i.e. self-provisioning) compares with the rates for lit fiber services.

Endnotes

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4

PROMOTING COMPETITION for COMMUNITY ANCHOR INSTITUTION BROADBAND SERVICES

Policymakers can improve anchor institution broadband by fostering competition, lowering prices, and promoting open interconnection and shared use of broadband networks.

by John Windhausen, Jr.

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

John Windhausen, Jr. is Executive Director of the Schools, Health & Libraries Broadband (SHLB) Coalition. In prior years, he served as President of a telecommunications trade association in Washington D.C., as senior counsel to the United States Senate Commerce Committee working for Senator Hollings (D-SC) and Senator Inouye (D-HI), and as a staff attorney at the Federal Communications Commission. Windhausen graduated from Yale University and the UCLA School of Law.

Introduction

Many studies show that competition breeds greater investment in broadband networks, more jobs, innovation, lower prices and higher quality customer service.[1] Yet many anchor institutions still have only one choice for their broadband provider, and the lack of competitive choices hampers anchor institutions' ability to acquire high-capacity broadband at affordable prices. Policymakers can address the shortage of competition by making it easier for new broadband providers to enter the market; requiring more bidders for E-rate services; ensuring that existing networks are open to interconnection to competitive providers; reducing prices of wholesale access to existing infrastructure and services that competitors need to expand their networks; and promoting network sharing.

Federal Policymakers Are Promoting Competition in the E-rate Program

In its December 2014 E-rate modernization order, the Federal Communications Commission (FCC) found that many schools and libraries only receive one response, or no responses, after they issue a request for proposal (RFP) seeking service.[2] According to a survey of school districts by the Consortium for School Networking (CoSN), 29 percent of schools (38 percent of rural schools) report having one or no qualified bidders for Internet services.[3] The Research and Education Network in Missouri (MOREnet) found that 30 percent of the RFPs issued by schools in Missouri received either one bid or no bids at all, most of them in rural areas.[4] Similarly, more than one-third of U.S. public libraries (and 41 percent of rural libraries) report they cannot improve their broadband connectivity because they already are at the maximum speed available to them.[5]

The FCC has worked to address this lack of competition in rural areas by requiring broadband companies that receive financial support from the FCC's Connect America Fund to respond to E-rate RFPs. The FCC found, "In high-cost, hard to serve areas, we expect that recipients of high-cost support will be best situated to offer affordable broadband service to eligible schools and libraries. Obligating these recipients to offer affordable services to schools and libraries in high-cost areas increases the likelihood that schools and libraries will receive affordable broadband service at the lowest cost to the E-rate program."[6] In addition, the FCC also equalized the treatment of lit and dark fiber, allowing schools and libraries the option of deploying their own broadband networks, giving them another (competitive) alternative for their broadband needs.[7]

Anchor Institutions Benefit from Open Access and Interconnection Policies

Open access and interconnection policies can open markets to non-traditional providers and promote competition. The American Recovery and Reinvestment Act (ARRA) required Broadband Technology Opportunities Program (BTOP) funding recipients to comply with open access and interconnection policies.[8] The theory was that building "open middle-mile" networks to anchor institutions could make it easier for other competitive providers to build out last-mile networks, not only to the anchor institutions, but also to the rest of the community, including residential users. The evidence shows that this theory has worked. To date, BTOP grant recipients have reached over 800 interconnection agreements with other providers. As ASR Analytics (ASR) describes it in a National Telecommunications and Information Administration-funded BTOP impact study:

> Through open access policies and network architecture, these projects provided the means for third-party middle-mile and last-mile providers to use the BTOP-funded infrastructure to expand their future reach into unserved and underserved areas. BTOP infrastructure

also provided means for service providers to improve the redundancy of their networks by expanding route diversity to new Internet peering points and improving traffic routing. The increased reliability facilitated by the BTOP infrastructure is a key feature in attracting businesses to the areas served by BTOP infrastructure grants.[9]

Admittedly, it takes open access policies a few years to have an impact, in part because the network needs to be deployed across a large enough footprint to impact the market. Nevertheless, in its 2014 report, three years after the BTOP projects began to deploy, ASR found a yearly increase in GDP in the areas served by the new broadband investment of between $5.7 billion to $21.1 billion. ASR also found that anchor institutions achieved significant cost reductions:

> Community anchor institutions served by BTOP infrastructure experienced a decline in broadband prices of approximately 95 percent, regardless of institution type. As an example of the potential importance of price reductions of this size, K-12 schools connected by BTOP grantees could experience a cost difference of $2 billion annually… [10]

ASR also noted that many interconnection agreements were still being negotiated and that it would take time for last-mile build-out to occur.

To expedite competition by last-mile providers, one state provides discounted access to its middle-mile network. The Maine Fiber Company (MFC), which owns the Three Ring Binder, a BTOP-funded project, announced rate reductions for more than half of its network starting in January 2016. These offers include no payments due during the critical first two years when last-mile providers face the most severe funding challenges.[11]

Many anchor institutions still have only one choice for their broadband provider.

The UC2B project in Champaign-Urbana, Illinois, provides another important example of the benefits of open access for community anchors. This BTOP-funded middle-mile project connected 294 anchor institutions and over 1,000 households to a fiber network. UC2B then initiated a competitive bidding process for a broadband and video service provider to expand and operate the network. The contract was recently awarded to iTV3, which will: 1) invest tens of millions of dollars to build gigabit fiber in areas of the city where at least 50 percent of potential customers commit to signing up for service, 2) offer wholesale access on the network to competing broadband providers, and 3) make unused capacity available to other providers to serve communities that iTV3 does not serve.[12]

The City of Sanford, Maine, has proposed to build the largest municipal fiber network in that state. Sanford intends to build a 32-mile fiber and open access network that will allow multiple ISPs to provide services. The city will partner with the Maine-based company Great Works Internet (GWI). The city's Economic Growth Council is a major driving force behind the public-private project that is estimated to generate between $47 million and $192 million in economic benefits over the next decade. The city expects to pay for the network, in part, through cost savings from signing long-term contracts with community anchor institutions. These anchor customers will pay significantly less than what they had been paying traditional commercial providers.[13]

The FCC Should Consider Price Controls on Special Access Services

Special access (and, more recently, Business Data Services) is the term used to describe direct, point-to-point data connections over both traditional copper telephone and fiber networks. According to the FCC, special access services are used by businesses, schools, libraries, and other institutions of state and local government.[14]

The Communications Act requires that prices for special access services must be "just and reasonable." There is evidence that special access prices are much higher than they should be. The FCC deregulated special access pricing over a decade ago based on the expectation that competition would develop, but many claim that competitive networks simply do not exist for most locations.

Some analogize the impact of special access service prices to the price of a barrel of oil. When oil prices increase, so do gasoline prices, home heating prices, and even taxi cab rates. Similarly, high prices for special access services impact the rates consumers pay for home Internet connections, for wireless data plans, and even for basic telephone service. Special access services are an input to virtually every other communications and broadband service cost.

Special access prices also affect competition. Competitive local exchange carriers (CLECs) often lease special access circuits from large incumbent providers because CLECs do not have their own facilities to serve schools, libraries, hospitals, and government offices. Competitive carriers say reducing prices for special access services will encourage them to lease circuits and enter new markets, thus increasing competition.

These competitive providers allege that high prices for dedicated (point-to-point) circuits from incumbent companies thwart the rollout of advanced networks to new markets.[15] They have called upon the FCC

Lack of competitive choices hampers anchor institutions' ability to acquire high-capacity broadband at affordable prices.

to place greater price controls over incumbents' special access prices in order to promote competition. The FCC is considering renewing price controls over telephone companies' special access services.

AT&T has criticized the FCC's investigation, saying that competitors have a wide array of choices for special access services, and that rate regulation of special access services would discourage them from expanding their broadband networks. But Level3, a competitor, notes that there are not, in fact, many competitive providers of special access services and that AT&T has a virtual monopoly on high-capacity networks to many buildings in its service area. For instance, Level3 claims that there are approximately 20 million business buildings across the country, and Level3 has only connected 30,000 buildings with lit fiber. Level3 must purchase special access services from the one and only other provider of data services if it wants to provide competitive services to the other buildings that it does not serve with its own fiber.

The FCC is expected to make a decision about the pricing for these special access services later in 2016.

Shared Networks Can Facilitate Lower Prices for All Anchor Institutions

The National Broadband Plan spoke eloquently about the value of sharing networks across sectors:

[Government policies] frequently drive institutions to use dedicated, single-purpose networks that are not available for broader community use… These restrictions make it difficult to expand and share broadband with other community institutions in the most cost-effective way. This problem is especially acute in rural areas and Tribal lands where broadband may only be available and affordable to residents and small businesses in a community if the fiber optic infrastructure in that town is shared not only by commercial users but also by the local hospital, government office and school system. Because broadband networks—particularly fiber optic networks—demonstrate large economies of scale, bulk purchasing arrangements for forms of connectivity like second-mile and middle-mile access can drive down the per-megabit cost of such access considerably. As a result, policy restrictions that impede the ability of school

networks funded by E-rate to share capacity with hospitals funded by the Rural Health Care program, or the public safety system, which may be funded by state and other federal sources, drive up the cost of connectivity for those institutions and for others in the community.[16]

There are several examples of communities that are building shared networks to support multiple kinds of users, such as:

- Danville (Virginia) built the nation's first open access fiber network beginning in 2007. The nDanville Network is a public-private partnership with the city and the electric utility. The network now serves the needs of the electric utility, the school systems, and the medical community. Private sector service providers use the nDanville Network to provide Internet access to businesses and residential consumers.[17]

- Bell County (Texas) designed and installed a countywide fiber optic system to provide connectivity to county offices, local colleges, the regional medical center, and Fort Hood, a military base. This shared fiber network is the key to Bell County's consolidated 911 communications center, allowing remote court testimony by doctors and promoting collaboration between city law enforcement agencies and prosecutors.[18]

- Harford County (Maryland) began deploying its own countywide fiber network in 2014. The network services 108 sites, including schools, libraries, volunteer fire companies, county and public school administration buildings, Harford County Transit, police departments in Bel Air and Havre de Grace, county and municipal water and sewer facilities, and the county's backup 911 center. The network builds off of the OneMaryland Network that was built across the state with BTOP funds. The county estimates that it will save about $1 million a year by having its own communications network, freeing it from depending on traditional Internet service providers.[19]

Recommendations

Federal policymakers can:

- Enforce the new requirement that Connect America Fund recipients must bid in response to an E-rate RFP issued by a school or library.

- Place limits on the pricing for special access services to promote greater competition.

- Eliminate barriers that prevent anchor institutions from sharing their networks with other anchors and with the surrounding residential community to improve the availability of broadband for everyone.

- Ensure that any new Federally-funded investments in broadband infrastructure have open access provisions similar to those in the BTOP program.

- Develop mechanisms and incentives to harmonize the E-rate, Healthcare Connect Fund and Connect America Fund investments to promote shared use and prevent funding of duplicative infrastructure.

State and Local Policymakers can:

- Promote open access networks that are open to interconnection and shared use, in order to promote economic development and aggregated demand, especially in rural areas.

- Facilitate building of municipal and competitive networks off of state middle-mile networks, perhaps by offering discounted access to the middle-mile network.

- Coordinate the shared use of fiber networks serving the needs of police, public safety, government offices, schools, libraries, public media, and other anchor institutions.

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15   See John T. Nakahata, Comments of Windstream Services, LLC, WC Docket 05-25, Jan. 27, 2016 http://apps.fcc.gov/ecfs/comment/view?id=60001386514: "Windstream's competitive operations typically must rely on other [broadband providers'] existing infrastructure in the last-mile…. Without such access on just and reasonable terms, Windstream will not be able to continue to be a nationwide provider of complex communications solutions to large, medium, and small businesses; federal, state, and local governments and agencies; schools; and healthcare providers."

16   Federal Communications Commission, Connecting America: The National Broadband Plan, (March 2010) https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf

17   "nDanville: Connecting Danville to the Future" http://www.danville-va.gov/DocumentCenter/Home/View/1859 last accessed May 27, 2016.

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5

BROADBAND INFRASTRUCTURE POLICY and COMMUNITY ANCHOR INSTITUTIONS

Streamlining access to rights-of-way and effectively managing public land can expedite the deployment of high-capacity broadband to anchor institutions.

by Tom Koutsky

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Tom Koutsky serves as Chief Policy Counsel for Connected Nation. Tom provides vision and leadership for Connected Nation's research and policy initiatives. Tom joined Connected Nation from the Federal Communications Commission where he served as a Senior Advisor to the team that wrote the first U.S. National Broadband Plan. Tom focused on policy recommendations related to network infrastructure, the law and economics of middle-mile connectivity, wholesale competition rules, and universal service and access charge reform.

Introduction

Federal, state and local government policies concerning access to rights-of-way, pole attachments, tower siting, and other issues can have a significant impact on the pace of broadband network deployment. The National Broadband Plan, the federal Broadband Opportunity Council report, and numerous state and local broadband plans have found that streamlining these decisions can dramatically lower the cost of broadband investment.

For example, the National Broadband Plan found that an effective rights-of-way policy of facilitating joint placement of facilities (known as "dig once" policies) can reduce broadband deployment costs by over 20 percent.

Cost per mile for fiber deployment (Thousands of dollars)

28	6	110	144
2			43
26	6	41	
		69	101
MATERIALS	SPLICING	PLACEMENT	TOTAL
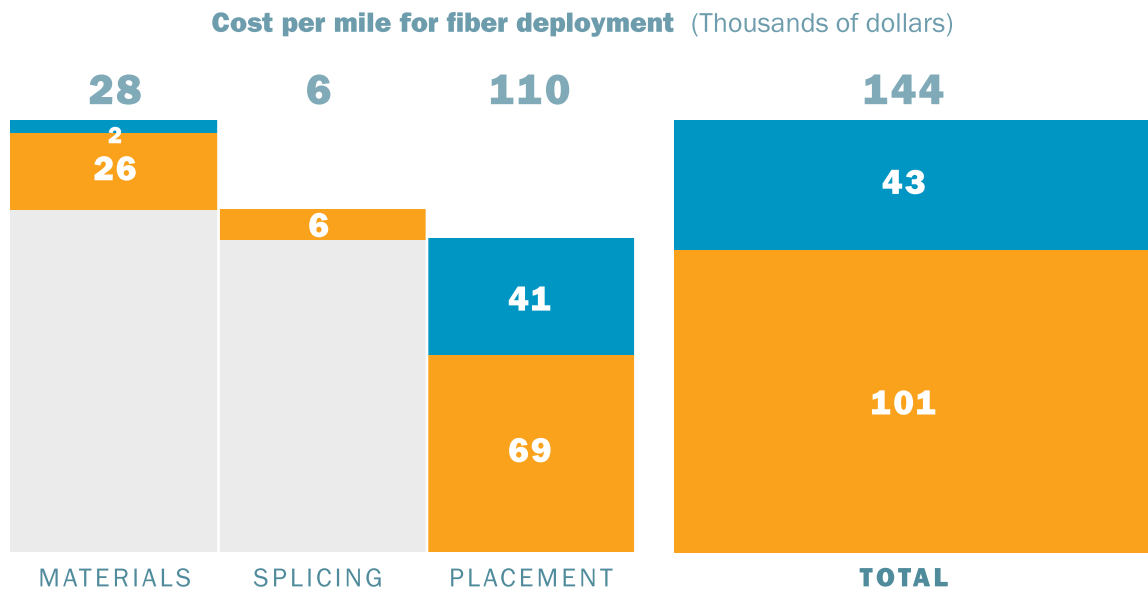
Additional costs when not jointly deployed
Costs in joint deployment case

Federal Communications Commission, *Connecting America: The National Broadband Plan* (2010), ch. 6 (Infrastructure), Exhibit 6-B.

Governments can also lower the cost of broadband deployment by installing empty conduit for fiber optic lines as part of every construction project, including roads, bridges, and sewers. The cost of running a strand of fiber through an empty conduit is 3-4 times less expensive than digging new trenches or attaching fiber to utility poles.[1] Empty conduit can be leased to service providers directly, or the community can use that conduit itself to self-provide fiber and broadband services to community anchor institutions (CAIs) and other governmental purposes.

Streamlining rights-of-way policies and installing empty conduit typically do not require additional funding, but taking these steps does require a concerted effort to change existing bureaucratic practices, ensure equitable access to all broadband competitors, and protect the public interest. Forward-thinking government broadband infrastructure policies improve access to, and use of, existing infrastructure and foster further infrastructure deployment.

Proactive leaders can use the following policy levers to meet the broadband needs of community anchor institutions, promoting infrastructure investments with sufficient scale, breadth, reach, and capacity to serve the economic and social needs of the entire community.

Dig Once, Rights-of-Way and Conduit Policies

In 2013, the Federal Highway Administration estimated that 90 percent of the cost of burying broadband infrastructure along a roadway consists of the expense of digging up and replacing disturbed land and the road.[2] Sharing that expense among multiple uses—by digging once—can lower the cost of fiber deployment considerably, but requires coordination with a variety of broadband providers and government agencies.

Despite the opportunity for considerable cost savings in deployment, dig once policies are not required by the Federal Government or any state government for all infrastructure projects. The major barriers are existing laws. The Federal-Aid Highway Program, for example, can only spend funds on "highway eligible activities;" the U.S. Department of Transportation interprets this to mean that it cannot spend funds coordinating construction projects with broadband infrastructure, absent a specific public interest showing.

In addition, "silo" thinking and policies can stand in the way of dig once opportunities. For example, when the U.S. Environmental Protection Agency (EPA) requires local governments to fix or replace sewer lines as part of a settlement of potential environmental rule violations, the EPA does not generally consider the outlays for joint trenching and broadband conduit to be part of the cost of the project. This policy acts as a disincentive and may effectively limit the ability of cities to adopt a dig once policy for what are frequently major public works investments.[3]

The National Broadband Plan recommended that Congress consider enacting dig once legislation applying to all future federally-funded projects along rights-of-way (including sewers, power transmission facilities, rail, pipelines, bridges, tunnels, and roads).[4] Several bills in Congress have been introduced since 2010 that would establish dig once policies for federal transportation projects and apply standard fees for rights-of-way leases. Some of the ideas under consideration are to:

- Make it the policy of the United States to encourage the deployment of communications facilities.

- Convey a sense of Congress that federal agencies should endeavor to provide for the inclusion of broadband conduits in federally-funded highway construction projects and to do so in a manner that does not negatively impact highway safety or operations and limits burdens on state departments of transportation.

- Establish a common permit application form and fee structure for communications facilities.

- Require highway departments and projects to 1) coordinate with state telecommunications and broadband plans and 2) implement dig once coordination.

- Mandate the installation of broadband conduit—plastic pipes that house fiber-optic communications cable—during the construction of any road receiving federal funding if there is a demonstrated need for broadband in the area within the next 15 years.

In 2012, Executive Order 13616 required the 14 federal agencies that control property to identify and consider adopting dig once "best practices."[5]

Many cities across the country are adopting conduit installation requirements. The city code in Mt. Vernon, WA, requires the installation of conduit as part of the development of all buildings, homes, subdivisions, streets, and utilities. Mt. Vernon has used this city-owned network of empty conduit to help build an open access telecommunications network that supports community anchor institution connectivity.[6] Brentwood, CA, has a similar policy, requiring developers to install two conduits when doing work in public rights-of-way. One conduit is assigned for city network use. The second is leased to a private provider that will offer Gigabit service to consumers and businesses.[7]

Access to Existing Poles and Ducts

In addition to digging trenches, another way to build broadband networks is by attaching wires and facilities to existing utility poles. There are an estimated 130-180 million utility poles in the U.S. – more than one pole for every household. These poles are generally owned by electric utilities, municipalities, railroads, and traditional telephone companies.

In rural areas, where a provider may need to attach to hundreds of poles to reach a community, even small changes in the cost of attaching to these poles can have a significant impact on broadband deployment. The National Broadband Plan estimated that, in rural areas, pole attachments alone can cost a broadband provider $4.54 to $12.96 per month per subscriber—a significant part of the cost of monthly broadband service.[8]

Governments that own and control these poles and ducts can use them to attract broadband investment. Governments also regulate the rates, terms, and conditions of access to privately-owned poles, which are frequently built on public rights-of-way. Section 224 of the Communications Act gives the Federal Communications Commission (FCC) the power to regulate the rates, terms, and conditions of poles that are owned by private companies. Section 224 also allows states to establish their own pricing rules for privately-owned poles. To date, 19 states and the District of Columbia have established pole attachment policies.

Asset Inventories and Databases

Governments are, by far, the largest owners of property in the nation. Every level of government has the ability to directly affect the cost, nature, and quality of a network build simply by making it easier for private firms to identify and lease space on public buildings, signs, water towers, and other locations. In 2015, the Broadband Opportunity Council recommended that the Federal Government create an "open data inventory of infrastructure assets" for broadband.[9]

Local government can also provide information directly to broadband providers in a way that essentially "markets" those locations to providers. For example, for no upfront cost, Columbus, OH, is working with Connected Nation Exchange[10] to inventory, catalog, and map all civic infrastructure and locations to market to service providers interested in expanding their networks.

Wireless Tower Siting Policies

According to the FCC, the process of deploying wireless towers can be expensive, cumbersome, and time-consuming. In addition to identifying and purchasing or leasing the right location, a provider usually must obtain siting approval from the local municipality and comply with environmental review. The Middle Class Tax Relief and Job Creation Act of 2012 streamlined this process, requiring state and local governments to approve certain wireless broadband facilities' siting requests and to set timelines for local review of applications.

Recommendations

Dig Once, Rights-of-Way, and Conduit Policies

- Federal, state, and local governments should adopt binding and enforceable "dig once" policies that will lower the cost of broadband deployment by requiring coordination between government and the private sector on broadband construction and upgrades.

- Infrastructure projects and development that involve public rights-of-way, or are built on public lands, or are subsidized with universal service funds, should include installation of empty conduit that can be made available to commercial service providers.

- Federal and state governments should establish common and uniform lease agreements, rates, and terms of access to rights-of-way, public lands and facilities for broadband network construction and upgrades.

- As part of community planning and community anchor institution connectivity initiatives, state and local governments should review rights-of-way management policies, including fees charged, in order to streamline approval and lower the costs of that connectivity. Community anchor institution representatives should be included in this assessment and review.

- In negotiating rights-of-way arrangements with broadband service providers, local policymakers should ensure that community anchor institutions are offered service at appropriate and affordable rates, terms, and conditions.

- In using or leasing empty fiber optic conduit, government should ensure that community anchor institutions have the ability to lease or obtain dark or lit fiber services through that conduit.

Effective Pole Attachment Management and Regulation

- Federal, state and local authorities responsible for resolving pole attachment disputes between providers and utilities should do so quickly, effectively, and in a pro-competitive manner.

- Policymakers should revise pole attachment rules so that they: (a) include all utility poles, ducts, and conduit; (b) provide clear, consistent, uniform, and low rental and make-ready rates for attachments for all broadband, cable, and telecommunications providers; (c) establish clear timelines and terms of access; and (d) include enforceable commitments.

Asset and Property Management

- The Federal Government[11] should implement the federal asset inventory database recommended by the Broadband Opportunity Council (BOC).

- State and local governments should implement similar asset inventory databases and should, as recommended by the BOC, work with federal authorities to develop a common platform for those databases.

- Community anchor institution sites and facilities should be included in all community asset inventory databases.

Wireless Tower Siting Policies

- State and local governments should move quickly to fully implement Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, which expedites wireless tower siting policies.

Resources for Further Reading

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6

COMMUNITY ANCHOR INSTITUTIONS SERVED by GOVERNMENT and NON-PROFIT FIBER NETWORKS

State and local government networks can often provide anchors with high-quality bandwidth at affordable rates.

by Joanne Hovis

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Joanne Hovis is president of CTC Technology & Energy, where she heads the firm's work in network business planning, market analysis, financial modeling, policy, and strategy. Joanne advises cities and states regarding how to build strategy and opportunity for public–private partnerships in broadband. She led the CTC teams that developed first-of-their-kind partnerships for the Commonwealth of Kentucky, the City of Santa Cruz, and the Champaign-Urbana Big Broadband consortium. Joanne is a former president of the National Association of Telecommunications Officers and Advisors (NATOA) and serves on the boards of the Fiber to the Home Council, OneCommunity, and the Benton Foundation.

Introduction

State and local governments have been providing anchor institutions with high-speed data connections using fiber-optic networks for several decades. Indeed, tens of thousands of schools, libraries, community centers, and public health and safety providers obtain their broadband connectivity from local government and state non-profit networks, including state research and education networks. Policymakers should strongly consider developing or augmenting their municipal or statewide governmental or non-profit networks to ensure that their anchor institutions have the highest-quality broadband connectivity, to establish a foundation for economic growth, and to meet fundamental societal needs.

Government and non-profit anchor networks generally do not require short-term profits and, in most cases, can focus on long-term and community-based goals. These networks enable anchors to benefit from high bandwidth and reliability at reasonable per-unit pricing. These networks also benefit the private sector; many anchor networks lease excess capacity to and from commercial providers. While some criticize municipal broadband providers that serve residential customers, there are very few objections to networks that focus on serving anchor institutions.

Addressing the Unmet Needs of Government Agencies and Anchor Institutions

Anchor institutions often cannot afford to purchase high-capacity circuits from the private sector; rather, anchors simply cap their bandwidth and choose not to deploy applications that require high bandwidth. In other cases, high bandwidth capacity is just not available to anchor institutions at any price because the commercial carriers have not deployed the required infrastructure in that region.

The town of Holly Springs, North Carolina, for instance, was paying private providers higher bills each year, and it was struggling to afford the bandwidth it needed. The town decided to construct a municipal network to provide telecommunications services to public buildings and community anchor institutions. The network cost $1.5 million to build, and is set to pay for itself in less than 10 years. The network offers connection speeds that are exponentially faster than the services previously obtained from the private provider. The network will also lease extra fiber strands to companies who want to serve homes and businesses, thereby allowing the private sector to "piggy back" on its network.[1]

Similarly, in response to the increasing cost of service from a commercial provider, county officials in Martin County, Florida, decided to connect public buildings to the county's fiber network. The decision reduced the cost by sharing conduit with the county's traffic division, which was upgrading its intelligent transportation system. The county reduced the cost even further by negotiating a fiber swap with a rural exchange company in the region. The county built the network using a $3.12 million loan and the network is expected to provide $30.3 million in savings over the next 20 years.[2]

Fiber-Based Networks Offer Affordable Scaling as Needs Grow

Fiber-optic networks have a useful life of decades because the capacity can be upgraded simply by changing the electronics at the end of the fiber. These networks are capable of supporting greater speeds and bandwidths as anchor institution needs and applications grow. Anchor networks commonly upgrade any one of their backbone fiber pairs to hundreds of gigabits per second – which is often faster than available commercial service offerings. Further, government and non-profit anchor networks often offer increases in capacity at little or no increase in recurring costs to the anchor because of how they typically

structure their cost recovery models. Cost savings from aggregating traffic from multiple users sharing the same network are passed along in the form of lower prices to all users, including the anchor institutions.

For instance, Merit Network (a non-profit research and education network in Michigan), received two federal Broadband Technology Opportunities Program (BTOP) grants to deploy fiber throughout the state. Merit has realized operational cost savings as a result of this fiber infrastructure and has passed those savings onto its anchor institution members. Merit provides several examples of schools and libraries that increased their capacity from 3 Mbps to 1 Gbps (about a 300% increase in speed) at prices that are less than what they had been paying a commercial provider.[3]

The Efficiencies of Shared Construction

Many of the government anchor networks in operation were built through the economically-efficient mechanism of shared construction, in which agencies and organizations agree to build cooperatively and simultaneously. For instance, the network that serves the four partnered entities in and around the city of Seattle (including the City, King County, University of Washington, and school district) was made affordable by the agreement of the four entities that, in the event that one of the partners planned to deploy fiber infrastructure, the others would have the option of contributing funds to build additional capacity in this shared infrastructure. Each partner agency operates its own network services over the shared physical infrastructure, but only one physical network was built to enable these many functional networks. The end result has been a robust, high-speed bandwidth infrastructure that realizes economies of scale in both construction and maintenance—and delivers world-class services to Seattle-area anchor institutions, including schools, higher education, public safety, and libraries.[4]

Walton County in the Florida Panhandle offers another example:

> Incumbent providers have failed to invest in the region's infrastructure, and as a result, connectivity has been both poor and expensive. Some county agencies pay as much as $500 per month for 3 Mbps DSL connections that don't meet their needs. "Basic functions of our government are not working due to inadequate speeds," explains Rick Wilson, projects and programs manager for the Walton County Board of County Commissioners.[5]

Walton County joined with several surrounding counties to build a new network using Alabama-based fiber provider Southern Light. The network will connect more than 50 public buildings, including schools, libraries, firehouses, sheriff's offices, a rural health care office, road crew offices, commissioners' offices, and community centers.

A Platform for Last Mile Deployment to Homes and Businesses

Local government and non-profit anchor networks often realize yet another key efficiency – these networks also can serve as an open platform for last mile deployment, both public and private. By their nature, most government networks to anchor institutions will reach deep into neighborhoods that house schools, libraries, public health offices, and government facilities such as water towers and fire stations. Many localities then lease excess capacity to private sector providers to enable service provision and last-mile build-out in the neighborhoods. This trend is fast accelerating as hundreds of localities make available spare fiber optic capacity to private carriers at rates designed to catalyze new private sector investment and opportunity.[6]

In Clackamas County, Oregon, a public fiber-optic network serving anchor institutions was purposely built with excess capacity that the county now leases to eight retail Internet service providers (ISPs). Access to the county's middle-mile network allows the ISPs to provide significantly better service to end customers and improves the business case for additional investment in last-mile networking solutions. The county is able to cover the ongoing cost of operating the network with the revenues generated from leasing excess network capacity.[7]

Similarly, Arlington County, Virginia, recently built a fiber-optic network to meet the county's internal communication needs. The county is now using excess network capacity to attract businesses to the area, in support of the county's economic development goals. The county offers three-, five-, and ten-year leases for up to 48 strands of dark fiber to any entity that can demonstrate it will use the connection to expand economic opportunities within the county.[8]

Strategies to Finance Government Anchor Networks

There are several strategies local and state governments have used to finance anchor networks. Where there is sufficient leeway in the general fund, governments can appropriate funds to cover the necessary initial capital expenditure, either on a one-time or multi-year basis. If there is not sufficient leeway in the general fund, a number of municipalities have used general obligation bonds, revenue bonds, or certificates of participation to finance the network build-out.

While these financing strategies do come at a cost, the lack of a high-capacity anchor network can pose a greater threat to the community's long-term financial situation. Government agencies' and anchor institutions' demand for bandwidth will continue to grow in the coming years. Failing to invest in high-capacity broadband can impede the community's economic growth.

Anchor networks tend to have a relatively modest payback period, with the initial investment often being offset through avoided costs in roughly 3-10 years. This holds true even when bonds are used to finance the network build-out, taking into account the cost of servicing the debt.

Once constructed, there will also be ongoing operational costs associated with maintaining the network. Often, the network manager charges agencies and anchor institutions fees for their use of the network that are limited to the actual operational costs. Most networks have been able to reach financial self-sufficiency while charging agencies far less than a private carrier would charge for comparable services.

There is also growing interest amongst private financial institutions willing to invest in municipal networks. Local governments may be able to find alternative means of financing government anchor networks using private capital.

Addressing Criticism of Municipal Networks

Despite numerous examples of successful municipal networks providing broadband services on a wholesale or retail basis,[9] some critics argue that such networks unfairly compete with private industry and can pose a risk to taxpayers. While much of the criticism is unfounded and based on factual errors,[10] these criticisms are largely irrelevant to anchor networks. Very few of the critics of municipal retail and wholesale networks argue against municipalities' right to own and operate a network to meet their agencies' internal needs. Commercial companies generally do not question anchor institution networks in part because these networks are analogous to private, corporate networks that are usually provisioned by commercial companies.

Policy Recommendations

To help community anchors obtain the high-capacity broadband they need, policymakers should consider the following options:

- State and local governments should consider creating or upgrading their municipal or state non-profit networks to expand broadband service to anchor institutions. States and municipalities have successfully used anchor networks to control the cost of communications services for decades. While the success of such networks depends on wise financing decisions, quality engineering, and skilled operation, there is often a strong business case for local and state governments to invest in fiber infrastructure in order to serve local anchor institutions in a cost effective manner while benefiting the private sector as well.[11]

- State and local governments that deploy fiber optics for internal use, including to government and public safety facilities, should include the full range of anchor institution types in their plans, including education, health care, libraries, community centers, public media, and digital inclusion training sites.

- The Federal Communications Commission should continue its successful policy of allowing municipal and non-profit networks to serve as eligible providers under the E-rate and Healthcare Connect Fund programs, thus enabling schools, libraries, and health care facilities to benefit from the competitive bids and services of public as well as private sector networks.

- Federal and state broadband funding programs, including but not limited to those specifically designed to extend or improve services to anchor institutions, should include local governments and affiliated non-profits as eligible entities for funding.

- Policymakers should encourage shared construction by multiple government agencies to deploy fiber conduit, lower their costs, and avoid deploying duplicate networks.

- Municipal and non-profit networks should be encouraged to build excess capacity that they can lease to the private sector in order to promote competition by commercial service providers and generate revenue to pay for the operating costs of the network.

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7

BROADBAND
SUBSIDIES for
COMMUNITY ANCHOR
INSTITUTIONS

Community anchor institutions need financial support so they can afford to purchase high-capacity broadband services.

by Gina Spade

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Gina Spade is the founder of Broadband Legal Strategies, a law firm specializing in universal service issues. During her 13 years at the Federal Communications Commission, Gina served as the policy manager for both the E-rate (six years) and Rural Healthcare (five years) programs. In addition, she oversaw audits, the Payment Quality Assurance Program, fraud detection, and financial issues for all universal service programs while in the Office of the Managing Director.

Introduction

Studies show community anchor institutions (CAIs) often cannot afford to purchase the broadband capacity they need to serve their communities. While the E-rate and Rural Healthcare programs have been enormously helpful, many schools, libraries, and healthcare providers still report that they cannot purchase sufficient broadband because of the high cost or because robust broadband networks are not available. Many other anchor institutions—such as public media, public housing, community colleges, community centers, and other community-based organizations—do not receive federal subsidies for broadband connectivity and have even more trouble finding the resources to pay for high-quality broadband. Federal, state, and local governments need to address the connectivity challenges of tomorrow by providing additional financial resources and incentives to CAIs so that they can afford to purchase high-capacity broadband services.

Anchor Institutions Often Cannot Afford to Pay for the Broadband Services They Need

Broadband prices are often much higher than anchor institution can afford to pay. The Consortium for School Networking's Third Annual E-rate and Infrastructure Survey finds, "Affordability continues to be the primary impediment for securing robust connectivity; this is particularly true for monthly service fees but also for initial capital costs."[1] EducationSuperHighway says, "Affordability is the number one barrier to meeting connectivity goals. Schools must dramatically increase the broadband they receive for the dollars they spend."[2] Public libraries report the same, with roughly 40 percent stating they cannot afford to increase bandwidth.[3]

CAIs cannot purchase sufficient broadband because of the high cost, especially in rural areas.

Affordability concerns are especially high in rural areas. In the fall of 2015, *Education Week* ran a series of stories about the difficulties rural schools face in paying for broadband services. The stories summarized the plight of two school districts, one in New Mexico and the other in rural Mississippi:

- In Catron County, New Mexico, two school buildings in the towns of Quemado and Datil share a 22 Mbps connection and pay roughly $3,700 per month, when most U.S. schools can get similar speeds for roughly $550 per month.[4]

- In Calhoun County, Mississippi, the school district faces an even more expensive situation. Its 2,500 students share a 3 Mbps connection on a T1 copper line. This speed does not allow students to take state-mandated online tests or even conduct online research, yet the school district pays $9,275 each month.[5]

- *Education Week*'s Benjamin Herold concludes: "The E-rate is supposed to prevent against price-gouging. A provision known as the 'lowest corresponding price rule' says that telecoms can't charge schools and libraries more than they ask comparable non-residential customers to pay. But in places like Catron County, determining such comparisons can be tricky, if not impossible. The FCC has also shown little ability to aggressively enforce its own rules."[6]

In its 2014 E-rate modernization orders, the Federal Communications Commission (FCC) noted evidence of excessively high prices paid by schools. For instance, the FCC found that schools in Mahleur County, Oregon, were paying $1,000 per month for a single T-1 line (at 1.544 Mbps) and that the rate paid by schools in Iowa for a 45 Mbps connection varied between $210 and $3,375 per month.[7]

Rural health care clinics face similar problems. According to a group of health care policy experts:

> [H]igher bandwidth and greater reliability comes with much higher prices in rural areas—as much as three times as expensive compared to urban areas—leading to a larger connectivity gap for more advanced medical services. Especially for telemedicine and other services that require rapid and reliable transmission of high volumes of clinical data, the broadband connectivity gap can be a considerable barrier to improving rural health.[8]

The American Library Association noted in public comments filed with the FCC before the E-rate modernization orders were released that:

> Many, if not most, rural libraries pay disproportionately high costs for broadband services. For example, one library in Arizona's Apache County pays more than $18,000 for 5 Mbps metro Ethernet service compared to a Maricopa County library that pays $11,000 for 100 Mbps service, annually. Similarly, an Idaho library near the Montana border is paying more than $1,300 each month for wireless 5 Mbps service. The only other choice for Internet is dial-up. In contrast, a suburban library near Boise pays $750 per month for 40 Mbps.[9]

Many anchor institutions cannot afford their share of the cost of broadband, even after receiving federal funds from programs like E-rate. This could be the result of insufficient local budgets or excessive pricing by broadband providers. Because there is little competition in rural areas, broadband providers may have little incentive to lower prices, especially because they realize the E-rate and Rural Healthcare programs will subsidize a portion of the cost.

Anchor institutions other than schools, libraries, and health clinics likely face similar challenges obtaining affordable, high-capacity broadband, but there is little data collected to document the scope of this challenge.

State Universal Service Solutions

Fortunately, some states have developed programs to address CAIs' funding and broadband challenges. Below are a few examples:

- The State of Maine was one of the first to recognize the need for a subsidy program to support the costs of connecting Maine schools and libraries to the Internet. In 1999, Maine created the Maine Telecommunications Education Access Fund (MTEAF), which collects funds from a small (less than 1 percent) surcharge on intrastate telecommunications services. The MTEAF, together with financial support from the FCC's E-rate program, pays for the Maine School and Library Network (MSLN) to provide Internet access to approximately 950 schools and libraries in Maine.[10] The MSLN recently upgraded its network by connecting to the middle-mile Three-Ring Binder fiber project funded by the U.S. Department of Commerce's Broadband Technology Opportunities Program (BTOP).

- The California Teleconnect Fund (CTF) subsidizes select communications services to qualifying K-12 schools, community colleges, libraries, hospitals, health clinics, and community-based organizations. The CTF supports a telehealth network connecting almost 300 rural sites to a network of medical service providers.[11]

- The State of Wisconsin also has an intrastate subsidy program called the Technology for Educational Achievement (TEACH) program.[12] TEACH subsidizes equipment purchases, installation, and a portion of the monthly service costs for access to the BadgerNet Converged Network (BCN) for more than 900

K-12 schools, technical colleges, public libraries, and other public and private institutions statewide. BCN is a broadband voice, video, and data network operated by a consortium of telecommunications carriers.[13] (Note: TEACH is separate from the relatively new Broadband Expansion Grant program first authorized in 2013, which funds the build-out of new broadband networks to underserved areas of the state.[14])

- In 2009, Missouri Governor Jeremiah (Jay) Nixon (D-MO) established MoBroadbandNow, a public-private initiative created to facilitate the integration of broadband and information technology into state and local economies. Three years later, MoBroadbandNow launched a Rural Health Broadband Initiative, to support rural hospitals in underserved cities and towns with last-mile connections, health record cloud storage, disaster recovery support, and professional communication in real time. Between December 2012 and July 2014, the Initiative provided 15 awards to hospitals with 50 patient beds or less, with a total project amount of $375,000. In return, hospitals receiving grants were required to provide MoBroadbandNow with information, including case studies, on how new or upgraded broadband connectivity contributed to quality of life in rural Missouri in regard to health care and its associated costs. Hospitals were asked to document how new or improved broadband speeds affected areas of health care delivery. Participating hospitals were also required to become members of the Missouri Telehealth Network, one of the nation's first public-private partnerships in telemedicine.[15]

- Soon after creation of the FCC's E-rate program, the Oklahoma Corporation Commission established a "special Universal Service Fund" to provide financial support for schools, libraries, and telemedicine.[16] Under new legislation passed in May 2016, all schools and libraries must apply for federal support and then use the Oklahoma Universal Service Fund (OK USF).[17] The OK USF now covers the balance of the cost after federal E-rate funding. While earlier legislation focused on raising libraries' connectivity to 1.5 Mbps, the more recent legislation set bandwidth goals based on national bandwidth standards adopted by the FCC. This allows for administrative adjustments as FCC standards change without having to introduce new legislation whenever those standards change.

Adapting to Anchor Institutions' Broadband Needs

While some states and the federal government have programs that provide funding for anchor institutions, the demand for broadband services continues to grow and government programs need to be reformed to adapt to the changing marketplace. EducationSuperHighway estimates that the typical school district will need to triple its broadband capacity in the next three years. The FCC's long-term target for schools, as recommended by the State Educational Technology Directors Association, is 1 Gbps Internet access per 1,000 users by 2018.[18] The FCC also adopted the targets for libraries that were recommended by the American Library Association (ALA) – a minimum of 100 Mbps for libraries serving communities of less than 50,000 people and 1 Gbps for libraries serving larger communities.

In 2014, the FCC added $1.5 billion in annual support, indexed to inflation, bringing the E-rate program to about $4 billion per year. Recognizing the high costs of building additional broadband networks, the FCC also offered to award an additional 10 percent in E-rate funding to states that contribute their own funding to support 10 percent of the costs of special construction projects deploying fiber to schools and libraries. This decision could help make fiber connectivity more affordable, especially in rural areas.

But the FCC did not increase the percentage subsidy for rural schools and libraries that simply purchase service using existing networks. The FCC did allow schools and libraries to self-provision fiber—that is, construct, own, operate, and maintain their own network or a portion of a network—as long as they compare the costs of doing so to the costs of leased services. This option allowed the Calhoun County,

Mississippi, school district to seek bids for self-provisioning. That request for proposals led to the offer of fiber from existing carriers and, as of December 2015, Calhoun County schools now have access to fiber.

The FCC also required recipients of high-cost support to offer broadband service in response to a posted Description of Services Requested and Certification Form (FCC Form 470) to eligible schools and libraries at rates reasonably comparable to rates charged to schools and libraries in urban areas for similar services. The FCC directed its Wireline Competition Bureau to develop pricing benchmarks for these services, but so far, the benchmarks have not been released.

The FCC also reformed the Rural Health Care (RHC) program in 2012, but the reduction in the amount of subsidy from 85 percent for the RHC pilot program to 65 percent for the Healthcare Connect Fund (HCF) has thwarted the goals of the program. Partly for this reason, only a third of RHC funding has been committed for the HCF.[19] Of the $236 million committed for funding year 2015 to date (through May 31, 2016), only $77 million was committed to HCF applicants. A significant number of rural health providers still have 5 Mbps or less, with many still using legacy copper. This is at least partially because healthcare providers struggle to raise the 35 percent match funding and have been unable to purchase necessary upgrades.

Government programs need to collect more detailed information about the levels of connectivity of anchor institutions and their needs for connectivity in the future. The FCC was able to increase funding for the E-rate program in part because two organizations (the SHLB Coalition and EducationSuperHighway) submitted studies estimating the costs of deploying fiber to school and libraries in rural areas. These studies made it clear that additional funding was necessary to ensure that rural schools and libraries have sufficient high-speed connectivity. Once additional data is collected about the prices of broadband access, policymakers will be in a better position to identify the amount of the subsidies necessary to ensure that anchor institutions can afford to purchase the broadband services they need.

Many anchor institutions other than schools, libraries, and health care providers do not receive federal government subsidies, yet they have significant needs for high-capacity broadband. Community colleges, community centers, public housing projects, public media, and other community-based organizations can provide valuable services for their communities, especially for low-income populations. State and local programs to make broadband service more affordable for these anchors would be especially helpful to the communities they serve.

Network Sharing and Aggregation Are Valuable Methods of Reducing Prices and Costs

In addition to providing direct financial subsidies to anchor institutions, policymakers can also reduce anchors' connection costs by encouraging network sharing.[20] As the National Broadband Plan recognized, the more users share a network, the lower the per-user costs will be. Some federal and state programs discourage network sharing by restricting programs to particular types of users, thereby creating "silos" that are inefficient and lead to duplicative investments. For instance, the E-rate program funds are restricted to "educational services" and "on-campus" use; whether these networks can or cannot be shared with other entities or uses is not clear.

There are several examples of shared networks that offer lower prices for anchor institutions. The nDanville Fiber project in Virginia began with an effort by the electric utility to deploy fiber to enhance its smart grid, and then expanded to schools, city offices, and public safety. nDanville then expanded again to serve commercial providers and residences, as well, offering more affordable services to all users.[21]

The Corporation for Education Network Initiatives in California (CENIC), the research and education network in California, recently opened its network to carry library traffic.[22] The BTOP-funded projects were designed to carry the traffic of all anchor institutions and have open interconnection so that their capacity can be shared with commercial customers. Aggregating demand on joint networks can lower prices to affordable levels for all users and thus can reduce the need for direct subsidies.

The Utah Education and Telehealth Network (UETN) offers a different model. UETN manages a large network that provides broadband capability to Utah schools, colleges, libraries, clinics, and hospitals. The network saves Utah institutions thousands of dollars per month by purchasing Internet access in bulk from multiple competing Internet service providers. UETN has also been instrumental in reducing broadband costs throughout the state. High-speed broadband costs have been reduced by at least 50 percent in most areas of Utah, largely due to UETN seeking bids for aggregated Internet services each year. Through this strategy, UETN has driven aggregated Internet access costs for the state down to less than $1/Mbps. As an added bonus – the underlying private sector broadband infrastructure that distributes the aggregated Internet access is almost entirely composed of scalable fiber.

Recommendations

As noted above, community anchor institutions face significant challenges when trying to acquire affordable broadband, especially when budgets are tight or shrinking. Below are some recommended actions that support the goal of affordable high-capacity broadband services for all anchor institutions:

- Policymakers at all levels of government should strive to collect better data on broadband deployment to, and adoption by, anchor institutions. This data can help identify broadband needs more precisely and target funds more efficiently. In particular, efforts should be made both to measure existing broadband capacity and to estimate the future broadband needs of anchor institutions, including the cost of both deployment and ongoing service.

- The FCC should lower the amount of funding required of applicants to the Healthcare Connect Fund from 35 percent down to 15 percent, the amount required for the Rural Health Care pilot program.

- The FCC can take more assertive action to enforce the "lowest corresponding price" rule in the E-rate program to make sure that broadband providers are not inflating their prices because of the E-rate discount.

- By the end of 2016, the FCC should develop national pricing benchmarks for broadband services to ensure that schools and libraries in high-cost areas are able to purchase broadband offerings at rates that are reasonably comparable to similar offerings to schools and libraries in urban areas.

- If they have not done so already, states should establish their own programs to support anchor institutions' broadband expenses either to supplement the federal programs or to support anchor institutions that do not receive federal subsidies. Those states that have already adopted such programs should modernize them to ensure they are designed to promote high-speed broadband connectivity that CAIs will need for the future.

- States can reduce broadband expenditures by aggregating broadband traffic onto shared networks serving all government buildings and services, rather than encouraging separate and duplicative networks.

- As in Utah, states can create or fund umbrella state entities to (1) procure, provision, and manage network facilities for anchor institutions, (2) offer technical assistance and other consulting services to anchor institutions to help them take advantage of the broadband services available to them, (3) help schools, libraries, and rural health care providers apply for federal universal service funding, and (4) obtain the best pricing via aggregated demand.

- States should take advantage of the FCC's offer to provide an additional 10 percent of E-rate funding by considering special construction projects to deploy high-speed fiber connections to schools and libraries.

- Policymakers should encourage competition among broadband providers and should look favorably on new entrants into the broadband marketplace. More competition should result in more widespread broadband availability and lower prices.

Resources for Further Reading

FCC's 2016 Broadband Progress Report
The FCC's Congressionally-mandated report determining whether "advanced telecommunications capability" -- broadband -- is being deployed to all Americans in a "reasonable and timely fashion." If the answer is negative, the Act requires the FCC to "take immediate action" to speed deployment. (January 29, 2016) http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0129/FCC-16-6A1.pdf

FCC's E-rate First Modernization Order
The FCC took major steps to modernize and streamline the E-rate program and focused on expanding funding for Wi-Fi networks in elementary and secondary schools and libraries across America. (July 11, 2014) https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-99A1.pdf

FCC's E-rate Second Modernization Order
The FCC aimed to ensure that all schools and libraries have access to high-speed connectivity by increasing the E-rate program spending cap to adequately support that connectivity. (December 11, 2014) https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-189A1.pdf

FCC's Rural Health Care Order
The FCC reformed its universal service support programs for health care, transitioning the existing Internet Access and Rural Health Care Pilot Programs into a new, efficient Healthcare Connect Fund. (December 21, 2012) https://apps.fcc.gov/edocs_public/attachmatch/FCC-12-150A1.pdf

Connecting America: The National Broadband Plan
Sets out a roadmap for initiatives to stimulate economic growth, spur job creation and boost America's capabilities in education, health care, homeland security and more. (March 17, 2010) https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf

Additional Coordination and Performance Measurement Needed for High-Speed Internet Access Programs on Tribal Lands
Government Accountability Office review of the status of high-speed Internet on tribal lands. (January 2016) http://www.gao.gov/assets/680/674906.pdf

2015 State of the States
Education Superhighway report on the state of broadband connectivity in America's public schools. (November 2015) http://stateofthestates.educationsuperhighway.org/

Broadband Quality in Public Libraries
American Library Association report on public library technology infrastructure and how it is used to enable digital inclusion in communities nationwide. (April 2015) http://www.ala.org/offices/sites/ala.org.offices/files/content/Speed_Test_FINAL_0.pdf

3d Annual E-rate and Infrastructure Survey
Consortium for School Networking asked K-12 school leaders and technology directors from around America about the state of connectivity in their districts and the impact they've felt from changes to the E-rate program. (2015) http://www.cosn.org/Infrastructure2015

Anchor Institutions: An Interpretive Review Essay
Marga, Inc. seeks to evaluate the current state of knowledge on anchor institutions. (2013) http://www.margainc.com/files_images/general/Literature_Review_2013.pdf

Progress on National Broadband Plan Goals
The Benton Foundation tracks implementation of the National Broadband Plan. https://www.benton.org/initiatives/national_broadband_plan/agency/5016

Impact Aid
Department of Education explainer on assistance to local school districts with concentrations of children residing on Indian lands. http://www2.ed.gov/about/offices/list/oese/impactaid/watisia.html#b

Endnotes

1   Consortium for School Networking, 2015 Annual E-rate and Infrastructure Survey, (2015) http://cosn.org/sites/default/files/pdf/CoSN_3rd_Annual_Survey_Oct15_FINALV2.pdf

2   EducationSuperHighway, 2015 State of the States (November 2015) http://stateofthestates.educationsuperhighway.org

3   Bertot, J.C., Real, B., Lee, J., McDermott, A.J., & Jaeger, P.T. (2015). 2014 Digital Inclusion Survey: Findings and Results. College Park, MD: Information Policy & Access Center, University of Maryland College Park. Available at http://digitalinclusion.umd.edu/sites/default/files/BroadbandBrief2015_1.pdf

4   Benjamin Herold, "'They Rake Us Over the Coals,'" Education Week (November 19, 2015) http://www.edweek.org/ew/projects/2015/rural-schools-broadband/they-rake-us-over-coals-affordable-internet.html

5   Benjamin Herold, "The Slowest Internet in Mississippi," Education Week (November 19, 2015) http://www.edweek.org/ew/projects/2015/rural-schools-broadband/the-slowest-internet-in-mississippi.html

6   Herold, "'They Rake Us Over the Coals.'"

7   Federal Communications Commission, Modernizing the E-rate Program for Schools and Libraries, WC Docket No. 13-184, Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 8870 at n. 73 (2014) https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-99A1.pdf (E-rate First Modernization Order).

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9   Emily Sheketoff, "Comments of the American Library Association in Response to Notice of Proposed Rulemaking to Modernize the E-rate Program (WC Docket No. 13-184)," (September 16, 2013) http://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/advleg/pp/pub/file/ala_e-rate_comments_9_16_2013.pdf

10   Maine School Library Network www.msln.net accessed June 20, 2016.

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18   E-rate First Modernization Order at ¶34.

19   Universal Service Administrative Company, "Funding Information," http://www.usac.org/rhc/healthcare-connect/funding-information/default.aspx accessed June 15, 2016. [The vast majority of commitments are for the pre-existing Telecommunications program.]

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8

GOVERNMENT FUNDING for BROADBAND NETWORK PROVIDERS SERVING COMMUNITY ANCHOR INSTITUTIONS

Providing government funding to broadband network providers serving CAIs encourages economic development, expands educational opportunity, improves health care services and promotes digital equity.

by Amelia Bryne

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

by Amelia Bryne. Trained in cultural anthropology and new media, Amelia Bryne is co-Director of DeepTech.org, a research consultancy that focuses on the social and environmental impacts of information and communications technologies. She has worked with the American Library Association Office for Information Technology Policy, the University of Helsinki, the Social Science Research Council, the Community Wireless Infrastructure Research Project, byDesign eLab, and other public interest research projects and institutions. Her research has been published in journals such as *Telematics & Informatics, Policy & Internet,* and the *Journal of Community Informatics.*

Introduction

Governments can play an important role in funding broadband infrastructure deployment to ensure robust, affordable access for anchor institutions beyond what the market is able to do. Failing to take action to spur broadband deployment creates risks for the community – losing businesses, jobs, services, and population. A U.S. Government Accountability Office report found that in communities with government-funded broadband projects, small businesses experience higher speeds and lower prices as compared to communities without such projects.[1]

Many governments are financing at least a portion of broadband network build-out.

There are several ways that governments can finance broadband deployment, including subsidies for investment, equity in public-private partnerships (PPPs), preferential tax treatment, long-term loans, on-lending loans, [2] and guarantees to offset regulatory or political risk.[3] One strategy that can minimize risk to the government and the provider is to fund broadband builds first to community anchor institutions (CAIs) in a region: CAIs can then serve as the "anchor tenants" to support the network's economic viability. This strategy can ensure that schools, libraries, health providers, and other anchor institutions receive the high-capacity broadband services they need, while also providing capacity that can be shared with surrounding residential and business consumers.[4]

Despite Significant Broadband Network Investment, CAIs Face Connectivity Gaps

Despite broadband's critical importance, many anchor institutions struggle to obtain the high-speed Internet connectivity they need at a reasonable price.

In rural, sparsely-populated areas, commercial providers may have little economic incentive to build out fiber networks, or to maintain and adequately upgrade infrastructure, because the costs of building a network are so high -- especially compared to potential revenues. In this scenario, rural CAIs are left without sufficient connectivity to serve their communities.

Even in some non-rural areas, broadband providers may provide lower-speed, residential grade service (such as DSL) leaving anchor institutions unable to obtain the high-speed connectivity that they need. For example, the Conference of Churches, a business incubator in downtown Hartford, CT, was unable to receive sufficient service from either of the two local commercial Internet service providers (ISPs). While one broadband provider served the building with copper-based DSL, the speeds offered (maximum download speeds of 10.5 Mbps) were far short of the organization's needs (50 to 100 Mbps). Another provider requested a $30,000 installation fee and a monthly $1,000 to $2,000 service charge.[5]

While the market sometimes provides sufficient financial incentives for broadband companies to deploy high-capacity broadband, the market does not always work. There are several factors that contribute to this market failure, including:

● The expense and complexity of building out and maintaining high-capacity broadband infrastructure;

● The limitations of legacy infrastructure, such as aging DSL lines;

● The absence of competition and open access policies that could allow multiple ISPs to operate using the same infrastructure; and

● Little return on investment when it comes to serving certain communities and regions.

Public Funding for Broadband Networks Benefit CAIs

Federal, state, and local governments are playing an increasingly important role in funding ubiquitous, high-capacity broadband infrastructure to CAIs and the general public. Reversing the privatization trend of the 1980s and 1990s,[6] more governments are financing at least a portion of broadband network build-out, particularly where there is a market failure to reach unserved or underserved areas.

The federal Broadband Technology Opportunities Program (BTOP) was a catalyst for broadband infrastructure deployment benefiting anchor institutions across the country.[7] BTOP grantees were awarded matching Federal grants to deploy "middle mile" broadband infrastructure in every state in the U.S. Grantees were required to connect anchor institutions and to abide by non-discrimination and open interconnection policies that allowed other "last mile" broadband providers to build off the BTOP-funded infrastructure to serve surrounding residential and business consumers. BTOP funding resulted in approximately 116,000 miles of new and upgraded broadband networking and improved connections to 25,766 anchor institutions.[8] CAIs served by BTOP infrastructure experienced a 95 percent decline in broadband prices, among other benefits.[9] For example,

> The BTOP-funded Lane Council of Governments (LCOG) network in Oregon provides middle mile connectivity at lower prices than before the construction of the network. Price and capacity data from six CAIs interviewed … show that the average price of broadband per megabit per month was reduced from $343 to $7, while the average speed increased by more than 27 times the original speeds. Additionally, the LCOG network is more reliable than the network it replaced. The increased route redundancy provided by the new network has enabled CAIs to implement more bandwidth-intensive applications. For example, healthcare providers can implement tele-stroke applications that are sensitive to interruptions in service, and schools can use online standardized testing.[10]

The American Recovery and Reinvestment Act provided a total of $4.7 billion to the National Telecommunications and Information Administration to fund projects that would expand access to, and adoption of, broadband services across the United States.

In September 2015, the National Telecommunications and Information Administration (NTIA) issued a new Guide to Federal Funding of Broadband Projects[11] to answer questions from communities on how to access federal funding to support broadband planning, public access, digital literacy, adoption, and deployment. The guide contains a chart of 29 Federal Government programs that support broadband.

Several states are also engaged in funding broadband deployment by private sector companies. Illinois created a broadband grant program in 2013 that specifically includes anchor institutions. Former Governor Pat Quinn instituted the "Gigabit Cities Challenge" program to award $6 million in funding for broadband networks.[12] One award of $1.5 million was given to a coalition that included Frontier Communications, the City of Carbondale, Southern Illinois University, and Connect SI to build a high-speed fiber optic network to Carbondale's businesses, schools, hospitals, and neighborhoods.[13] The first phase of the network was completed in December 2014, providing speeds 50 times faster than what was previously available, and making Carbondale Illinois' first "Gigabit City." The City of Carbondale has leveraged its grant to create a "playbook" to transition from a city that was initially defined by railroads into a globally-connected and nationally-recognized, innovative and entrepreneurial community.[14]

Several other states – including New York,[15] California,[16] Wisconsin,[17] Minnesota,[18] Maine,[19] and Massachusetts[20] – have also developed state broadband grant programs. California and Minnesota

administer "scored" grant programs to give targeted awards to entities that present the strongest business case and best use of state funding.

In 2011, the FCC created the Connect America Fund with an annual budget of $4.5 billion to extend broadband infrastructure to the millions of Americans who currently have no access to broadband.

Even when a broadband program is focused on residential customers, the program can include an obligation to serve the anchor institutions in residential communities. The Federal Communications Commission employs this approach in implementing the Connect America Fund (CAF), which provides financial support for telecommunications networks serving rural and high-cost areas of the country.[21] The program requires recipients of CAF funding to engage with CAIs in the network planning stages and establishes an expectation that broadband companies will provide CAIs with high-capacity connections at rates that are reasonably comparable to the rates offered to CAIs in urban areas.

Public funding to spur broadband network development can have additional benefits, such as a deepening collaboration between local entities working on infrastructure deployment and those working on digital inclusion. New funding opportunities, even if small, can have a tremendous positive impact on local planning and partnering. Even coalitions that did not receive BTOP funding often developed "shovel-ready" projects that were able to attract additional funding post-BTOP.[22]

High-Quality, CAI Broadband Delivers Many Broader Community Benefits

Supporting anchor institution connectivity is an effective means to help achieve public interest goals for education, health, and economic development. Broadband networks around the country built with public funds offer many examples of these benefits:

- With access to a new, higher capacity (1 Gbps) network made possible by BTOP funding, students at Arlington High School in South Dakota are now able to take previously-unavailable online foreign language classes during school hours.[23]

- Investing in broadband networks can provide significant cost savings in tele-health. In New York, a study found that 40 percent of nursing home hospitalizations were avoidable. With hospitalizations costing approximately $12,000 per occurrence, eVisits, with a fee of as little as $40, have the potential to lead to millions of dollars in annual savings.[25]

- In northwest Pennsylvania, there are only two board-certified pediatric dermatologists practicing within a 125-mile radius, leading to excessive travel and wait times for children in the region. The Children's Hospital of Pittsburgh leveraged the region's connectivity to create a telemedicine program in pediatric dermatology. During the first two years, 500 time-sensitive e-consultations were conducted – which were typically followed up by an in-person visit. The consultations allowed for "more time-efficient, precise care, decreasing patient travel and expense, and even in many cases decreasing prolonged hospital stays."[24]

- High-quality, affordable broadband infrastructure can help stimulate economic development and job growth. The BTOP investments are estimated to generate increased annual economic activity of between $5.17 billion and $21 billion. The additional broadband infrastructure could also be expected to create more than 22,000 long-term jobs and generate more than $1 billion in additional household income each year.[26]

Recommendations

To support the development of high capacity, affordable broadband infrastructure for community anchor institutions, federal, state and local policymakers can:

- Provide government funding to broadband network providers to stimulate network deployment that benefits anchor institutions, especially in unserved or underserved areas.

- Supplement government funds by helping secure additional and/or matching funds, whether from private or grant sources, to build out necessary broadband infrastructure.

- Offer open eligibility requirements in regard to the types of entities that can apply for funding to increase the number and quality of proposals.

- Ensure that grantees are strong enough and have the expertise to sustain a project for the long-run after the initial funding has been exhausted.

- Require recipients of funding to include anchor institutions in the design and planning of the network build-out.

- Work with stakeholders – including anchor institutions and the broadband industry – to understand how the provision of high-quality broadband to anchor institutions can help reach non-broadband policy goals, such as those related to distance learning or telemedicine services.

- Develop a scored grant program that allows the grantor to target awards to entities that present the best case for funding.

- Ensure that government-funded networks have open access and interconnection policies that facilitate competition and promote service to surrounding business and residential consumers.

- Act as facilitators to help coalitions of entities apply for broadband infrastructure funding.

- Keep up relationships with grantees to help identify and solve issues before they become problems.

Resources for Further Reading

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CTC Technology and Energy, *Recommendation: The Potential for Pilot Funding for Gigabit Networking in Connecticut,* March 9, 2016. Useful guidance for states thinking about offering funding for broadband infrastructure and why this policy mechanism can be beneficial. Also includes examples and lessons learned from other state programs. http://www.ct.gov/occ/lib/occ/2016-0309_ctc_report__pilot_funding_program.pdf

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RURAL BROADBAND PROGRAMS and COMMUNITY ANCHOR INSTITUTIONS

Governments should explore funding, network sharing, and service obligations to ensure that rural and tribal community anchor institutions have affordable, high-capacity broadband.

by Tom Koutsky

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Tom Koutsky serves as Chief Policy Counsel for Connected Nation. Tom provides vision and leadership for Connected Nation's research and policy initiatives. Tom joined Connected Nation from the Federal Communications Commission where he served as a Senior Advisor to the team that wrote the first U.S. National Broadband Plan. Tom focused on policy recommendations related to network infrastructure, the law and economics of middle mile connectivity, wholesale competition rules, and universal service and access charge reform.

Introduction

In thinly-populated rural and tribal areas, community anchor institutions (CAIs) can be vitally important to connecting residents to the rest of the world. Schools, libraries, health clinics, and many other anchor institutions rely upon high-capacity broadband to provide education, health, and information services to rural consumers. Unfortunately, because of the economic factors described below, anchor institutions in rural and tribal areas have an especially difficult time obtaining high-capacity broadband connections at affordable rates.

Ensuring every rural community has access to high-capacity Internet access through their anchor institutions will often require financial support and other government initiatives to stimulate deployment

Policymakers should give high priority to the broadband needs of rural community anchor institutions.

and promote competition. Connecting rural CAIs to high-capacity broadband can be a catalyst for further investment; when CAIs serve as the "anchor tenant" on a rural network, they improve the business case for community-wide network upgrades or further network expansion. When implementing programs designed to increase access to broadband service in rural areas, federal, state, and local efforts should give high priority to the broadband needs of rural community anchor institutions.

The Economics of Deploying High-Capacity Broadband Networks in Rural Areas

According to the Federal Communications Commission (FCC), Americans who live in rural areas are ten times more likely to be unserved than their urban counterparts.[1] Thirty-nine percent of rural Americans (23 million people) lack access to 25 Mbps broadband service (41 percent on Tribal lands), compared to only 4 percent of urban residents.

There are two reasons for this disparity between rural and urban areas. First, the cost of deploying broadband networks in rural areas is higher than in urban areas. Rural broadband networks often require substantial amounts of investment capital because they cover large territories with varied landscapes (mountains, rivers, forest, etc.) and geological terrains (sand, rock, soil, etc.). In a 2014 cost study conducted for the SHLB Coalition, CTC Technology & Energy estimated the cost of building robust fiber optic capacity to the nation's K-12 schools and public libraries that do not already have fiber access and documented the cost differences between metro and non-metro areas:[2]

Fiber Deployment Costs for Schools and Libraries

GEOGRAPHY	AVERAGE COST, K-12 SCHOOL	AVERAGE COST, PUBLIC LIBRARY
METRO	$40,000 - $104,000	$40,000 - $59,000
DESERT	$596,000	$275,000
PLAINS	$324,000	$55,000
RURAL WESTERN	$317,000	$94,000
RURAL EASTERN MOUNTAIN	$205,000	$56,000
RURAL EASTERN	$185,000	$60,000

The cost of deploying rural broadband networks is higher than in urban areas.

Second, because of low population density in rural areas, the costs of deploying broadband in rural areas must be recovered from a smaller user base. Even if the costs of laying a mile of fiber are the same in a rural or urban area, an urban area may have 500 users who can share the cost, but a rural area may only have five. Further, rural consumers often cannot afford to pay the monthly cost inherent in operating and maintaining broadband networks because rural household incomes are lower than urban.[3] As a result, the private sector business case for building high-speed network connections in many rural, sparsely-populated areas simply does not exist without governmental assistance.

Connecting Rural CAIs with High-Quality Broadband Is Important But Challenging

Broadband demands at community institutions are rising quickly. The FCC estimated in 2014 that school demand for broadband data would increase 100-500 percent from 2014 to 2016.[4] Moreover, anchor institutions have broadband needs that are very different from residential customers. For example, a library providing Internet access to dozens of desktop and laptop computers and tablets requires substantially more bandwidth than a home. While a 25 Mbps connection for one family may be sufficient, that capacity will provide barely enough connectivity for one classroom in the near future. Furthermore, to allow for the same opportunities in rural areas as compared to urban and suburban areas, rural broadband networks must be scalable so they can expand their capacity to meet growing demand.

Broadband and Rural Education

Rural schools are four times less likely to have a fiber optic connection than urban schools.[5] The Consortium for School Networking's most recent survey of school broadband infrastructure found that, compared to urban schools, rural schools were more likely to have slower Internet connections, were less likely to receive competitive (two or more) bids for service, and were more likely to report that monthly and upfront costs were the biggest challenges to obtaining greater bandwidth.[6] *The Washington Post* wrote that these bandwidth connectivity challenges have a negative impact on schoolchildren:

> . . . the financial decisions of telecom companies have put rural students at a disadvantage, leaving some without basic digital abilities that many in America take for granted. Federal regulators are working toward a fix for these out-of-reach schools, but it's unclear to what extent these efforts will solve the problem.

> The schools with sub-par Internet are scattered around the country, spanning from the far-flung communities of Alaska to the desert towns of New Mexico. The danger is that students who attend these schools will struggle for years with the critical tasks that now require online fluency: applying to colleges, researching papers, looking for jobs.[7]

For example, in Alaska, only 23 of 333 K-12 schools in rural areas (less than 7 percent) meet the FCC's 2020 broadband connectivity benchmark of 1 Mbps per student/staff, and 24 percent of schools are forced to rely on expensive satellite broadband service.[8]

Broadband and Rural Libraries

Nearly half of all public libraries (46.8 percent) are in rural areas[9] and many encounter high costs and lack of availability when trying to obtain broadband connectivity. The Institute of Museum and Library Services (IMLS) reports that average visitation per capita at rural libraries (6.7 visits per year) was significantly

higher than in city libraries (5.7 visits).[10] This is particularly striking in light of the fact that rural libraries are generally open to the public fewer hours than their urban and suburban counterparts. According to IMLS, this greater visitation in rural libraries reflects that "[s]mall and rural libraries, which are present in so many communities, serve a strategic role in extending public services to residents that may be hard to reach by other means."[11] Further, one study found that the use of public computers in rural libraries also increases rates of household broadband adoption, and this link was only found for libraries in the most rural counties.[12]

Despite this clear community need, rural libraries struggle to obtain high-quality broadband. Nationwide, virtually all public libraries offer free public Wi-Fi access (98 percent), and nearly 94 percent offer technology training.[13] But only 44% of libraries have a fiber connection and rural libraries lag 15-20 percent behind their urban counterparts.[14] A speed test study conducted by the University of Maryland Information Policy and Access Center for the American Library Association (ALA) showed that the median download speed for rural public libraries was 9 Mbps, while the median download speeds for urban and suburban areas were 30.5 Mbps and 18.8 Mbps respectively. Wi-Fi connection speed and upload speeds were also much slower in rural locations.[15]

Broadband and Rural Health

Rural health care institutions are closing across the United States indicating a crisis in the rural health care market.[16] According to one source, 74 health care institutions have closed since 2010 (17 in 2015 alone and another 11 in 2016 so far).[17] A research brief issued by iVantage in 2016 identifies an additional 210 hospitals that are most vulnerable to closure and an additional 463 that are less vulnerable, but still at risk.[18] The impact of these closures extends beyond health care. Rural hospitals are often the largest employers in a community, so a hospital closure can cause severe economic distress to the entire region.

Telemedicine could make providing health care in rural areas more economical by reducing travel time and allowing rural health institutions to see more patients at reduced costs. Unfortunately, many rural health care providers have an especially difficult time obtaining high-capacity broadband. For example, the Manila Clinic is the only health care facility in Daggett County, Utah, which has a population of 1,127. Manila Clinic operates with only an asynchronous DSL connection and limited capacity to access or transmit medical information such as X-rays and pharmacy services. This service level does not meet the health care provider target of 10 Mbps recommended by the National Broadband Plan. When the clinic requested bids to connect to the Utah Telehealth Network, not a single provider responded, even with financial support from the FCC Rural Health Care (RHC) Program.[19] Similarly, the REACH Montana Telehealth Network has identified its top future challenge as "Bigger Pipes! Bandwidth BANDWIDTH." Its telehealth network has a mix of high-speed fiber and low-bandwidth, copper-based T-1 lines using routers that are over 10 years old.[20]

Many rural health care providers have an urgent need for broadband.

Broadband and Tribal Communities

Tribal communities[21] face especially difficult challenges when it comes to obtaining broadband services. According to one report, at least 40 percent of tribal libraries in the study sample did not have a broadband Internet connection.[22] The National Broadband Plan recommended the FCC increase its commitment to consultation with tribal leaders and the FCC created an Office of Native Affairs and Policy, tasked to promote deployment and adoption of broadband. In addition, in rural areas where the FCC is subsidizing broadband construction through the Connect America Fund, the FCC requires subsidy recipients to engage with tribal governments on tribal broadband needs, culturally-sensitive marketing, and network construction.[23]

More can be done, however. The National Broadband Plan recommended creation of a "Tribal Broadband Fund" to support sustainable broadband deployment and adoption on tribal lands.[24] In 2016, the Government Accountability Office (GAO) released a report that recommended the FCC develop performance goals and measures for improving broadband availability to tribal schools and libraries on tribal lands. In addition, the GAO recommended the FCC collect and release E-rate data that would allow it to measure the impact of E-rate on tribal schools and libraries.[25] While the GAO report says that the FCC agreed with these recommendations, it is not clear whether the FCC has taken these two steps to date. More recently, the Broadband Opportunity Council recommended that the Department of Interior Bureau of Indian Education launch an interagency initiative to "increase broadband connectivity and educational support at schools throughout Indian Country" by the fourth quarter of 2016.[26]

Policy Approaches to Narrowing the Rural Broadband Gap for Anchor Institutions

In the absence of a private business model for broadband deployment,[27] public policies need to respond to the challenge of connecting anchor institutions in rural areas. Here are some examples of policies to promote rural broadband deployment to, and use by, anchor institutions in rural areas:

- The FCC has been trying to address the growing broadband needs of rural health clinics for greater broadband access through its RHC program, but annual RHC funding is small (only $400 million per year, compared to about $4 billion per year for the E-rate program). The FCC created a new Healthcare Connect Fund (HCF) program in 2012 to supplement the traditional telecommunications program. The HCF was intended to drive fiber deployment to rural health clinics, but the HCF rules require applicants to provide 35 percent of the funding on their own, and the program's restrictive rules on eligible health care providers and expenses have made it difficult for applicants. Disbursements from the RHC program have been consistently much lower than the $400 million allocated to the program each year.[28]

- Some states have utilized joint purchasing and consortia arrangements to lower the costs of broadband connectivity. The University of Maine System structured a request for proposals in 2014-15 for connections to K-12 schools, libraries, state and local government offices, and research institutions in the state, setting a minimum target of 100 Mbps per location.[29] As a result, the average bandwidth in Maine schools increased from 187 Mbps to 515 Mbps with near-ubiquitous fiber access—all with no increase in overall cost.[30]

- The E-rate program provides significant financial support for schools and libraries and additional annual funding was added to the program beginning in 2015. The program includes additional supplemental funding of 5-10 percent for some rural schools and libraries, but, oddly enough, there is no additional rural discount in the two largest and highest poverty categories.[31] The rural discount could be increased and expanded to include more schools and libraries, thereby reducing rural applicants' match and incentivizing greater broadband investment in rural communities.

- The 2014 E-rate changes also gave schools and libraries the option to self-construct their own broadband network, rather than purchasing "lit" service from an established broadband provider. Some rural school and libraries are considering this option in order to control their own destiny and save costs. The FCC received applications from over 500 applicants exploring dark fiber in 2016 – the first year dark fiber was eligible – and this option is expected to grow in future years.

- To address the concern that there is too little competition to constrain prices in rural areas, the FCC recently required recipients of Connect America Fund (CAF) support to bid on E-rate requests for service. But the recipient of CAF support may still be the only provider in the area, so it is not clear

whether this obligation will truly succeed in increasing broadband options for rural schools and libraries. This requirement may also cause challenges in areas where there is a consortium, state network or research and education network who is partnering with a CAF recipient, as it is not clear whether the recipient must independently submit its own bid for services in addition to its participation with the consortium. Some other ways to promote greater competition in rural areas are to promote policies such as open interconnection and lowering special access prices among rural providers.[32]

- The US Department of Agriculture awarded over $3.2 billion for 320 projects under the Broadband Initiatives Program (BIP), primarily for "last mile" projects to provide broadband service directly to end users in rural areas. While the program allowed funds to connect anchor institutions, most of the BIP grants and loans focused on connecting residential consumers. GAO issued a report in June 2014 that criticized the BIP program for failing to monitor and report on the impact of the program on broadband availability and use.[33] The statutory language creating the Rural Utility Service gives a preference to award funding to existing RUS borrowers, which are often incumbent telephone companies. This practice has made it difficult for new entrants to compete for this funding. The Broadband Opportunity Council recommended that the RUS change its regulations by the fourth quarter of 2016 to open funding opportunities to alternative providers.

- Some states are designing rural broadband build-out programs to address the needs of anchor institutions. Unfortunately, many of these programs focus only on levels of service appropriate for residences and small businesses, not the high-capacity services needed by CAIs. Minnesota, however, has instituted a Border-to-Border Broadband Development Grant Program, a project that initially provided over $10 million to fund broadband construction in unserved and underserved regions throughout the state. The program specifically included service to community anchors as a key criterion for awarding broadband infrastructure grants.[34] The program will be expanded to $35 million for fiscal year 2017.

- Congress has embraced network sharing for FirstNet, a newly-created, quasi-governmental agency that is charged with building and operating a national public safety wireless broadband network for first responders. Created by Congress in the Middle Class Tax Relief and Job Creation Act of 2012, FirstNet is required to develop network construction sharing agreements with commercial mobile providers as an important means of lowering the overall cost of building the network.[35]

- Rural broadband policy does not always adequately address the needs of anchor institutions. For example, the FCC's Connect America Fund invests $4 billion per year into supporting networks in rural, high-cost parts of the country, but the FCC has set no specific benchmark or service standard for service to community anchors in those rural areas. Instead, the FCC only requires Connect America Fund subsidy recipients to consult with community anchor institutions when making network upgrade plans. These consultation and bidding requirements are supposed to happen on a case-by-case basis, but there is little oversight to ensure this FCC requirement is being enforced. Increased oversight would create greater incentives for the recipients of funding to comply with the obligation to consult with anchor institutions regarding their broadband needs.

Recommendations

The following policies would improve the ability of community anchor institutions in rural areas to have broader access to robust, scalable broadband:

1. **Federal, state, and local broadband funding programs must focus on the high-capacity broadband needs of community anchor institutions.**

   When promoting, incentivizing, or subsidizing deployment of broadband infrastructure in rural areas, governments should clearly and specifically include service to community anchor institutions. Further, the unique broadband needs of community anchors, in terms of speeds and quality of service, must be taken into consideration, as they are different from residential or small business broadband needs. Governments should oversee and enforce requirements to serve anchor institutions' broadband needs.

2. **Governments should increase their financial support for rural broadband networks to make it more financially attractive for private sector investments in rural networks.**

   Because of the high costs of deployment in rural markets and the lack of population density, the private sector is unlikely to invest in rural broadband networks without additional financial incentives. Some options for increasing incentives include:

   - The FCC should increase the rural discount factor for the E-rate program to provide greater funding for rural schools and libraries especially in "remote" rural areas and tribal lands.

   - State and federal programs that fund broadband investment should include the needs of anchor institution connectivity and consider issuing grants and loans that support build-out to rural anchor institutions (as in Minnesota and Maine).

   - The FCC should consider following through on the National Broadband Plan recommendation to create a Tribal Broadband Fund to promote deployment and adoption in tribal areas.

3. **Programs designed to promote broadband infrastructure in rural areas should encourage sharing and joint use of network facilities.**

   Network sharing can drop the per-unit cost of connecting community anchor facilities significantly and dramatically. Unfortunately, many existing broadband programs either prohibit sharing of infrastructure or impose complex regulation of sharing arrangements that make them extremely difficult to implement. For example, FCC universal service rules for schools, libraries, and rural health providers discourage institutions from leasing excess capacity for other uses on a subsidized network.[36] Oddly enough, this limitation on sharing applies even among community institutions—a school that has an E-rate funded fiber connection is limited in its ability to resell capacity on that connection to a rural health provider. State and federal policymakers who wish to help bridge the rural connectivity gap should follow the example set by Congress in the public safety context and require that, to the maximum extent economically feasible, community institutions should share network infrastructure and projects with one another and the neighboring business community.

4. **The FCC Rural Health Care Program should be reformed and modernized so the connectivity needs of rural health providers are fully addressed.**

   The FCC should:

   - Increase the 65 percent cap on funding from the Healthcare Connect Fund to 85 percent.

- Encourage shared capacity between health care providers, other community institutions, consortia, and public-private initiatives.

- Support consortia that include non-rural health facilities, so as to promote the use of urban-rural telemedicine solutions such as remote patient monitoring and specialist consultation.

5. **Governments should promote greater competition for service in rural areas through open interconnection and service obligations.**

Opening rural broadband networks to interconnection and allowing government funding to non-traditional entities can stimulate greater investment by new providers. This competitive dynamic can also help to lower broadband prices to more affordable levels.

6. **Governments should take greater efforts to promote broadband connectivity to anchor institutions in tribal lands.**

Several goals have been established to improve broadband services on tribal lands, but there is little evidence that these recommendations have been implemented. The Federal Government should immediately take action to implement the Broadband Opportunity Council recommendation to launch an interagency initiative to promote technology for tribal schools, and the Federal Government should also consider a tribal Broadband Fund as suggested by the National Broadband Plan. In addition, the FCC should establish robust connectivity goals for tribal schools, libraries, and health care centers through the E-rate and Rural Health Care programs, and collect and publish data that track progress on these goals.

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10

COMMUNITY ANCHOR INSTITUTIONS and RESIDENTIAL BROADBAND ADOPTION

Community anchor institutions are essential partners to increasing broadband adoption.

by Angela Siefer

The SHLB Broadband Action Plan includes the following:

Connecting Anchor Institutions: A Vision of Our Future

Angela Siefer is the Director of the National Digital Inclusion Alliance (NDIA). Angela envisions a world in which all members of society have the skills and resources to use the Internet for the betterment of themselves and their communities. Since 1997, Angela has worked on digital inclusion issues with local community organizations, the National Telecommunications and Information Administration, state governments, and the Schools, Health & Libraries Broadband (SHLB) Coalition. This work led Angela to co-found the National Digital Inclusion Alliance, a unified national voice for local technology training, home broadband access, and public broadband access programs. A profile of her written work is at angelasiefer.com.

Introduction

The Internet is driving innovation in community and economic development, education, health care, and government services. But residential broadband adoption[1] has stalled. Community anchor institutions (CAIs) are improving residential broadband adoption in several ways: providing digital literacy training, educating consumers about government programs to promote broadband adoption, leading community planning efforts, lending wireless "hot spots," and, in some cases, providing wireless broadband services directly to consumers. For these efforts to have the greatest impact, however, policymakers must provide CAIs and their community partners with the right resources and incentives. Solutions should be locally customized to meet the needs of specific populations.

Closing the Digital Divide is a National Priority

The "digital divide" is becoming worse. According to the Pew Research Center, about one-third of Americans still do not have a wired, high-speed Internet connection at home.[2] The percentage of homes

Closing the "digital divide" is of critical importance to our nation and anchor institutions have a central role.

with a wired broadband connection actually fell from 70 percent in 2013 to 67 percent in 2015 despite the fact that 69 percent of Americans believe that people lacking broadband at home are at a major disadvantage in at least one of five areas (getting news and information, finding health information, learning new things, accessing government services or looking for job opportunities).[3]

As more information and services are only available online, those without a high-capacity broadband connection have even less opportunity to access the information they need or to progress up the economic and educational ladder. Conducting daily activities increasingly requires a fast online connection.

The disparity between information "haves" and "have-nots" can be dangerous not just for individuals, but to the future of democracy. According to Professor Ellen Goodman of Rutgers:

> The broadband experience shows that markets alone cannot be expected to deliver [information and communications technology] services to maximize the intelligence of the network as a whole. There are two concerns here. One is distributional—so far, the market has not delivered on the promise of next generation broadband access for all. A second concern is about control. Having a diversity of communications nodes—different kinds of actors with different sets of incentives and answerable to diverse stakeholders—has long been thought to be beneficial for democracy…

> Civil society anchor institutions like libraries, sitting between the market and the state . . . may be able to respond to both of these concerns by diffusing and augmenting city "smarts." Their particular capacities and public service missions give them an important role to play as digital connectors, both within their walls and as hubs in public networks.[4]

Professor Goodman is not alone in emphasizing the relationship between broadband adoption and social justice. The National Urban League has long been a proponent of universal broadband adoption, "recognizing the nexus between technology-enabled opportunity and our historic mission: to enable African Americans to secure economic self-reliance, parity, power and civil rights."[5] In 2015, the Sesame Workshop offered several policy suggestions for how to leverage the assets of under-served communities and families to address digital inequality for Hispanic families.[6]

In short, closing the "digital divide" is of critical importance to our nation, and anchor institutions have a central role in helping solve this problem.

Barriers to Broadband Adoption

Cost is the number one barrier to broadband adoption. Pew found that, for the 33 percent of Americans who do not currently have broadband service at home, financial concerns loom large—overall, 66 percent of non-adopters cite either the monthly service fee or the cost of the computer as a barrier to adoption.

The National Broadband Plan, Pew, and the American Library Association also note that digital literacy— "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills"[7] —is another crucial barrier to broadband adoption. For this reason, the National Broadband Plan recommended the creation of a "Digital Literacy Corps."[8]

Recent research by Dr. Colin Rhinesmith of the University of Oklahoma and the Benton Foundation examined the work of eight digital inclusion organizations.[9] Dr. Rhinesmith identified four activities that these organizations believe are necessary for helping low-income individuals and families adopt broadband:

- Providing low-cost broadband;

- Connecting digital literacy training with relevant content and services;

- Making low-cost computers available; and

- Operating public access computing centers.

CAIs are Working to Increase Broadband Access and Adoption

Community anchor institutions are addressing broadband access and adoption gaps in many ways. Communities, led by their anchor institutions, are often engaged in broadband planning to achieve digital inclusion.[10] For instance, the Kansas City Public Library (KCPL) coordinates and hosts the efforts of Digital Inclusion KC, which is facilitating collaboration among local organizations and initiatives in order to maximize resources for the greatest community impact.[11]

Virtually all libraries (98-100 percent) offer free public computing, broadband, and Wi-Fi access.[12] But more and more CAIs are moving to address home broadband adoption. For example, the New York Public Library (NYPL), among other library systems, loans out remote wireless hot spot devices that allow consumers to access the Internet from their homes through its Library Hotspot program. Luke Swarthout, the Director of Adult Education Services at NYPL, said:

> Our Library Hotspot program is focused on the 2 million New Yorkers without home Internet access… We looked at the needs of our patrons, our resources, and saw this opportunity to have an impact and experiment with a new model. HotSpot lending is just one tactic and can be more useful in some communities. The main question for us is how can libraries and civic institutions influence broadband adoption? How do we end this persistent gap that has such serious consequences for so many Americans?[13]

NYPL is not the only CAI loaning out "hot spots." Public libraries in states from Maine to Kansas to Washington are "checking out" hundreds of hotspots to community residents of all ages. For example, in

Missouri, the KCPL is piloting a hotspot program with Kansas City Public Schools.[14] The program has a holistic purpose that brings connectivity and digital skills to entire families. A family can borrow a tablet and a hotspot device and receive digital literacy training. Students are required to perform 40 hours of community service, which may include training parents to use the Internet.

Some CAIs are extending their broadband networks to reach low-income homes and public spaces outside of CAI buildings, including through experimental use of TV White Space (TVWS).[15] Communities across the country have begun to install TVWS units to support new remote public library Wi-Fi access points in parks, community centers, shelters, kiosks, underserved library branches, and other publicly accessible places. One of the libraries piloting the use of TVWS to extend library-supported public wireless broadband is Manhattan Public Library in Kansas, which is now providing community Wi-Fi hotspots in four remote locations.[16]

School districts are also trying to address broadband adoption and the "homework gap" by expanding their broadband networks to surrounding residential consumers. For instance, the Albemarle County school system in southwestern Virginia has built its own fiber network connecting several K-12 schools and is also building an LTE wireless network that will allow all county students to have "school at home."[17]

The Boulder Valley School District in Colorado has requested a waiver of the Federal Communications Commission's (FCC) E-rate rules to allow it to partner with low-income housing projects that seek to provide Internet access to students at home.[18] Microsoft and school districts in southern Virginia have petitioned[19] the FCC to allow E-rate-supported networks the use of TV white space technology to extend their service to the homes of students in and around those schools for educational purposes. (Both waivers suggest that E-rate funds will not be used to pay for these services.)

Similarly, CAIs also provide digital literacy training and support so that residential consumers can understand how to use devices and the Internet. Close to 90 percent of public libraries, for example, offer basic digital literacy training, and a significant majority support training related to new technology devices (62 percent), safe online practices (57 percent) and social media use (56 percent).[20]

Example of Government Programs Promoting Broadband Adoption in Coordination with CAIs

Federal

The Broadband Technology Opportunities Program (BTOP), created in 2009, provided about $251 million in funding for 44 Sustainable Broadband Adoption programs across the U.S. Many of these grants were made to universities and other anchor institutions. The program funded innovative projects to promote broadband adoption, especially among vulnerable population groups, and resulted in about 671,585 new household broadband subscribers by the end of 2015.[21] The National Telecommunications and Information Administration's Broadband Adoption Toolkit, aimed at sharing best practices developed from broadband adoption and digital literacy projects funded by BTOP, references CAIs as essential partners and providers of broadband adoption programming.[22]

More recently, the Obama Administration and the Department of Housing and Urban Development (HUD) launched the ConnectHome Initiative in July 2015.[23] ConnectHome is a public-private collaboration to encourage families with school-age children who live in HUD-assisted housing to subscribe to broadband. Through ConnectHome, Internet service providers, non-profits, and the private sector will offer broadband access, technical training, digital literacy programs, and devices for residents in assisted-housing units in 28 communities across the nation. The pilot aims to reach 200,000 school-age children living in HUD-assisted housing. The American Library Association and local libraries in the pilot communities are program partners.[24]

In 2016, the FCC addressed the availability of affordable broadband for low-income households by reforming its Lifeline program to make standalone broadband service eligible for subsidies. The FCC's decision also recognizes the important role of anchor institutions in promoting broadband adoption. The changes in Lifeline rules:

- Permit schools, libraries and other anchor institutions to participate in the Lifeline program as providers of broadband service.[25]

- Allow the aggregation of Lifeline subscribers by broadband providers and community-based organizations.[26]

- Commit the FCC to crafting, by the end of October 2016, a comprehensive plan to address the non-price barriers to digital inclusion and specifically calls for engaging CAIs in this development of the plan.[27]

While these steps are helpful, the FCC retained the same $9.25/month subsidy that the Lifeline program has provided in the past to make telephone service affordable, even though wired residential broadband service is typically priced much higher.[28] There is an open question whether this subsidy will be large enough to increase the broadband adoption rate.

State

The California Emerging Technology Fund (CETF) is a non-profit corporation established to close the "digital divide" by accelerating the deployment and adoption of broadband to unserved and underserved communities.[29] As an example, CETF is now inviting grant applications from community-based organizations (CBOs) with an established record of improving broadband adoption among low-income households. The California Public Utilities Commission, when it approved Charter Communications' acquisition of Time Warner Cable, required New Charter to provide CETF $6.5 million annually over 5 years, for a total commitment of $32.5 million. These funds will be used to invest in community partnerships with nonprofit organizations, including schools and libraries, that can serve as "trusted messengers" for encouraging low-income customers to subscribe to high-speed Internet service at home in New Charter service areas.[30]

Municipal

Several cities have launched their own broadband adoption initiatives and have hired staff specifically to improve broadband connectivity. Seattle's Community Technology Program has been providing support for digital inclusion programs since 1996. In 2016, the program released a new Digital Equity Action Plan, which was developed in partnership with more than 100 community leaders, non-profit organizations, companies, and members of the public. The plan calls for the city to focus on three goals for increasing digital equity: skills training, devices and technical support, and affordable Internet connectivity. The plan includes expanding the availability of low-cost devices and expanding free Wi-Fi access in community centers.[31]

Charlotte, North Carolina, and the Knight School of Communication have developed a strategic plan for bridging the digital divide by working with the Charlotte Mecklenburg Library, Charlotte Mecklenburg Schools, Central Piedmont Community College, the University of North Carolina at Charlotte, and dozens of other community, media, business, and educational organizations. The vision for Digital Charlotte is for every city resident to have access to, and to use, digital and communications technology. Digital Charlotte has also begun building a map of free public wireless network access locations – a crowd-sourced tool to help people locate free Wi-Fi networks.[32] This effort coincided with Google Fiber's decision to build a fiber network throughout the City of Charlotte.

Recommendations

Policymakers can engage CAIs to improve residential broadband adoption in the following ways:

- Federal, state, and local governments should develop broadband plans that specifically identify and support the roles that CAIs play in promoting broadband adoption. The plans should recognize that CAIs can:

  1. Distribute information to consumers about how to sign up for the Lifeline program and other programs that make broadband more affordable;

  2. Serve as broadband providers for low-income populations;

  3. Provide digital literacy training; and

  4. Lead and convene local broadband planning efforts.

- The federal government should 1) create a National Digital Literacy Corps, as recommended by the National Broadband Plan, and 2) leverage the work and assets of CAIs in promoting digital literacy.

- The FCC and states should consider increasing the amount of the Lifeline subsidy for low-income families who need an affordable, high-capacity wireline broadband service at home, and identify CAIs' role in promoting these programs.

- Federal, state, and local governments should facilitate and/or support broadband adoption data collection and research to aid the strategic work of CAIs and their partners. CAIs can provide key information about specific populations that can help to target broadband adoption efforts to meet the needs of local constituencies.

- Local and state governments should designate staff positions tasked with identifying broadband adoption resources and coordinating regional broadband adoption efforts that include CAIs. These staff can recognize CAI leaders in each state who are best suited to serve on task forces, or engage in broadband planning, to promote broadband adoption and digital literacy.

- The federal government should consider allowing schools and libraries that receive E-rate support to use a portion of their broadband capacity for community "hot spots" and for residential broadband traffic, as long as E-rate funds are not used to pay for these additional services.

Resources for Further Reading

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John Horrigan and Maeve Duggan. "Home Broadband 2015." December 21, 2015. The latest statistics on home broadband adoption. http://www.pewInternet.org/2015/12/21/home-broadband-2015/

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Angela Siefer, Katherine Bates, Colin Rhinesmith. "Libraries Increasing Role in Broadband Adoption." January 2016. With library systems increasingly prioritizing equitable access to the Internet and digital literacy training, the role 21st century libraries serve in promoting digital inclusion has become more prominent. https://www.benton.org/initiatives/libraries-broadband-adoption

Building Digital Communities: A Framework for Action. January 2012. A resource for fostering digital inclusion throughout the United States. https://www.imls.gov/assets/1/AssetManager/BuildingDigitalCommunities_Framework.pdf

The Consortium for School Networking Digital Equity Toolkit. February 2016. Student access to robust digital tools is key to their success as 21st century citizens. Yet many students from economically disadvantaged families have limited access to these tools both at school and at home. http://www.cosn.org/focus-areas/leadership-vision/digital-equity-action-agenda

Endnotes

1   This paper focuses specifically on residential broadband adoption. The related concepts of "digital inclusion," and "digital equity" are broader terms that could also include the use of broadband Internet services at the anchor institutions. It could be said that the entire SHLB Broadband Action Plan addresses the broader goals of "digital inclusion" and "digital equity."

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3   Pew's research suggests that part of the drop can be explained by an increase in "smartphone-only" households. But smartphones have a number of disadvantages compared to landline service; for instance, a wired broadband connection typically has a faster connection speed and much higher data caps and thus is preferred for filling out job applications, obtaining health information, and doing homework assignments. Further, the size of the smartphone screen can limit effective use of word processing applications, training programs, etc.

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5   Chanelle Hardy, Hazeen Ashby, and Sean Mickens, With Broadband Equity for All: Principles to Drive Adoption, Investment and Growth in Urban America, National Urban League (March 2014) http://nulwb.iamempowered.com/sites/nulwb.iamempowered.com/files/BROADBAND%20PRINCIPLES%20MARCH%202014%20FINAL.pdf

6   Vikki Katz and Michael Levine, Connecting to Learn: Promoting Digital Equity for America's Hispanic Families, Joan Ganz Cooney Center at Sesame Workshop (Winter 2015) http://digitalequityforlearning.org/wp-content/uploads/2015/12/2015-Katz-Levine_Connecting-to-Learn-brief.pdf

7   American Library Association Office of Information Technology Policy, "Digital Literacy, Libraries, and Public Policy" (January 2013) http://www.districtdispatch.org/wp-content/uploads/2013/01/2012_OITP_digilitreport_1_22_13.pdf

8   Federal Communications Commission. Connecting America: The National Broadband Plan. (Washington, DC, March 17, 2010.) https://www.fcc.gov/general/national-broadband-plan. (Recommendation 9.3: "The federal government should launch a National Digital Literacy Program that creates a Digital Literacy Corps, increases the capacity of digital literacy partners and creates an Online Digital Literacy Portal.')

9   Colin Rhinesmith, Digital Inclusion and Meaningful Broadband Adoption Initiatives, Benton Foundation (January 2016) https://www.benton.org/sites/default/files/broadbandinclusion.pdf

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12   J.C. Bertot, B. Real, J. Lee, A.J. McDermott, and P.T. Jaeger, 2014 Digital Inclusion Survey: Findings and Results, College Park, MD: Information Policy & Access Center, University of Maryland College Park (October 1, 2015) (Digital Inclusion Survey) http://digitalinclusion.umd.edu/sites/default/files/BroadbandBrief2015_1.pdf

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14 Kansas City Public Library, "Library Launches Innovative Wi-Fi Lending Program, Opening Applications to Students and Households Without Home Internet Access" (September 15, 2015) http://www.kclibrary.org/press-release/library-launches-innovative-wi-fi-lending-program-opening-applications-students-and-ho

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18 See the May 16, 2016 petition at http://apps.fcc.gov/ecfs/comment/view?id=60001741702

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25 Federal Communications Commission, In the Matter of Lifeline and Link Up Reform and Modernization (April 27, 2016) (Lifeline Order) https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-38A1.pdf (See specifically footnote 610: "if a non-traditional provider like a school, library, or other anchor institution wishes to provide Lifeline-supported [broadband Internet access service (BIAS)] and can meet the streamlined requirements to enter the program and offer service as a Lifeline Broadband Provider, such a provider could seek designation to participate in Lifeline just as any other qualifying provider may.")

26 Lifeline Order, footnote 406: "[the Universal Service Administrative Company's (USAC)] role will be to develop processes to ease and streamline the administration of aggregation projects by implementing special systems, technical support, and coordination efforts. USAC will not fund consumer outreach efforts but may provide administration and expertise to community-based organizations, housing associations, and institutions seeking to coordinate the aggregation of benefits."

27 Lifeline Order at ¶ 379.

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Stay informed and learn about the best broadband policies and examples of how to improve anchor institution connectivity by reading and contributing to SHLB Coalition's Action Plan web portal.

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