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USING THE TOWARD GIGABIT LIBRARIES TOOLKIT

Carson Block

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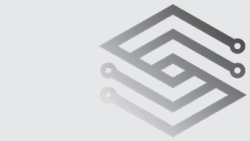

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About the Authors

Carson Block has led and loved library technology efforts for more than twenty-five years as an IT director and library technology consultant. Carson acted as a director-at-large for the American Library Association's former Association of Specialized Government and Cooperative Library Agencies (ASGCLA) and is a past chair of ASGCLA's Library Consultants Interest Group. He is a former member of the Future of Libraries advisory group to ALA's Office of Information Technology Policy. Carson is also past president of the Colorado Division of the Public Library Association.

Abstract

The Toward Gigabit Libraries (TGL) toolkit was a project originally funded by a Laura Bush grant from the Institute of Museum and Library Services (IMLS). The initial phase took place from 2015 to 2018 and included on-site visits to test the toolkit in real-world applications. An important focus of the grant was that the toolkit should work for all libraries but should be especially helpful to rural, tribal, and underfunded libraries. A second grant was awarded in 2020, and while somewhat hindered by the COVID-19 pandemic, a new project (called Gigabit Libraries and Beyond) is underway to further refine the toolkit to expand reach to tribal and rural libraries and explore how the toolkit may be used in "tech desert" urban areas. This issue of *Library Technology Reports* (vol. 57, no. 8), "Using the Toward Gigabit Libraries Toolkit," presents ideas for using the resources of the toolkit and gives examples of how libraries have used it in troubleshooting or training.

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A Confidence-Building Toolkit

Is it possible for library workers in small, rural, and tribal libraries to understand their technology enough to troubleshoot common problems, make decisions about future technology needs, and even advocate for improvements to their broadband connectivity?

That set of questions was the driving force behind the Toward Gigabit Libraries toolkit. The short answer is yes. The toolkit is a free, open-source technology learning, diagnostic, and advocacy tool designed for public and tribal libraries in the US, but it can be used just about anywhere in the world.

According to the *2014 Digital Inclusion Survey*, "30 percent of American households lack broadband [internet], and this rises to 38 percent for rural households."[1] Libraries help bridge this gap by serving as technology hubs for their community members and providing free internet access. But difficulties arise when it comes time to troubleshoot internet connectivity issues and other technology problems. This is where the Toward Gigabit Libraries toolkit can come in handy. It can be used as a training resource for library workers and also as an assessment tool to further enhance libraries' current broadband infrastructures and information technology (IT) environments.

The initial project was funded via a Laura Bush grant from the Institute of Museum and Library Services (IMLS); a second Laura Bush grant was awarded in 2020 to scale the project for further reach to explore how it could help in "tech deserts" (areas of no or challenged technology access) in urban areas (see figures 1.1 and 1.2). As of the summer of 2021, the program is scaling up to reach more tribal libraries, create stronger partnerships between state library organizations and public technology providers in states, and even reach those in urban technology deserts.

When library workers understand technology, it results in real-world impacts for the communities they serve. If library workers in rural, tribal, and even urban areas do not have the technical skills to continually increase and manage connectivity speeds, they risk leaving behind millions of people who rely on public access technologies and connectivity. Many libraries without skilled technical staff do not manage their connections with best practices that would maximize the connectivity and better serve their communities.

Figure 1.1
The Toward Gigabit Libraries logo; used for the first grant cycle.

Figure 1.2
The Gigabit Libraries and Beyond logo; used for the second grant cycle.

The original Toward Gigabit Libraries toolkit grant (TGL) during 2015–2018 provided hands-on broadband infrastructure training to rural and tribal librarians, especially those serving small, rural, or tribal libraries with limited technology support, to enhance

The original Toward Gigabit Libraries project site, which includes the downloadable Toward Gigabit Libraries toolkit and other project documents (including the final project report for the TGL grant) is hosted by Internet2 at https://internet2.edu/community/community-anchor-program/cap-library-resources/toward-gigabit-libraries/.

The full grant language for the current Gigabit Libraries and Beyond is available from IMLS:

- Preliminary Proposal: https://www.imls.gov/sites/default/files//grants/re-246219-ols-20/proposals/re-246219-ols-20-preliminary-proposal.pdf
- Full Proposal: https://www.imls.gov/sites/default/files//grants/re-246219-ols-20/proposals/re-246219-ols-20-full-proposal.pdf

the community digital and broadband-enabled services those libraries provide. TGL piloted the development of technical broadband assessment tools (a toolkit) that gave thorough hands-on training to librarians to advance their understanding of and advocacy for broadband infrastructure in their libraries.

What Is the Toolkit?

Although all library operations rely increasingly on properly functioning technology, many library staff have little knowledge, training, or practice in addressing technological challenges. This problem is faced by libraries of all sizes, but it could be argued that the most acute negative impacts are for small, rural, or tribal libraries with few staff members (sometimes a single person) who endeavor to provide public services, maintain collections, maintain the physical buildings, and more. Rural and tribal libraries generally have less support for technology than larger and urban library systems, yet their communities still expect reliable access to Wi-Fi, the internet, and computing devices.

The Toward Gigabit Libraries toolkit is designed to be a friendly, accessible guide to what is often a black box of technology. The toolkit is structured to give meaning to all of those blinking lights in wiring closets in libraries across the US (and beyond) and create a layperson's path to diagnosing and fixing technology problems. The toolkit is organized by sections designed to build upon each other, starting the technological journey with the awareness brought through self-assessment, followed by direct targets for improvements, and ending with the confidence needed for effective advocacy. As shown in figure 1.3, the toolkit serves these three main functions: education, assessment, and advocacy.

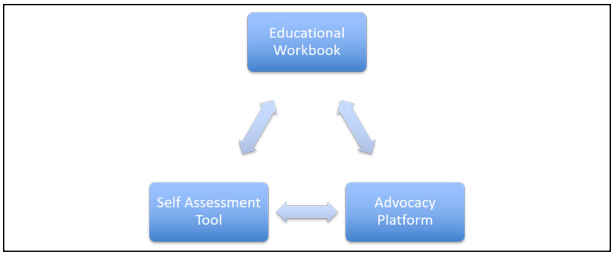

Figure 1.3
Three main functions of the toolkit: education, assessment, and advocacy.

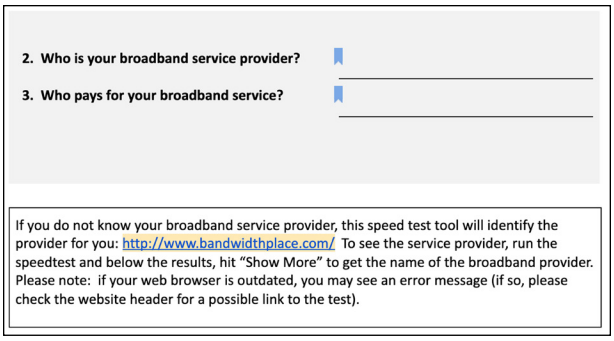

Figure 1.4
Screenshot from page 6 of the toolkit, which gives an example of the questions, as well as the guidance provided in case the questions are difficult to answer.

The toolkit guides users through a series of questions about the technology environment of the library and provides all the information needed to answer the questions. The toolkit was piloted with fifty-eight rural and tribal libraries in eleven states to ensure that it is as simple as possible to use.

Toolkit Format

The toolkit is laid out in a simple-to-follow fashion. Questions relating to the library's broadband connection, infrastructure, and related services and operations are posed in a series of gray boxes. Users may write the answers in the boxes. Help text appears immediately below each question and is designed to assist in answering each question directly or to provide additional guidance, education, detail, information, and resources associated with the topic. Essentially, the questions and the resources to answer them are contained in the same easy-to-follow space, as illustrated in figure 1.4.

Although the toolkit is designed to work as a digital document, many users find it most helpful to print a hard copy and complete the sections by hand. The questions, especially in the first sections of the toolkit, which address a technology inventory and broadband services, often require walking around to technology

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* Creative Commons, "About the Licenses," https://creativecommons.org/licenses/.

components in different locations. A paper toolkit, clipboard, and pen or pencil often constitute the low-tech approach that best facilitates the tech inventory.

Open Licensing

From the beginning, the TGL toolkit was designed to be used, in any manner possible, to help libraries improve their technology. All content in the toolkit was released under a Creative Commons license that allows reusing and remixing for noncommercial uses. See chapter 4 for examples of how library organizations have integrated the toolkit into training programs.

Origins of the Toolkit

Several important factors came together to form the IMLS project that would create the Toward Gigabit Libraries toolkit.

In the field, I and others working with small libraries (notably the Colorado State Library and the Texas State Library and Archives Commission) were responding to needs for improved technology skills, comfort, and mastery among small and rural libraries. At the policy and national levels, Mary Alice Ball (former IMLS senior program officer), other IMLS staff, and technology specialists at the American Library Association were making gains in bridging the digital divide in rural and tribal libraries (with a focus on the "last mile" of connectivity), but they also were noticing a gap in understanding and addressing needs within the "last 100 meters" of library technology systems (the internal wiring and components that connect the devices and Wi-Fi systems in each building to the internet).[2]

To address this gap, the IMLS contacted Internet2, a not-for-profit computer networking consortium, to describe the needs and encouraged Internet2 to create a proposal that would help address these technology gaps for rural and tribal libraries. The team at Internet2 reached out to me (based on my field work in Colorado and Texas, described in chapter 4 of this report), and we collaborated on writing a grant proposal that would lead to the Toward Gigabit Libraries toolkit.

The project team for the original TGL grant was composed of two staff members from Internet2 and the author (Carson Block). Much of the content of the toolkit had origins in each project team member's areas of expertise:

- Susanna Spellman—policy and telecommunications project management experience
- James Werle—digital inclusion work and application of tech via Internet2's Community Anchor Program
- Carson Block—library technology assessments, training, and consulting

While it was a happy accident that brought the original project team together, our complementary skills and working styles turned out to be a powerful catalyst in exploring needs and producing a viable pilot and tangible results. As an existing team at Internet2, Susannah (based in Washington, DC) and James (based in Washington state) had already developed a strong team and fluid online and in-person working style. (This work was pre-COVID, and not everyone was familiar, let alone skilled, with the tools and techniques for successful remote teams.) When I joined James and Susannah, we discovered we had a solid common core of values and work ethics and quickly developed a natural rapport that resulted in taking what could have been an impossible task and turning it into reality.

When Susannah left Internet2 during the final year of the grant, James Werle was promoted to executive director of US Unified Community Anchor Network at Internet2, and Stephanie Stenberg was hired as the program manager. Stenberg is now the director of the program, and she and Block are codirectors of the Gigabit Libraries and Beyond project.

James Neal, senior program officer at IMLS, has been instrumental in supporting the further development of the toolkit. Neal said, "IMLS places a great deal of emphasis and importance on open source and shared infrastructures and initiatives for libraries using technology and digital tools to meet community needs. The 'Toward Gigabit Libraries' project is exemplary in this effort as a tool for use by libraries of all sizes across the United States and in particular for rural and tribal libraries."[3]

The Original Toward Gigabit Libraries Project Team

Susannah Spellman served as the executive director of the United States Unified Community Anchor Network (US UCAN) program at Internet2. US UCAN is focused on efforts to support the broadband needs of community anchor institutions nationwide. In addition to Internet2, she has worked in telecommunications for the last twenty years for Booz Allen Hamilton, Detecon, Telcordia Technologies, and IBM and holds a BA in telecommunications from the Pennsylvania State University and an MA in international science and technology policy from George Washington University. Spellman is currently a broadband program team lead at the US Department of Commerce's National Telecommunications and Information Administration. She is working with the Office of Telecommunications and Information Administration to help expand broadband infrastructure and digital inclusion initiatives.

James Werle (deceased) served as the director of the National Internet2 K20 Initiative, which brings together Internet2 member institutions and innovators from public libraries, primary and secondary schools, colleges and universities, and museums to extend advanced broadband-enabled technologies, applications, middleware, and content to all community anchor institutions. He began his career as a Peace Corps volunteer teaching physics and building a library and science lab in the small central African nation of Malawi. He also worked at the University of Washington, where he helped launch the Washington Digital Learning Commons, a statewide K–12 online learning consortium. He held a BA in science education and a master's degree in library and information science from the Ischool at the University of Washington. Posthumously, Werle was given the Richard Rose Award.[4]

Carson Block has led and loved library technology efforts for more than twenty-five years as an IT director and library technology consultant. He's been called a "geek who speaks English" and occasionally compared to Ferris Bueller and Calvin (of *Calvin and Hobbes*). Carson is dead serious about the essential and positive community impacts of libraries and focuses his consulting practice on helping libraries increase their capacity to serve patrons. Carson has served in leadership positions in ALA's former Association of Specialized Government and Cooperative Library Agencies (ASGCLA) group, is a past president of the Colorado division of the Public Library Association, and evangelizes about libraries to SXSW Interactive and other tech communities. Carson is coauthor of *Library Information Systems* (with Joe Matthews; Libraries Unlimited, 2019) and author of *Managing Library Technology: A LITA Guide* (Rowman & Littlefield, 2017).

An Active Advisory Board

A not-so-secret ingredient of the toolkit is the strength of review, feedback, and iteration leading to the final versions. With the goal of making technical information accessible and actionable for lay people, the project team adopted a barrier-free approach to feedback. All feedback from all sources, no matter how difficult it might be to incorporate, was welcomed, considered, and often wrestled with in the effort to make the toolkit a valuable document for all users.

Advisory board members for the TGL and GLB projects were invited based on their subject matter expertise, interest, and willingness to provide thoughtful, thorough, and detailed insight to the toolkit and process.

Toward Gigabit Libraries Advisory Board

(Job titles and organizations were current as of mid-2018.)

- Cindy Aden—state librarian of Washington
- Stephanie Bailey-White—deputy state librarian, Idaho Commission for Libraries
- Dylan Baker—broadband consultant, Idaho Commission for Libraries
- Maria Bernier—Connecticut State Library
- Carson Block—library technology consultant
- Daniel Cornwall—internet and technology consultant, Alaska State Library
- Adam Day—Twin Falls Public Library, Idaho
- James Deaton—executive director of the Great Plains Network (Oklahoma)
- Susan Feller—president/CEO of the Association of Tribal Archives, Libraries, and Museums
- Ann Joslyn—state librarian of Idaho
- Susan McVey—state librarian of Oklahoma
- Carolyn Petersen—"connector": works with rural and tribal libraries in Washington State Library
- Tom Rolfes—education IT manager, Nebraska Information Technology Commission
- Mark Smith— director and librarian, Texas State Library and Archives Commission
- Stephanie Stenberg—Internet2
- Henry Stokes— library technology consultant and state E-rate coordinator for libraries, Texas State Library and Archives Commission
- Sharon Strover—professor, University of Texas at Austin
- Nicole Umayam—digital inclusion library consultant, Arizona State Library, Archives, and Public Records James Werle—Internet2
- Holly Woldt—senior IT infrastructure support analyst, Nebraska Library Commission

Gigabit Libraries and Beyond Advisory Board

- Stacey Aldrich—state librarian, Hawaii State Public Library
- Dylan Baker—broadband consultant, Idaho Commission for Libraries
- Jeff Baldwin—Association for Rural and Small Libraries and Noble Public Library
- Mary Alice Ball—dean of library and academic technology, Washington College
- Alivia Blount—data scientist, technical program manager, Microsoft
- Daria Bossman—state librarian, South Dakota State Library
- Mike Buschman—LSTA coordinator, Washington State Library
- Lauren Comito—chair, Urban Librarians Unite
- Daniel Cornwall—internet and technology consultant, Alaska State Library
- James Deaton—executive director of the Great Plains Network (Oklahoma)
- Susan Feller—president/CEO of the Association of Tribal Archives, Libraries, and Museums
- Dr. Jon Gant—dean and professor, School of Library and Information Sciences, North Carolina Central University
- Amber Gregory—E-rate consultant, Arkansas State Library
- Hillary Kolos—director of digital learning, DreamYard
- Dr. Marcia Mardis—professor and associate dean; associate director, Information Policy, Management and Use; institute research faculty, Institute for Digital Information and Scientific Communication (iDigInfo), iSchool@Florida State University
- Jennifer Oxenford—director, member services and NYC Dark Fiber Program, NYSERNet
- Matthew Rantanen—director, TDVNet, Tribal Digital Village; director of technology, Southern California Tribal Chairmen's Association
- Suzanne Reymer—consultant, Montana State Library
- Colin Rhinesmith—associate professor and director, Community Informatics Lab, Simmons University
- Chris Ritzo—mLab
- Tom Rolfes—education IT manager, Nebraska Information Technology Commission
- Mark Smith—director and librarian, Texas State Library and Archives Commission
- Henry Stokes—library technology consultant and state E-rate coordinator for libraries, Texas State Library and Archives Commission
- Dr. Sharon Strover—professor, University of Texas at Austin
- Matt Turner—strategic advisor and technologist
- Nicole Umayam—digital inclusion library consultant, Arizona State Library, Archives, and Public Records
- Jameka Williams—director of member engagement, Merit
- Holly Woldt—senior IT infrastructure support analyst, Nebraska Library Commission
- Christian Zabriskie—executive director, Urban Librarians Unite

Notes

1. John Carlo Bertot, Brian Real, Jean Lee, Abigail J. McDermott, and Paul T. Jaeger, *2014 Digital Inclusion Survey: Survey Findings and Results* (College Park, MD: Information Policy & Access Center, University of Maryland College Park, 2015), x, https://digitalinclusion.umd.edu/sites/default/files/uploads/2014DigitalInclusionSurveyFinalRelease.pdf.
2. Wikipedia, "Last Mile," last updated July 5, 2021, 13:11, https://en.wikipedia.org/wiki/Last_mile.
3. James Neal, conversation with author.
4. "Internet2 Honors Late James Werle with 2019 Richard Rose Award," Business Wire, February 28, 2019, https://www.businesswire.com/news/home/20190228005020/en/Internet2-Honors-Late-James-Werle-With-2019-Richard-Rose-Award.

Chapter 2

Navigating the Toolkit

The toolkit is divided into several key sections covering the types of technical challenges likely to be encountered in all libraries and ways to solve them:

- Sections 1–3: Executive Summary; How to Use the Toolkit; Library Contact Information
- Section 4: Technology Inventory
- Section 5: Broadband Services and Activities
- Section 6: Broadband Technology and Operations
- Section 7: Broadband Funding
- Section 8: Additional Resources and Best Practices
- Sections 9–10: Glossary and Acknowledgements

The self-guided workbook starts with section 4. Below is a summary of useful tools you can find in sections 4–8. In addition, the glossary has proven to be quite popular for quick lookups of technical terms.

Toolkit Section 4: Technology Inventory

The technology inventory leads users through the key technology components inside libraries, including the data network, computers, and other important items. This inventory is designed to help users identify existing equipment, to help them understand its function, and to provide a basis for determining if new or different equipment is needed in the future.

This section starts with identifying the type of broadband connection the library has (listing these options: digital subscriber line, cable modem, fiber optic connection, fixed wireless [such as microwave data transmission], satellite, and "other" to cover unusual, creative, or emerging connectivity methods such as TV white spaces).[1]

A raw inventory is the right starting point for any assessment, but understanding the "why" behind broadband is equally important. The concept of reinforcing the "why" behind library technology is scattered throughout the toolkit and becomes especially important for encouraging the library's self-advocacy efforts to improve its broadband capacity.

The chart from the technology inventory section of the toolkit (figure 2.1) shows, for instance, the relationship between different broadband speeds and online capabilities, illustrating simply how the speed and quality of an internet connection are key to supporting online services. For example, while text-based communications such as e-mail can get by on basic connections, videoconferencing and cloud computing require higher levels of both speed and quality.

As well as the basics of a technology inventory, this section contains two key elements that have proven to be very useful to all libraries, even those not working through the entire inventory process: testing the speed and quality of the library's broadband connection and drawing a network map.

Speed and Quality Tests

"Our Internet is slow" is perhaps the most common issue cited by libraries, and while the term *slow* describes a symptom of poor connectivity, it doesn't offer much help in diagnosing the root cause of the problem.

Speed tests are important for resolving connection quality issues with internet service providers (ISPs). Reports of "We're slow" on the library side can often receive an ISP response of "It looks fine from our end," with no resolution to issues that are encountered by the library and its patrons and are at the core of a great deal of frustration. Without accurate measures, who's really to know where the fault lies? Most ISPs diligently try to solve problems when made aware, but often also lack hard data to show the problem. The conversations between libraries and ISPs take on a whole different quality if the library can is equipped with data, saying something like, "According to tests

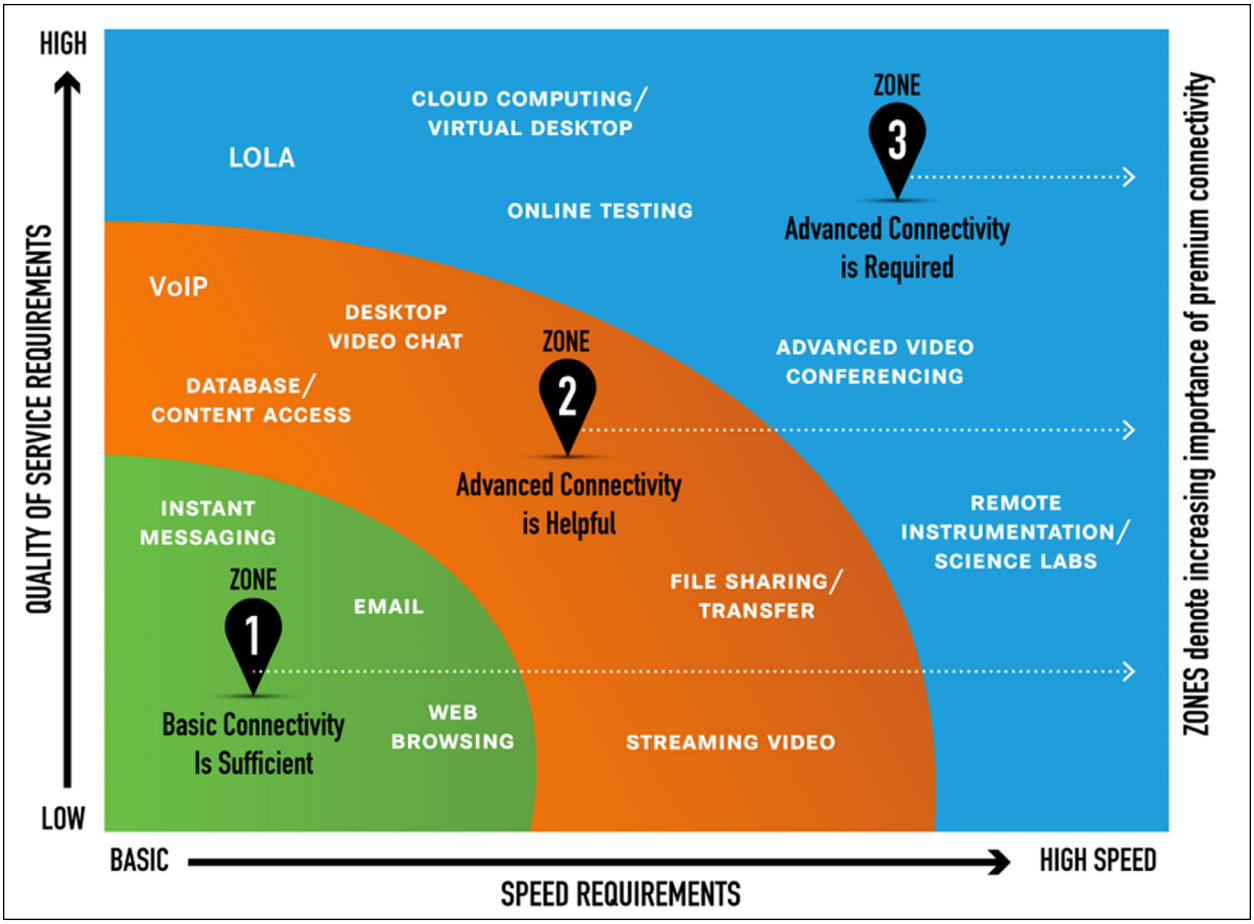


Figure 2.1
Graphic representing the relationship between quality and speed of internet service and what online capabilities they can support.

we've performed over two weeks, it looks like we're not getting all of the bandwidth that we're purchasing. Can you help us diagnose the problem?"

Speed tests are simple to perform but require a consistent approach, multiple tests, and at least two different speed test sources to result in usable data. The toolkit takes a simple, explicit approach to describe the process:

> It is best to test the speed when no one else might be using it, perhaps early in the morning before the library opens for the public and before other staff might be using the connection. It is also best to test the connection using a computer connected by an Ethernet cable (i.e. using a wired connection instead of wireless) connected computer, as close to the broadband router as possible. Consider repeating this once per day over a week and taking the average or median of the measured values.

The toolkit goes on to name a source for an instructional video demonstrating how to perform a speed test and addresses how the physical distance between the library and the ISP's core internet connection can impact speeds and measurements.

Drawing a Network Diagram

Since a network can be only as fast as its slowest component, drawing a network diagram has proven to be one of the most powerful activities in the toolkit. Network diagrams are used to show the major components of a data network and how each component relates to the others. Even the simplest network diagram, if accurate, can be one of the most powerful troubleshooting tools for technology experts and novices alike.

The network diagram is a graphical, mostly linear representation of the network from end to end, showing the pieces of the network that are outside each library and the components inside the library.

There are two key outside components: the internet itself, and the broadband service provider (also

Measuring Library Broadband Networks

A complementary project exploring fresh ground in measuring broadband speed and quality is the Measuring Library Broadband Networks (MLBN) project, started in 2018 to "examine how advanced broadband measurement capabilities can support the infrastructure and services needed to respond to the digital demands of public library users across the U.S."* The MLBN project was headed by Dr. Colin Rhinesmith, assistant professor and director of the Community Informatics Lab at the Simmons University School of Library and Information Science, along with Measurement Lab (M-Lab) and Internet2.

The MLBN project team worked with thirty public libraries over two years to pilot its measurement devices to assess the quality and speed of broadband service to libraries and how that service supported the libraries' digital needs. The other aim of the project was to broaden understanding in the library world about networked services and increase technical knowledge of library staff.

The research was funded by a grant (#LG-71-18-0110-18) from the US Institute of Museum and Library Services (IMLS) National Leadership Grant program.

Working with Dr. Rhinesmith on the project were Georgia Bullen, executive director at Simply Secure; Chris Ritzo, program manager and community lead at M-Lab at the Code for Science & Society; Stephanie Stenberg, director, Community Anchor Program (CAP) at Internet2; Carson Block, president of Carson Block Consulting Inc.; Susan Kennedy, research assistant at the School of Library and Information Science at Simmons University; and Jo Dutilloy, research assistant at the School of Library and Information Science at Simmons University.

The final report can be found and downloaded here: Chris Ritzo, Carson Block, and Colin Rhinesmith, *Measuring Library Broadband Networks Training Manual—Final*, version 1.2 (Harvard Dataverse, 2021), https://doi.org/10.7910/DVN/8XXXZQ.

* Chris Ritzo, "Supporting Broadband Measurement in Libraries," New America, April 27, 2018, www.newamerica.org/oti/blog/supporting-broadband-measurement-libraries/.

called the ISP). When creating the network diagram, we often start with the internet on one end (represented simply as a cloud of nearly uncountable connectivity methods, network components, and, of course, sources of digital information). The next stop for the purposes of our diagram is the broadband service provider and its function of offering the "on-ramp" for the library's connection to the internet.

Most of the detail on the diagram is given to the greatest need for the library: the internal network components that work together to distribute broadband access. The next stop for the internet connection is the broadband devices that allow the library's internal network to communicate with the ISP's equipment, in some cases called a "modem." (The term *modem* is a callback to the days when a hardware device or internal computer component would modulate and demodulate data signals over analog telephone lines. Technically, cable connections use a modem to modulate and demodulate the signal, but other methods, such as fiber, digital subscriber lines, and other digital connections do not require modulation and demodulation.)

The next stop inside the library is usually a router, which is the "traffic director" that regulates the data flow inside the library and allows devices to communicate with the outside world. Sometimes routers, especially those found in the smallest of libraries, also include Wi-Fi capability.

With the router directing the traffic at the edge of the library's internal network, a switch (a device with many Ethernet connections that allows all of the wired devices in the library to connect to the network) is usually the next stop, followed by all of the end-user devices that require a wired connection, including PCs, printers, and even the Wi-Fi system that provides wireless access to library users.

The toolkit includes an example network diagram, shown in figure 2.2, that users can reference when creating their own versions. It is expected that each library network will vary in some way from the diagram, but the example diagram still provides an excellent reference point for starting, especially for those who have never documented how their network is set up.

Section 4 covers the most territory in the toolkit, with subsections focused on the library's broadband connection, network devices, wired network and power, the Wi-Fi network, and computers and end-user devices.

Toolkit Section 5: Broadband Services and Activities

While the inventory of equipment helps users understand what they have (and how well it's operating), the purpose for technology in the library is to provide services to patrons. Section 5 of the toolkit explores broadband services and applications to ensure that the library has sufficient bandwidth to support patron and staff use of various devices and applications both today and in the future.

This section is short (since many libraries provide similar types of services) and includes one approach to answering a deceptively tricky question: Just how

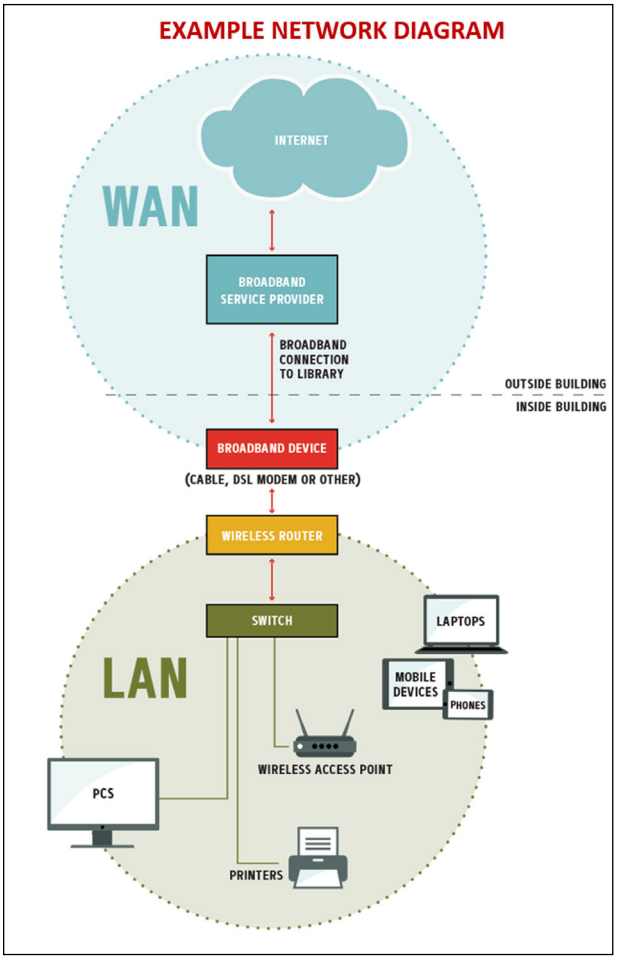
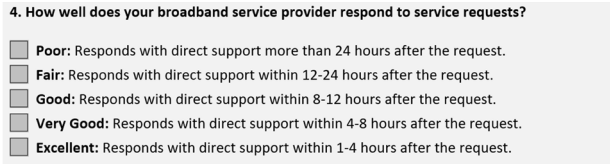


Figure 2.2
An example network diagram from page 15 of the toolkit, which shows users "outside" and "inside" network functions and how they relate to each other.

much bandwidth does a library need? While the answer to this question is a moving target (the author feels that the correct target is scalable bandwidth—the ability to increase speeds over time since tomorrow every library will need more bandwidth than it does today), but still, the toolkit references a study written by Samantha Becker, Sofia Leung, and Robert Bocher, "Benchmark 9: How Much Bandwidth Does My Library Need?" describing a formula to calculate minimum bandwidth needs.

Section 5 also asks users to note whether they provide hot-spot lending; to note whether they filter the content of their internet connection (which is required for some federal funding, including E-rate, the 2020 CARES act, and the 2021 American Recovery Act); and to dream about services they might offer if funding were not a limiting factor, including online testing, distance learning, videoconferencing, streaming video, makerspaces, digital content downloads, and others. Finally, two programs offered by Internet2's

Published by Library Edge, the technology benchmarks are available as the PDF file "Benchmark 9: How Much Bandwidth Does My Library Need?" on the Broadband4Education website: www.broadband4education.nm.gov/uploads/FileLinks/a6cbda6b6c3345ecbadd0cafa50aa1ae/Edge_Benchmark_9.2_Bandwidth_Article_8.19.13.pdf.


4. How well does your broadband service provider respond to service requests?

- **Poor:** Responds with direct support more than 24 hours after the request.
- **Fair:** Responds with direct support within 12-24 hours after the request.
- **Good:** Responds with direct support within 8-12 hours after the request.
- **Very Good:** Responds with direct support within 4-8 hours after the request.
- **Excellent:** Responds with direct support within 1-4 hours after the request.

Figure 2.3
An example question from page 43 of the toolkit, regarding evaluating services provided by internet service providers, with a guide explaining each answer.

Community Anchor Program (the Presidential Primary Source Project and LoLa—a real-time, open-source, low-latency communications technology) are used as examples of what libraries can do with fast connections.[2]

Toolkit Section 6: Broadband Technical Operations Support

People, including library staff and those who provide technical support, are just as important as technology equipment and broadband connections to bring technology access to communities.

This area can be difficult for library staff to negotiate; after all, if technology concepts and language are shrouded in mystery, even simple conversations with IT professionals can be at best strained, and at worst nonstarters. In addition, the relationships between library staff and technical support people vary. While many libraries have excellent and caring IT professionals, there are many library people working with tech support folks who don't understand how technology is used in libraries, causing even deeper disconnects.

And then there is the unfortunate worst-case situation of a library having no tech support options as all.

True to its design, the toolkit walks users through a series of questions to help them figure out their unique situation and points to possible solutions.

One part of section 6 is focused on technical support options that may be available from the library's broadband service provider, with the structure of the questions helping define things that all broadband customers should expect, including responsiveness (as shown in the toolkit excerpt in figure 2.3).

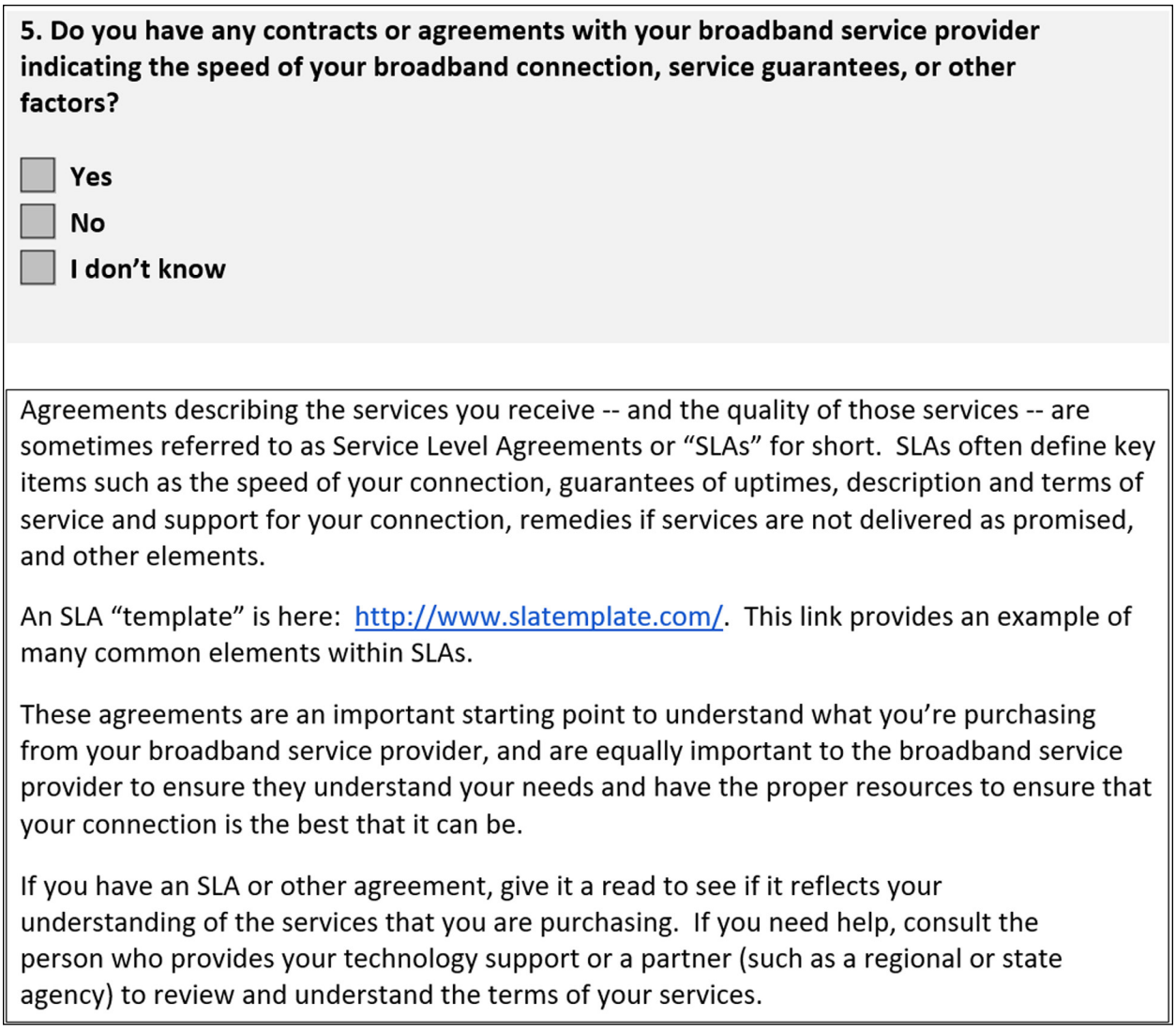


Figure 2.4
An example from page 43 of the toolkit, explaining the importance of a Service Level Agreement (SLA) and giving the users an opportunity to note its existence (or absence).

The toolkit tries to demystify areas that are often confusing to users, including how expectations should be set (via a document that should be provided by broadband providers called a service level agreement or SLA). The question from the toolkit in figure 2.4 goes into depth in describing the purpose and power of this seldom-known document.

Toolkit Section 7: Broadband Funding

When public library staff are asked what they need to serve patrons more powerfully, a popular answer is "more funding." Section 7 of the toolkit is structured to explore the total costs a library must pay for broadband and different sources of funding outside of the library's budget to help meet financial needs.

While being careful to not take a position on whether a library should explore discounts via the federal E-rate program, the toolkit does encourage libraries that do not participate in the discounts to review their position with a question citing common reasons libraries choose not to participate (figure 2.5).[3]

The funding section also provides broad guidance on connecting with state library organizations to explore other funding options.

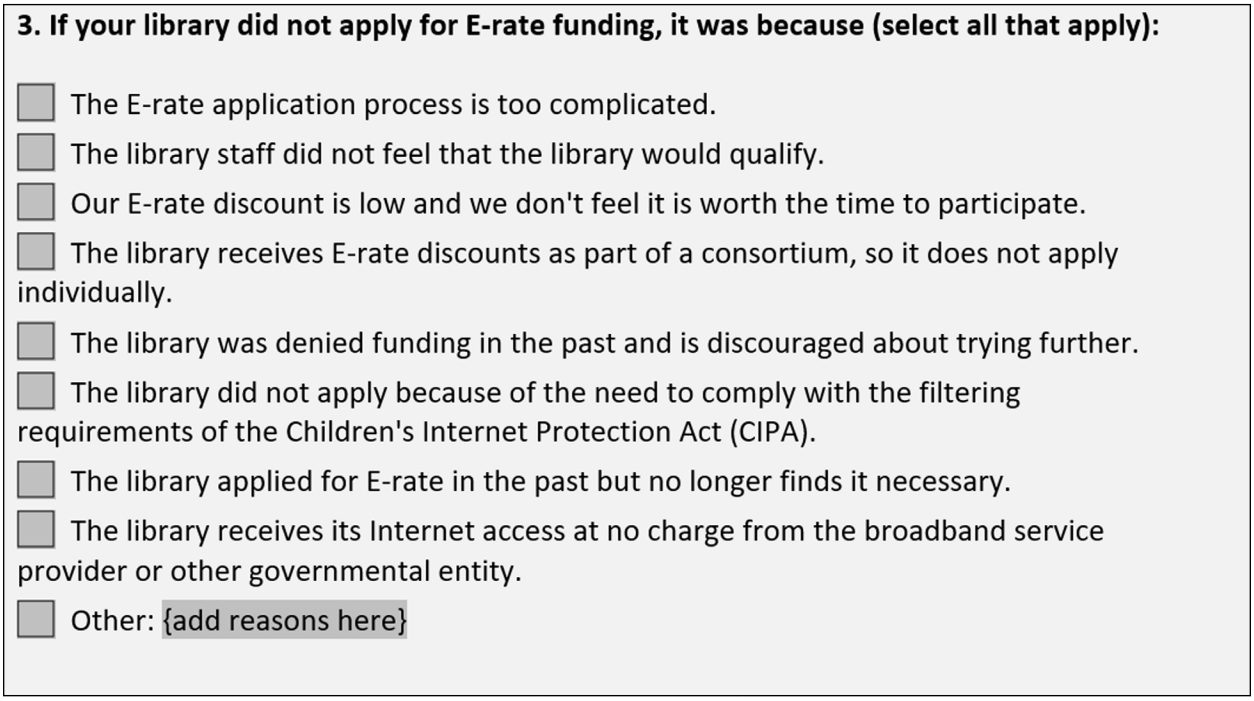


Figure 2.5
An example question from page 47 of the toolkit identifying reasons the library may not have filed for E-rate funding.

Toolkit Section 8: Additional Resources and Best Practices

In the process of creating the toolkit, many resources that contribute to successful broadband programs were discovered. Section 8 was created to provide handy information about frequently needed resources, with each resource reviewed and vetted by the project team before inclusion. Each resource category has a collection of plain-text web links and a brief description describing the resource.

It is important to note that the project team understood that links included in the toolkit would be subject to "link rot," which is the phenomenon of once-good web addresses disappearing along with the resources that they point to. The team tried to choose links that they felt would have the best chance of being around for the longest time.

The **E-rate** subsection goes into depth for those wishing to pursue the federal discount program, including a link to the E-rate Clearinghouse; a site describing E-rate in easy-to-understand terms; the E-rate application time line; tips for applying E-rate to internal network equipment needs; and help with common barriers for small libraries applying for E-rate.

The **Content Filtering** subsection points users to an Idaho Commission for Libraries web resource that provides an overview of filtering options for libraries; a guide to the Children's Internet Protection Act (CIPA), which is the law requiring filtering for libraries receiving funding from specific federal programs (including E-rate); an article clarifying and demystifying the type of filtering required by CIPA; and a link to an Alaska State Library web resource on filtering technologies.

The **Additional Broadband 101 Resources** subsection is a grab bag of powerful resources, including an entire free online class from the Texas State Libraries and Archives Commission called "You Can Do I.T.! Basic Network Technology for Libraries"; an ALA web resource describing the advantages of fiber-optic connections for libraries; a broadband planning guide from the Chief Officers of State Library Agencies (COSLA); a technical primer on broadband strategies from the American Library Association (ALA); and resources to help procure and optimize Wi-Fi signals.

The subsection **Free Technology Related Training Opportunities and Resources for Librarians** lists links to organizations providing solid technology instruction, including WebJunction; California's Infopeople; the Chief Officers of Library Organizations (COSLA); TechSoup for Libraries; and the Goodwill Community Foundation.

The **Data Backup** subsection contains information on the Rule of 3-2-1 (a simple and sustainable strategy for backing up data) and resources from TechSoup.

The **Internet Use Policies** subsection connects users to resources from ALA (its "Internet Use Policy Toolkit" and "Checklist for Creating an Internet Use

Policy"); the Maine State Library's comprehensive guidelines for developing internet use policies; and Tech Soup's "Wireless Policy Checklist."

Notes

1. For information on TV white spaces, see Federal Communications Commission, "White Space," https://www.fcc.gov/general/white-space.
2. Internet 2, "Presidential Primary Sources Project," https://internet2.edu/community/community-anchor-program/presidential-primary-sources-project/; Internet2, "Low Latency Audio and Video Conferencing (LoLa)," https://internet2.edu/community/community-anchor-program/cap-low-latency-video-conferencing/.
3. Federal Communications Commission, "E-Rate: Universal Service Program for Schools and Libraries," https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate.

Chapter 3

The Toolkit in Action

A healthy tension throughout the creation of the toolkit was considering whether it could really be used as a stand-alone, self-guided technology guide for novice users. The tension comes from the aim of the project (a resource accessible to all) and the subject matter (necessarily technical, which can be a turnoff to many users). This tension was embraced and explored throughout the pilot process.

The first challenge was encouraging nontechnical users to open the toolkit up for even a quick look-see. Many, fearing that the toolkit would be an incomprehensible collection of geek speak, did not review it in advance of the site visits performed during the pilot. However, when a member of the project team started walking these reluctant users through the toolkit process, each quickly realized that the language was understandable and designed to connect with a lay audience. For these users, each visit quickly turned from a feeling of "I'm not sure I want to do this" to "This isn't so hard! Let's learn and explore more!"

The toolkit was piloted with fifty-eight rural and tribal libraries in eleven states. Each pilot participant was offered the chance to share feedback after the site visits via a survey. The results indicated a high level of satisfaction with the program (figure 3.1) and unanimous recommendations for others to use the toolkit (figure 3.2).

Eating the Elephant a Bite at a Time

During the pilot, project managers noted two distinct approaches on how project members would use the toolkit onsite: novices tended to work through the material in a linear fashion (essentially from end to end), while more experienced techs would talk briefly with the library to discover the areas in need of the most urgent attention and then focus on just those sections of the toolkit that might provide the most help.

The **end-to-end approach** was most often used when the project member assisting with the toolkit site visit had little technology experience. This approach was especially valuable during the TGL pilot visits to help show where the toolkit was indeed self-explanatory and, even better, highlight areas that needed edits or other refinements to make the toolkit friendlier to novice users. In addition, this approach leans into the very design of the toolkit, making it a handy self-guided technology training course for users.

The **targeted approach** was most often used by a project member with technology troubleshooting experience. It would begin with a chat with the library worker about their experiences with technology, including off-the-cuff descriptions about things that the library was struggling with. The conversations led to targeted explorations of the toolkit, using sections that best addressed the issues described by the library worker. This approach is well-suited to quickly address ongoing frustrations and nagging hot spots that the library is experiencing.

Although no two site visits were identical, most of the TGL pilot visits had common elements.

At the very beginning (perhaps months before the site visit), each library filled out an intake survey. The purpose of this survey was twofold:

- The project team wanted to ensure that only the libraries with the most need were selected for the visits to ensure that participants would receive the greatest benefit for the time invested in the site visit process. All library workers are busy, and it can be argued that rural and tribal libraries, typically with few staff and many responsibilities, might be the busiest of all.
- The survey provided the site visit team with some basic information about the library's technology environment to help prepare for a productive visit.

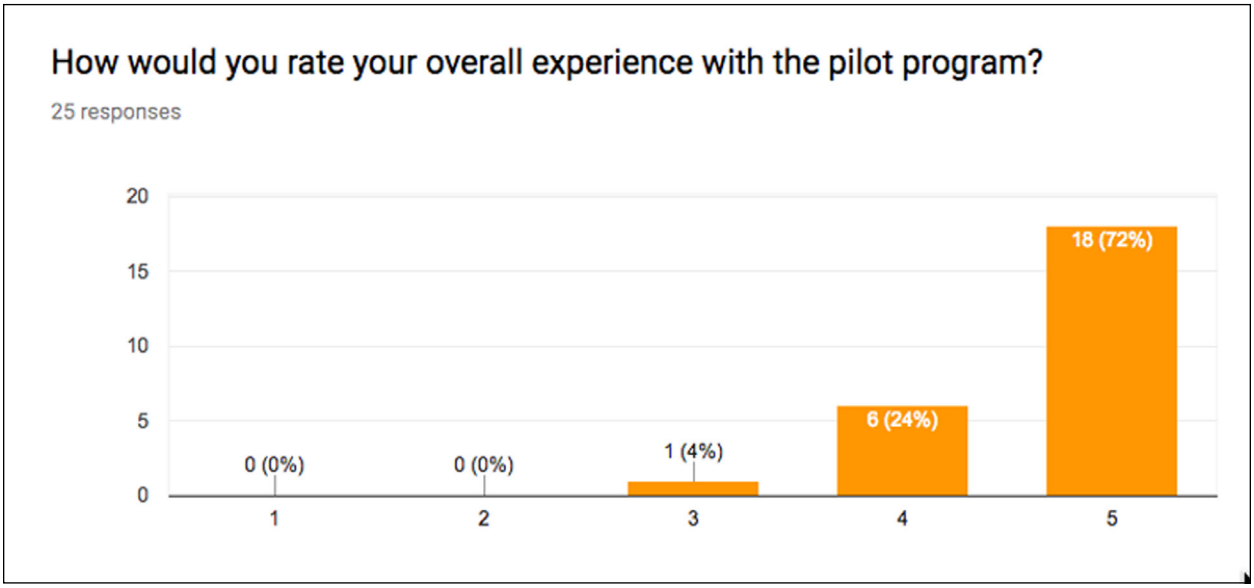


Figure 3.1
A chart based on the post-visit survey taken by TGL participants, which shows a very positive overall experience with the program.

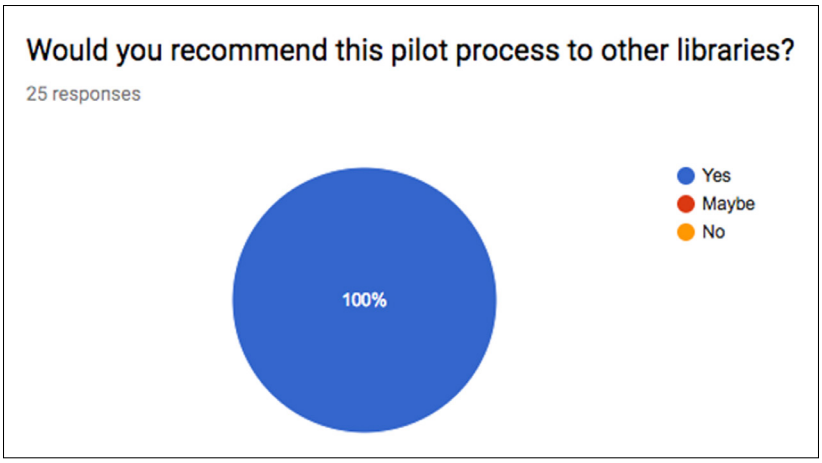


Figure 3.2
A chart based on the post-visit survey taken by TGL participants, which shows a 100 percent recommendation of the pilot process to other libraries.

The intake survey indicated who to include in the site visit, including the size of the site visit team (single or in partnership with a staff member from a state library organization, research and education network, or both) and who from the library (including nontechnical library staff, technical staff, partners, or volunteers) should be at the table. The survey was also helpful in determining the best toolkit approach up front (end-to-end or targeted toolkit experience), which was especially useful in planning the logistics of the day, especially for multiple-day road trips, when a large portion of the trip might be devoted to driving between sites.

A key element of success for the visit, which may be surprising to some, is the use of a physical copy of the toolkit instead of an electronic version. On visits that I performed, I asked the library to print out a version for our visit, and I would bring my own hard copy and a folio filled with more so that every participant could have their own. While sitting and discussing things is a part of the toolkit experience, physically walking around (and sometimes crawling with a flashlight in one hand) for assessment activities helps make the technology knowledge practical.

The process of tracking things down can be quite an adventure.

At a tribal library visit in New Mexico, the library director expressed an interest in serving a bus stop near the entrance of a library building with a strong Wi-Fi signal but was bewildered as to why the reception was poor at the spot.

Using a Wi-Fi stumbler (software noted in the toolkit that allows users to "see" and measure Wi-Fi signals and signal strength on a laptop, smartphone, or other mobile device), as shown in figure 3.3, we could indeed see that the signal strength dropped off dramatically when stepping outside the building.

The cause? Many buildings in New Mexico are made of adobe—essentially mud that can be made into bricks or applied over a solid core structure that

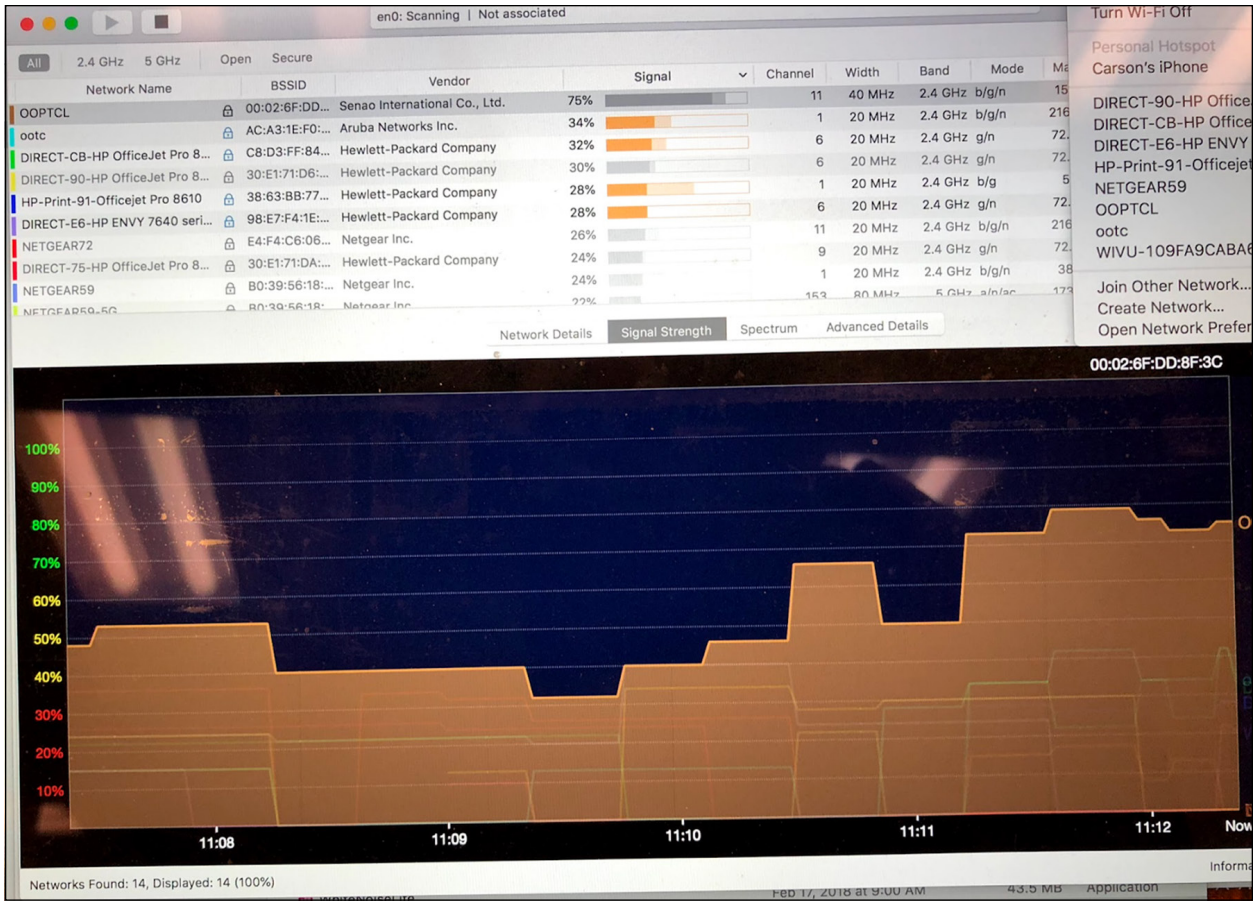


Figure 3.3
A screenshot of the author's Wi-Fi stumbler on-site in New Mexico. The graph shows low and high signal strength as part of toolkit activities during a site visit to a tribal library. As the graph moves to the bottom of the page, it indicates a weaker signal.

Figure 3.4
An example of an adobe building in New Mexico.

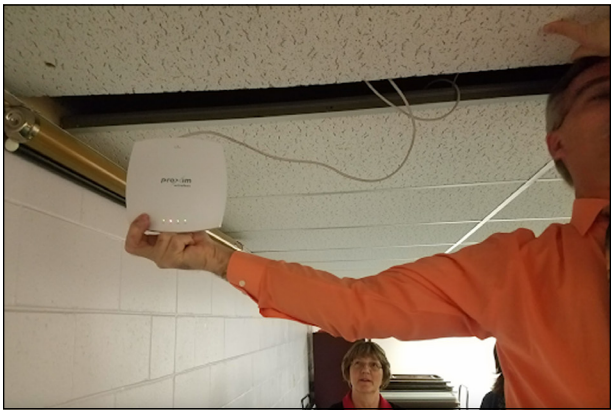


Figure 3.5
Tom Rolfes (education information technology manager at Nebraska Information Technology Commission) finds a hidden Wi-Fi access point during a site visit to a Nebraska library.

includes a metal webbing (sometimes chicken wire). See figure 3.4 for an example of an adobe building in New Mexico. In essence, adobe is not only beautiful, but the combination of elements make it an excellent shield against radio waves, including those used for Wi-Fi networks!

SHORT TERM ACTION PLAN (0-3 MONTHS)			
Action	**Intended Result**	**Resources Required**	**Timeline**
Move WiFi router from back of library to central part	*Improve throughput in library, reduce dead spots*	*Additional LAN cabling*	*One month*
Obtain information on contract with broadband service provider, including speeds, SLAs, contract time, costs, etc.	*Understand what speeds library should be seeing, calculate cost per Mbps, understand if there is recourse for missed speeds.*	*Name of service provider and billing name/information.*	*One week*

LONG TERM ACTION PLAN (3-12 MONTHS)			
Action	**Intended Result**	**Resources Required**	**Timeline**
Contract with an additional area broadband service provider and bond/combine with existing broadband capacity	*Increase broadband capacity at library*	*Additional broadband connection and equipment to combine connection*	*6 months*
Install WiFi repeaters	*Reduce dead spots, increase access to WiFi outside of library for off-hour use*	*WiFi repeaters*	*5 months*

Figure 3.6
A portion of the Broadband Improvement Plan document, which allows users to chart out actions, intended results, resources required, and a time line for both short-term and long-term plans.

The suggested solution to serve folks at the bus stop was to test different locations for Wi-Fi installation, such as in a window or outside of the library.

Another site visit, in Nebraska, started with a group of us sitting around a table talking about technical challenges faced by the library. In this particular library, staff knew that they had several Wi-Fi access points (installed by their city government partner), but they weren't quite sure where they were all located.

To help solve the mystery, we used a Wi-Fi stumbler to find the source of a Wi-Fi signal that seemed to be coming from a ceiling covered in acoustical tile. One team member grabbed a chair and popped one of the tiles loose and found the hot spot, which was placed on the hidden side of one of the acoustical tiles (figure 3.5).

Each toolkit visit involved a variation of these two stories—one or more technology mysteries that were solved through the simple process of evaluation as guided by the toolkit.

Given the payoff, it's probably not too surprising that even library workers who were skeptical that the visit would be worth the time invested, or perhaps unsure if they could gain the technical knowledge needed to fully participate (often referring to themselves as "tech illiterate"), quickly changed their minds and embraced the process. As mysteries were solved, amusingly many would start suggesting ways we could extend the visit and discover even more things that could use some tech TLC.

Finally, the participating library was asked to fill out a post-visit survey evaluating the process and experience. As indicated earlier, both were ranked highly, yet there were always excellent suggestions for process improvements that were embraced and incorporated into the toolkit and visit process.

Depending on the users' orientation, either the end-to-end or the targeted approach proved to work perfectly well, although all users tended to benefit from expert guidance as part of the experience, especially in creating the final step in the process: a document called the Broadband Improvement Plan.

The Broadband Improvement Plan (BIP)

While the toolkit itself has proven to be an excellent way to inventory, it would feel a little incomplete without a path to action. After completing even a small part of the toolkit, libraries sometimes find that they need to address technology issues. Sometimes there are a number of issues to tackle, and having a way to sort them all out is crucial to creating a path to action and improvements.

Another document from the pilot, called the

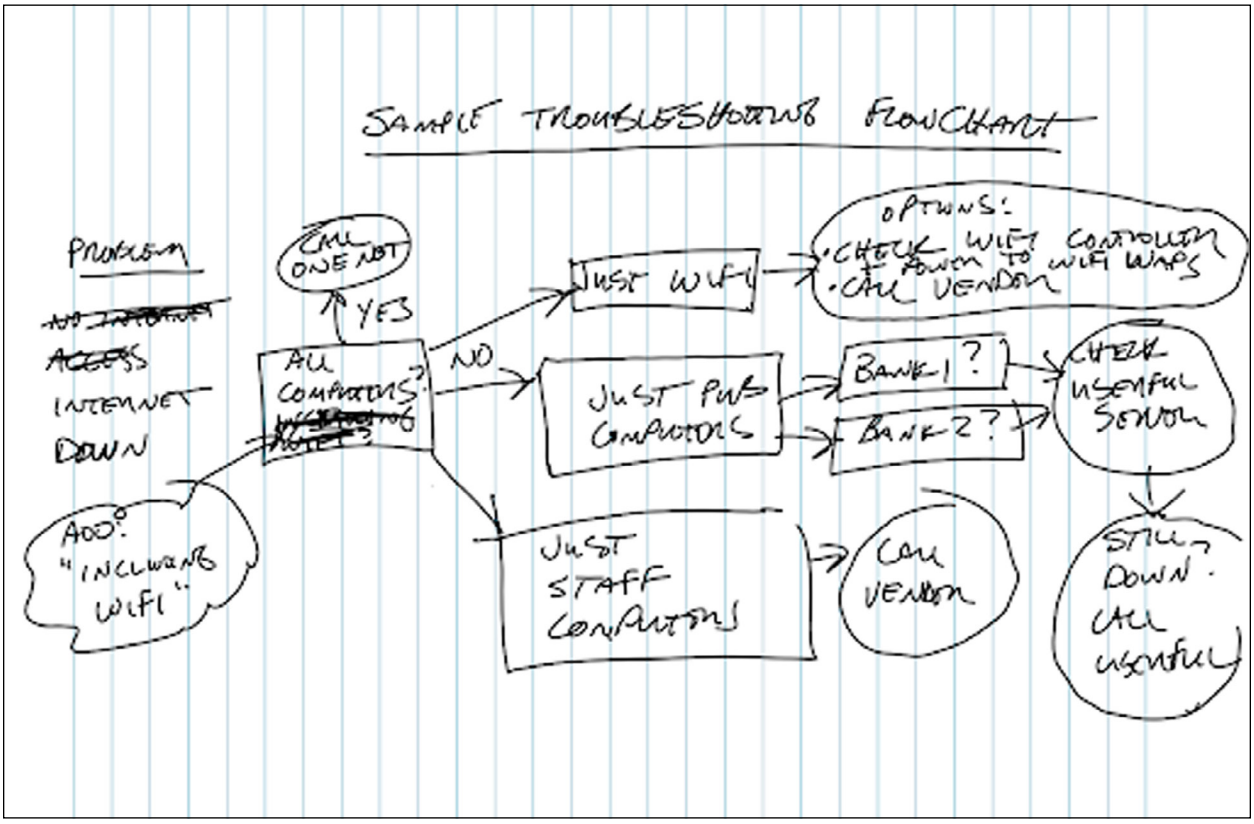


Figure 3.7
An example of a hand-drawn troubleshooting flowchart drawn on a site visit by the author.

Broadband Improvement Plan (BIP), is designed to help list and prioritize short-term and long-term actions (figure 3.6).

The document is a template (which can be used in any word processing software) that contains two grids for users to complete to build their own plan of action to address technology needs in their library.

The first grid, titled "Short Term Action Plan," is designed to address the most immediate needs, including those items that should be completed within one to three months. The second grid, titled "Long Term Action Plan," is provided for tasks that may take up to a year to complete.

The form is designed to be self-explanatory, and sample text is provided in the Word version of the document to give users an idea of how real-world needs were tackled in the BIP by an example library. Both the short-term and long-term sections contain grids with the same headings:

- Action
- Intended Result
- Resources Required
- Timeline

The Toolkit as a Communications Tool

The biblical story of the Tower of Babel illustrates what can happen when people don't speak the same language. Many nontechnicians who have tried to communicate with technical staff have lived the consequences of that story over and over again. While some keep on trying to communicate, many others simply give up. Not only is this situation personally frustrating to the people involved, but it also presents a barrier preventing many people in charge of libraries from maximizing the application of technology for the benefit of the communities they serve.

This unfortunate situation arises in part from a fallacy: that technology is somehow too difficult for a layperson to grasp. In truth, there are few technological concepts (arguably aside from highly complex ones such as the mechanics of the blockchain and the details of quantum computing) that a layperson cannot understand, at least in a conceptual sense. This basic understanding of fundamental technological concepts is also important to allow all libraries, regardless of size, to make wise choices about technology.

As in the biblical story, language can be a key barrier to understanding and, ultimately, progress. The

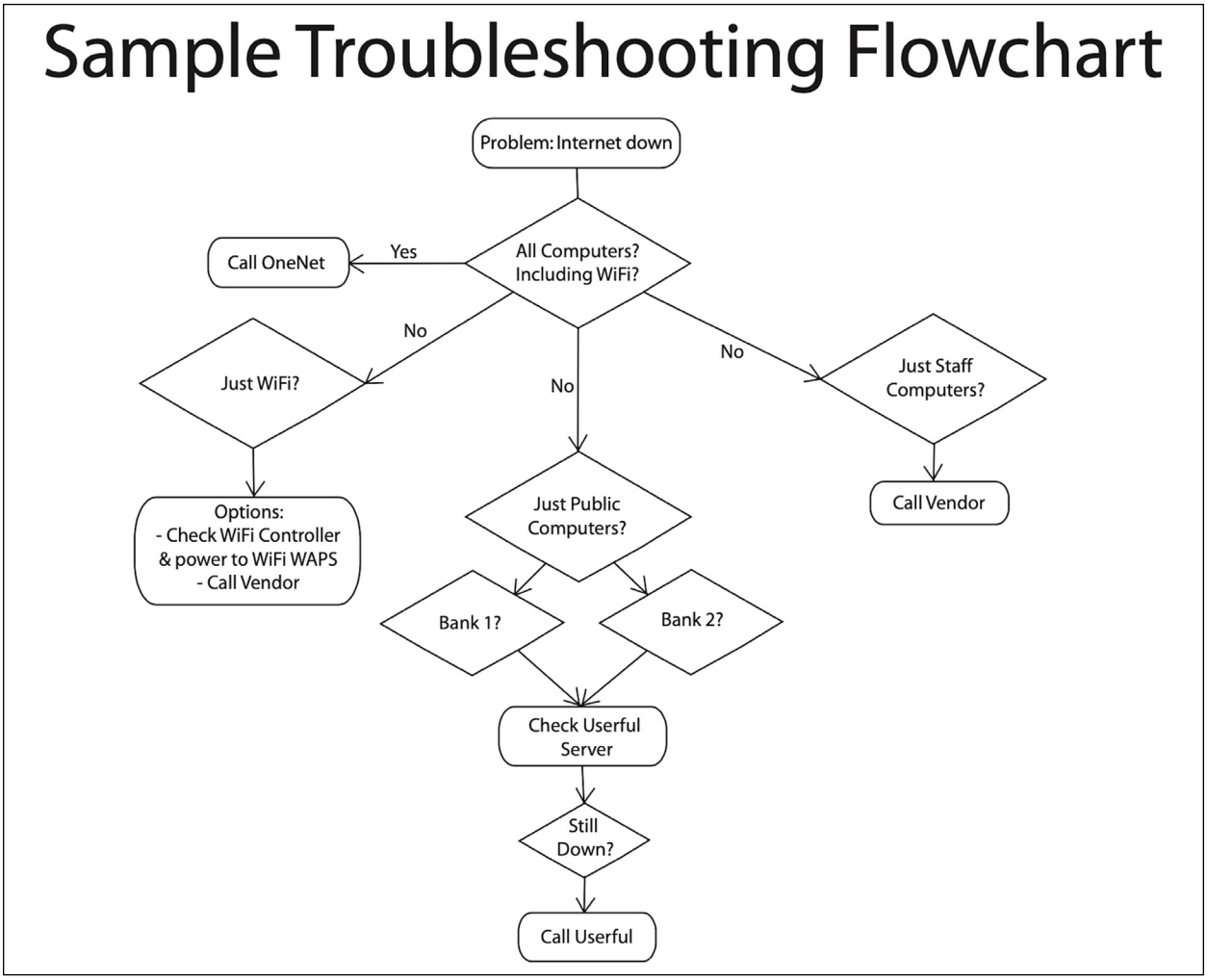


Figure 3.8
The same troubleshooting flowchart as in figure 3.7, refined and reproduced with computer software.

toolkit is designed to be a teaching aid. Its format is designed to help nontechnical people learn essential concepts. It even devotes an entire section to a glossary of common technical terms.

During the pilot process, the project team sought out opportunities to involve both "library" people and "technical" folks as part of site visits. This pairing resulted in two powerful discoveries: the toolkit can create stronger bonds between nontechnical library staff and technical support staff and can also help form powerful teams of subject matter experts (with complementary skills) from different agencies or organizations.

The project team discovered that even in some libraries where technical staff are available (for the pilot libraries, mostly through a public library system or associated tribal department), there was little dialogue between the nontechnical library worker and the tech worker. In these cases, simply sitting down together to work through the toolkit instantly created a shared understanding of essential concepts and vocabulary. Naturally, once the "library" person started having more technical understanding (and the "tech" person saw the transformation), conversations quickly shifted from the basics of assessment to more complex and specific troubleshooting dialogue. Some pilot libraries reported that the toolkit visit gave them their first opportunity to sit with their technical support folks and actually talk the same language.

Another positive situation emerged during the toolkit pilot process. In some states, the site visits were performed with a small team of local subject matter experts, including members of the state library organization (mostly nontechnical staff) and members of a technical organization (such as a research and education network or IT staff from a tribal organization or a university). In these cases, both partners had the chance to review the toolkit before the visit and enjoyed the process of using their focused expertise to help libraries. For instance, in a visit the author

3. If your library did not apply for E-rate funding, it was because (select all that apply):

- ☐ The E-rate application process is too complicated.
- ☐ The library staff did not feel that the library would qualify.
- ☐ Our E-rate discount is low and we don't feel it is worth the time to participate.
- ☐ The library receives E-rate discounts as part of a consortium, so it does not apply individually.
- ☐ The library was denied funding in the past and is discouraged about trying further.
- ☐ The library did not apply because of the need to comply with the filtering requirements of the Children's Internet Protection Act (CIPA).
- ☐ The library applied for E-rate in the past but no longer finds it necessary.
- ☐ The library receives its Internet access at no charge from the broadband service provider or other governmental entity.
- ☐ Other: {add reasons here}

See "Section 9: Additional Resources and Best Practices" some E-rate resources and information. Note that some libraries partner with their local school for E-rate applications and connections to aggregate demand, reducing application burden and potentially increasing services.

The State Librarian Office may also have resources to help libraries apply for E-Rate. A list of State E-rate Coordinators can be found on the American Library Association's website: http://www.ala.org/advocacy/e-rate-state-coordinators

Figure 3.9
An example question from page 47 of the toolkit, which asks libraries to list reasons why they did not apply for E-rate funding, as well as a "guidance" box that includes resources for libraries that are interested in E-rate funding.

performed in Oklahoma with James Deaton (formerly of OneNet, the Rural and Education Network for Oklahoma), the visit turned quickly from the bounds of the toolkit process to a deep dive into network diagramming and troubleshooting to address specific issues reported by the library. Deaton was able to use the troubleshooting time to provide a detailed description to technical support staff at OneNet to address the issues.

The process of troubleshooting a technical problem can be mysterious to non-technical people. When users discover that technology troubleshooting is mostly a linear process that can be diagrammed and shared, it turns mystery into mastery. In an example from the same library (figure 3.7), I created a troubleshooting diagram on-site showing the linear troubleshooting steps to try when the internet seems to be down. Making things a little more complex for this library is the use of a proprietary public PC system that requires a local server to function. Later, using software, I created a much more legible (and detailed) version to share with the library (Figure 3.8).

The Toolkit and Influence on E-rate Applications

The federal E-rate program, which provides discounts on select telecommunications services and equipment to K–12 schools and public libraries in the US, is widely used to mitigate ongoing technology costs.[1] Some, but not all, tribal libraries are eligible for E-rate. (Tribal library eligibility is determined by the local state library organization.)

"Explainer" Video

As the TGL grant period wrapped up, the team created an "explainer" video—important because this was possibly the only enduring way to communicate the existence of the toolkit to users after the TGL grant ended. (Carson Block, "The Toward Gigabit Libraries Toolkit (Explainer Video)," October 9, 2018, YouTube video, 3:55, https://youtu.be/PXWv3-HYm-I.)

Although participating in E-rate is widespread among public libraries, not all eligible libraries pursue the discounts. As was mentioned in chapter 2, one section of the toolkit lists the common reasons that libraries opt out of the program (figure 3.9).

In working with libraries during site visits, the project team discovered a reason that was not noted on the list but became apparent throughout the pilot process. Some libraries simply didn't know where to start in identifying their broadband service and equipment needs.

The process of working through the toolkit and creating the Broadband Improvement Plan essentially creates a tangible, actionable list of services and equipment needed by the library to improve its technology. With this list in hand, several pilot participants that had previously opted out of E-rate reconsidered their position.

Broadening the Reach

As the toolkit TGL grant period wrapped up in mid-2019, a compelling question remained. How would people in the library community know about the existence of this pilot project and the resources to help libraries understand and improve their technological environments?

After the second and final meeting of the project advisory board (during the American Libraries Association conference in New Orleans, Louisiana, in June 2019), the project team engaged a handful of board members to review a project awareness strategy based on the concept of an "explainer video," a format that is commonly used to communicate sometimes complex information in a brief, powerful, and easy-to-digest package. The team's hope was that the video would serve as a guidepost to the toolkit and associated project resources (at its home on the Internet2 website) for as long as possible.[2]

The script for the four-minute video was written and narrated by Block, with images taken from the toolkit and original graphics created by his daughter Jessikha Block, who also edited the video.

On October 9, 2018, the team published the video on YouTube and spread the word through a relatively modest approach of social media and discussion list postings, as well as requests for members of the advisory board to help spread awareness. As of June 2021, the video has been viewed nearly 1,400 times, much to the joy of all involved in the project.

Notes

1. Universal Service Administrative Co., "E-rate," https://www.usac.org/e-rate/.
2. Internet2, "How to Use the Toward Gigabit Libraries Toolkit," YouTube video, 3:55, posted by Carson Block, October 9, 2018, www.internet2.edu/tgl/.

Chapter 4

Training with the Toolkit

Reuse or Remix

In many ways, the concepts powering the toolkit echo the oral and written traditions around technology support in general. All approaches have their roots somewhere else—and they will go somewhere new in the future as people adapt their actions to the real world and ongoing changes in technology.

Some core elements of the toolkit came from my work as a library technologist—starting with library tech work in the 1990s just as the web was exploding everywhere and libraries were scrambling to learn how to incorporate this new and powerful information tool into services for patrons. The challenge then, as it is now, is that the processes, culture, and details of information technology (IT) structures are not just different from library approaches but can sometimes seem at odds with them. Clearly, libraries need to harness technology to fulfill their missions, so this is a gap worthy of attention.

One cultural element that is identical in libraries and IT is the process of communication and iteration in problem-solving. When I started learning IT on the library job, there was little formal or comprehensive instruction to guide me. Most of what I learned was cobbled together from various buckets of information, including books on technology topics from the library shelves (some quite old); various online sources (including bulletin board systems and early software manuals); and often cryptic and disparate information describing the different yet vitally interconnected technologies, hardware, network components and topologies, operating systems, and software that made up all network stacks.

The glue for me was going beyond the static information and talking to anyone who knew more about this stuff than I did and applying their knowledge to whatever tech challenge I was facing through hands-on practice. Rarely could I simply copy what someone else did, but when I understood the concepts behind, for instance, how a network router manages internal data traffic and communicates with the outside world, I could apply that knowledge to my situation and have a better chance of solving my problem.

This tried-and-true process of learning and iteration was not only a blueprint for my own work in library technology (and so many others in so many fields and walks of life), but also a key element of the toolkit. The project team designed the toolkit to be as flexible and adaptable as possible with the hope that it would be useful beyond the grant period.

Pre-toolkit Work

Two significant projects that contributed to the foundational elements of the toolkit were performed in my early consulting work.

Colorado Network Assessments

My first attempt to create a standardized approach to assessing real-world data network conditions in libraries and create recommendations for improvements came in 2013, when Sharon Morris of the Colorado State Library contacted me to perform eleven site visits to libraries in rural Colorado. The program was funded by the National Telecommunications and Information Administration's Broadening Technologies Opportunities (BTOP) program.

The site visits followed a standardized method I developed to assess the condition of the library's technology infrastructure and make recommendations for improvements:

- Each participating library was asked to complete an intake survey that helped me understand some basic things about the library's technology environment.
- Prior to each visit, I scheduled a phone call to schedule the site visit, set expectations for the site activities, and assign several easy tasks (including

internet speed tests) prior to the visit.
- The site visit was focused on staff interviews and assessment activities:
  - inspection, assessment, and detailed inventory of the library's internet connection and data area (including taking photographs)
  - on-site speed and quality tests of the library's internet connection
  - assessment of the library's Wi-Fi network (using Wi-Fi stumbler software)
  - a cursory inspection of basic network security
  - creation of a network map (hand-drawn)
  - discussions about the library's technology support

- After the visit, each library received a detailed individual report that included
  - key findings and recommendations for technological improvements
  - a detailed description of the library's technological environment
  - recommendations for broadband connectivity improvement options
  - a library network diagram (professionally drawn)
  - results of all tests (internet speed, quality, Wi-Fi, security, and others)
  - site photographs

This process and the deliverable blueprint provided a powerful foundation for what would be expanded upon and refined in the TGL program.

As well as guiding the creation and testing of a process to quickly assess tech conditions at a library, the effort yielded a key aspect of grant programs that carried through to the TGL pilot: the importance of aligning project outreach with the right participants.

Because Colorado Network Assessments was a first-of-its-kind grant program, participants essentially were allowed to self-select into it through an open application process. While ten of the eleven libraries I visited needed the visit (some quite urgently), I was surprised to discover that one small rural library had a sophisticated network design (enterprise-level hardware and software installed and maintained by a library board member who worked for an international tech company) and was clearly in good shape. The selection of this site for a visit was no fault of the library's (and the library staff were quite relieved to know that they were doing fine technologically), but it taught the program managers an important lesson for the future for making the best use of project resources when the relatively expensive and time-intensive process of site visits is involved.

You Can Do I.T. (Texas State Libraries and Archives Commission)

An opportunity to teach rural librarians in Texas the ins and outs of technology also contributed significantly to the toolkit approach. In some ways, it also gave the project team confidence that nontechnical staff were only a few simple moves away from taking control of their technological destiny.

In 2014, the Texas State Libraries and Archives Commission (TSLAC) posted a request for proposals for a training program with a seemingly audacious goal: teach lay people in libraries enough about hardware and software to address technology support gaps in the state. I had been a consultant for only a few years, and with a small office the arduous task of responding to a formal RFP was a little overwhelming. But the goal spoke to my values and mission as a consultant, and luckily, I was awarded the contract.

TSLAC E-rate coordinator Henry Stokes created the concept and identified the desired outcomes for the program (and the program logo, seen in figure 4.1), and the RFP was asking for a teacher who could create and deliver the curriculum to students gathered in central locations throughout Texas, with a focus on hands-on experiential learning. In the second year of training, Digital Inclusion Consultant Cindy Fisher supported the program by joining site visits for training and to provide feedback and inspiration for further curriculum development.

The first class, focused on network technologies, was indeed a success and spawned a second year and Texas tour focusing on the essential of hardware, software, and security. Table 4.1 shows the curriculum from both classes, and keen eyes will spot some parallels between the You Can Do I.T. curriculum and some content in the TGL toolkit.

Now anyone can access the resources created for the classes, offered as a free online curriculum on the TSLAC website.[1]

As well as incorporating this field-tested content into the TGL toolkit, I have taken and adapted the You Can Do I.T. curriculum and provided live, hands-on interactive training for libraries in Arizona and Arkansas, with at least one more state planned for 2022. The Arkansas training was performed during COVID, requiring adapting the class for online delivery with substantial effort (with thanks to my Arkansas State Library partner, manager of E-rate services Amber Gregory, and the entire state library staff) and great success.

You can read more about the You Can Do I.T. program in the LITA Guide *Tech for All: Moving beyond the Digital Divide*.[2]

Table 4.1. Objectives for workshop series Networking and Hardware/Software

First Year of Training	Second Year of Training
Section I: Network Hardware, Cabling, and Internet Service Providers (ISPs)	***Section I: Computer Hardware***
Workshop participants will be able to • define common terms used in computer networking • understand broadband options available and find ISPs serving their library, community, or both • demonstrate the ability to conduct speed checks to monitor broadband service in their library • identify hardware used or needed in a computer network • understand the functions and purpose of common network devices • understand modern cabling design and specifications and best practices to use when installing network cabling • understand the basic concepts of the TCP/IP protocol • understand simple IP address and subnet mask examples • understand the basic requirements for configuring TCP/IP network clients	Workshop participants will be able to • recognize and explain the function of external parts of a standard desktop and laptop • recognize and explain the function of the various ports and cables • recognize and explain the function of the internal parts of a standard desktop and laptop • understand and evaluate computer specifications (chip types, memory, speed, storage, 32- vs. 64-bit) • define important hardware terms • demonstrate the ability to do basic maintenance (for instance cleaning, adding memory, replacing basic components) • find reliable sources for reviews and purchasing
Section II: Networking Configuration and Security Skills	***Section II: Software and Security***
Workshop participants will be able to • understand the basics of wireless networking protocols and security • log in and configure typical wired and wireless routers • configure a router for internet access • connect computers to form a peer-to-peer wireless network • use networking utilities to analyze, diagnose, and document networks • demonstrate the ability to configure segmented public/staff library networks for security • understand drive mapping concepts and map a network drive • implement basic backups, security, and restoration procedures	Workshop participants will be able to • understand the basics of BIOS security (settings, passwords) • describe the function of the operating system • understand the function of device drivers; install printers • demonstrate the ability to update operating system, drivers, etc. • understand the importance and proper use of antivirus, anti-malware, and other security software • evaluate public access computer systems such as time and printer management (Insight) and system restoration software (such as Deep Freeze, Clean Slate, Drive Vaccine, etc.) • implement basic backups, security, and restoration procedures

Start with the Best Partners

The GLB grant is using the common and powerful practice of train the trainer with a slight twist. While the training curriculum is important, gathering the right team might be equally as vital.

In the process of developing the toolkit, the project team discovered a curious situation: while most state library–level staff had a high degree of confidence in helping lead users through the toolkit questions, not all staff felt confident enough in their own knowledge and skills to make recommendations to the library to create its Broadband Improvement Plan (BIP). These staff members tended to be knowledgeable, highly skilled, and invested enough to help a library work through the TGL process but stopped themselves short when the time came to turn the assessment activities into long- and short-range plans. This situation led the project team to encourage interagency collaboration as a path to toolkit implementation success.

The model for collaboration came quite naturally and early in the project. The first site visits for the TGL grant were performed in Nebraska, bringing together Holly Woldt of the Nebraska Library Commission (a state library organization) and Tom Rolfes of the Nebraska Information Technology Commission (a research and education network) for the very first time. As they logged hundreds of miles of dashboard time together visiting libraries for the TGL process, they found that not only do they have complementary skills, but they also have a shared dedication to help facilitate community transformation through schools and libraries.

Woldt says the toolkit process is like "gathering around the kitchen table, but at the library,"[3] noting how it creates opportunities to gather people together around a topic of shared interest. In addition to convening conversations at the library level, Woldt and Rolfes also used the toolkit to help leverage their combined expertise and areas of influence to spark positive change in the state.

One of those ideas for positive change led to the Sparks project, a $25,000 IMLS grant to create a fixed-base wireless connection between a local school district building and a public library in five rural Nebraska communities.[4] The IMLS Sparks grant

Figure 4.1
The logo for the Texas State Library and Archives Commission's (TSLAC) You Can Do I.T. program, featuring "I.T. Heidi" artwork conceived and created by Henry Stokes.

(subtitled "Nebraska Schools and Libraries: Breaking the Ice and Igniting Internet Relationships") was designed to kindle partnerships between schools and libraries and, through internet sharing, to help narrow the homework gap (the barriers faced by students when working from home without reliable internet connectivity)for public K–12 students.[5] In these communities, the libraries were able to tap into the higher bandwidth capabilities of the local schools. The experience with the Sparks grant led to further collaboration on connectivity improvements for libraries in the state.

While the partnership between Woldt and Rolfes resulted in significant impacts for users in Nebraska, perhaps even more importantly it demonstrated how powerful the right pairing of agencies and complementary skill sets can be in bringing the toolkit to users in the field. The TGL experienced the power of similar pairings in pilot visits to many states, notably Arizona, New Mexico, Pennsylvania, and others. In these cases, a representative from a state library organization and a representative from a research and education (R&E) network (or a technical person from a state university) formed the team. In other cases, we gathered a state library rep, an R&E rep, and a tribal IT professional to work with a local library.

Train the Trainer

The GLB project team believes this formula (forming a team from complementary library and technical organizations to perform toolkit visits) is replicable. As of summer 2021, the curriculum is under development. The training design incorporates efforts to identify and gather the right partners before teaching best practices in administering the toolkit. Next steps are:

- Identifying potential partners in regions (including state and tribal boundaries). These partners are ideally at least two subject matter experts with complementary skills: a library expert, and a technology expert. The partners may come from state library organizations, state departments of education, tribal libraries, tribal government, research and education networks, schools, and other organizations.
- Bringing these partners together informally to explore possible collaboration.
- Delivering technology training curriculum and activities to the partners based on the toolkit and updated training materials.
- Providing advice and guidance to partners throughout the GLB grant period.

The project team plans a combination of remote and in-person training opportunities beginning in late 2021 and continuing throughout the grant period.

A Toolkit for All Libraries

Though the toolkit has been developed with the needs of rural libraries in mind, creative trainers will see opportunities for staff development in all types of libraries.

As demonstrated throughout this report, users have found great value in the TGL toolkit, and it has been embraced, used, and adopted by many libraries and organizations. But still, many library leaders keep technology at an arm's length.

Simply put, technology is increasingly integral to all library operations—even our lowest-tech libraries have some level of reliance on technology for simple operations, let alone the expectation of public access to computing devices, Wi-Fi, and the internet. At best, not understanding technology puts libraries at a disadvantage, and at worst makes them hostage to a

seemingly mysterious and unknowable body of knowledge and practical skills.

Happily, the toolkit has proven to be a catalyst for breaking boundaries and welcoming library staff of all technology skill levels as members in good standing of the technology club. This goes beyond simple skill-building. Harnessing technology allows the library to fully optimize this essential resource to serve patrons as it would any other, including the library budget, the library building, services such as outreach, and more.

Here are several examples of how the toolkit leads to transformational improvements for libraries.

"The More You Know" is a popular internet meme that plays on 1980s era public service programming for young people.[6] While the meme is amusing, like all good humor it is based in truth. Knowledge is indeed power.[7]

This concept plays out in simple yet powerful ways.

One library I worked with reported a very inconsistent Wi-Fi signal at the front of the library and had received frequent patron complaints about the lack of reliable wireless service in that area of the building. The library director previously reported this issue to her tech support person, who felt that things were "working fine" every time he checked. (Intermittent issues are one of the biggest challenges for busy tech support people, who often need to reproduce a problem before they can solve it.)

After our site assessment, we spotted the likely culprit. The library building is rectangular, and the library's single combination router/Wi-Fi access point was located at the back of the library, far away from the patron area in the front. Armed with new vocabulary and a basic understanding of how Wi-Fi works, the library director was able to communicate the issue more clearly to her tech support person and even offer suggestions on how to improve the signal (e.g., "Since our Wi-Fi service is running on the 2.4 GHz band, which limits its range, perhaps we need to move the access point to the center of the building or consider a different system that supports multiple Wi-Fi access points to get better signal coverage throughout the building"). The more you know indeed: the combination of knowledge and vocabulary helped the library director collaborate with her tech support person to improve Wi-Fi for patrons.

In another case, a library tech support person wanted to prevent the library's Wi-Fi from "leaking outside" the building into a neighboring café, arguing that the café and its customers were unfairly benefiting from the library's internet access. After discussing how Wi-Fi works, our conversation turned to the public benefit of a service like Wi-Fi that does not need to be constrained by physical space and indeed can be a way for the library to show how it is an "anchor tenant" that plays a large role in the local community when it comes to meeting community internet access needs. After the discussion, the library director felt sharing the Wi-Fi with their neighbor was a benefit for all and could also serve as a way to market the library to new users by providing an innovative entry point to the library and its other services.

In another example, during a site visit to a library with poor connectivity, we learned that the city government (which the library was a part of) was bringing in a fiber optic connection to town hall, which was about one-half mile down the street. I thought this was good news, but the library quickly explained that it wasn't a part of that project and did not expect to receive any connectivity. A quick inspection showed that the fiber route ran through the library's back alley area, and it wouldn't be too difficult to arrange for a stop at the library as part of the network plan. In this case, our conversations focused on strategies for advocacy (helping the library craft the language to show why it would benefit the entire community to include the library on the city fiber) as well as the technical knowledge (the techniques used to create a fiber access at the library as part of the data network design).

As its primary focus, the TGL project has demonstrated how rural and tribal libraries directly benefit by having a higher understanding of technology. In the GLB grant, a new target audience emerged: urban or semi-urban libraries that do not have the benefit of centralized or consistent technology support.

From the real-world examples above (as well as other examples throughout this report), it's not a stretch to imagine how the toolkit could help libraries in more populated areas, including urban centers. Any library armed with the essential knowledge of basic technology functions and the vocabulary to describe problems or desires to technical and nontechnical people can tap into a world of opportunity to improve its technology support and advocate for better broadband and more powerful and equitable digital services for its community.

Library Organizations Using the Toolkit

The toolkit has been used throughout the US. The resources within the toolkit itself and the Creative Commons license present ample opportunities for adapting it to organizational needs. Projects at the state or consortial level include simple web page portals to the toolkit's resources, statewide implementation of surveys, or research partnership with a university LIS program.

Although it's difficult to track all uses and iterations of the toolkit materials, the project team has

identified the following uses of the toolkit in the wild:

ALASKA STATE LIBRARY

The Alaska State Library has published its own web resource on the toolkit and used it more recently as a basis to prepare libraries for possible technology funding opportunities.[8]

ARIZONA STATE LIBRARY

The toolkit was used as part of "You Can Do I.T." hands-on technology training throughout Arizona (taught by Block), with additional digital inclusion content from Nicole Umayam, digital inclusion library consultant at the Arizona State Library, Archives, and Public Records.[9]

ARKANSAS STATE LIBRARY

In Arkansas, the state library incorporated the toolkit into its trainings. It made a connection between an upcoming E-rate cycle and using the toolkit to make librarians knowledgeable about the networking equipment they need that they can get with the next funding cycle. In June 2021 the toolkit was used as the basis for an assessment and buyer's guide webinar to assist libraries in technology purchases under the American Rescue Plan Act.[10]

IDAHO COMMISSION FOR LIBRARIES

The Idaho Commission for Libraries is offering a Broadband Toolkit Improvement Program (BTIP), through which Idaho public libraries can receive $500 to put toward the implementation of their action items determined through their Broadband Improvement Plan.[11]

MASSACHUSETTS BOARD OF LIBRARY COMMISSIONERS

The Massachusetts Board of Library Commissioners conducted a public library internet bandwidth survey in February 2019. Of 370 libraries contacted, 214 provided information about their internet service providers, ran internet speed tests, and provided estimates of staff and patron perceptions with the library's connectivity. Questions were based on the Toward Gigabit Libraries toolkit.[12]

MEASURING LIBRARY BROADBAND NETWORKS (MLBN)

Researchers at Simmons University, along with Internet2, Measurement Lab (MLAB), Code for Science and Society, and the Community Informatics Lab (CI Lab), examined how public libraries can utilize broadband measurement tools and training materials to develop a better understanding of the relationship between library network infrastructure and digital services.[13]

MONTANA STATE LIBRARY

"In 2019, the Montana State Library contracted with Saddle Peak Technologies to collect data for the Internet2 Toward Gigabit Libraries Toolkit. The contractor visited Montana public libraries to gather information on broadband connectivity. A research team at the Simmons University School of Library and Information Science led by Dr. Colin Rhinesmith analyzed the data to help answer questions about libraries' connectivity and related IT infrastructure in Montana."[14]

NEBRASKA LIBRARY COMMISSION

The first TGL site visit in Nebraska modeled a key library-and-tech partnership model, teaming Holly Woldt from the Nebraska Library Commission and Tom Rolfes of the Nebraska Information Technology Commission. The collaboration produced more outreach and grant opportunities in Nebraska. The commission has hosted several webinars on the toolkit, and the toolkit is used as part of the E-rate application process in the state.[15]

NEW YORK STATE LIBRARY

The New York State Library is using the toolkit (spring/summer 2021) as a basis for a pilot project for remote network assessments.

OKLAHOMA (ONENET)

OneNet shared information about the toolkit on its website.[16]

PENNSYLVANIA/KINBER

In Pennsylvania, KINBER (the Keystone Initiative for Network Based Education and Research) used a Library Services and Technology Act (LSTA) grant to remix and tailor the toolkit for Pennsylvania libraries and in 2021 continues to provide training using toolkit materials.[17]

SOUTH DAKOTA STATE LIBRARY

The South Dakota State Library has published its own web resource on the toolkit. The toolkit has been used as a basis for technology education and advocacy training in the state, including hybrid live/remote sessions for fifty-plus library staff members throughout the state in early 2021.[18]

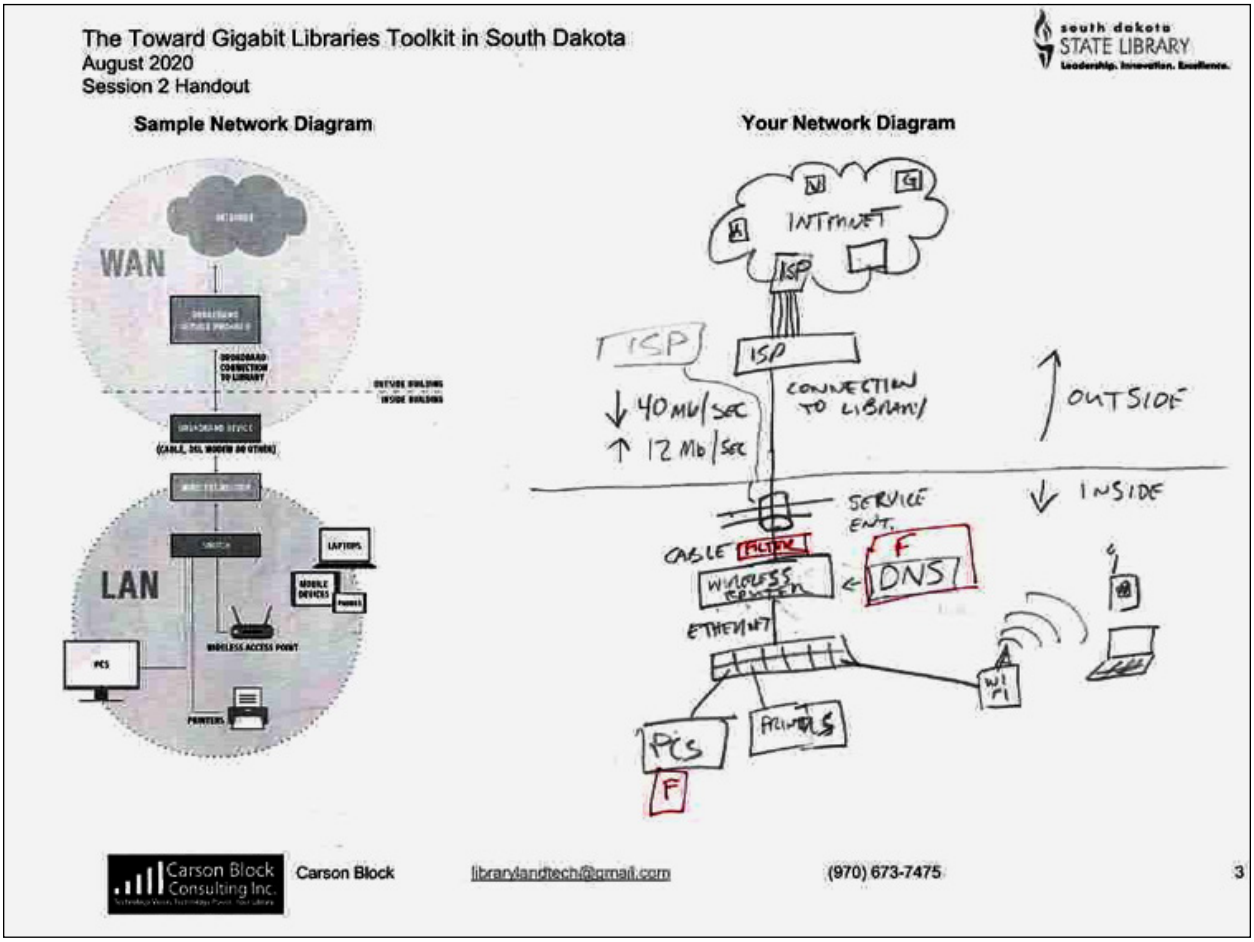


Figure 4.2
An example from a presentation to South Dakota libraries showing how the new network diagram handout can be used by libraries as a guide in drawing their own network diagrams.

TEXAS STATE LIBRARY AND ARCHIVES COMMISSION

Portions of the original toolkit were taken from Carson Block's work with the Texas State Library and Archives Commission "You Can Do I.T." hands-on technology training program for library staff. The "You Can Do I.T." core program objectives and logo were created by state E-rate coordinator Henry Stokes.[19]

WYOMING STATE LIBRARY

The Wyoming State Library shared information about the toolkit on its website.[20]

Reuse and Remix to Drive Impact

When the toolkit is *reused*, the results are what you might expect: users simply distribute or work through the published project documents as they currently exist.

When elements of the toolkit are *remixed*, users are encouraged to pluck applicable sections or elements of the toolkit to work into their own assessment, training, and advocacy work and to further adapt and improve the content.

The project team envisioned that this content flexibility would be especially useful for state library organizations, research and education networks, library consortia, and other organization that would like to customize the toolkit materials.

After the TGL grant ended, both Block and Stenberg provided unofficial support for the project, with Internet2 hosting the toolkit and other project resources on its website, and both answering questions from state agencies and others (including performing several webinars).

Block continued to promote the toolkit and, using the remix philosophy, developed more detailed worksheets for users.

The next version of the toolkit will include these new worksheets developed by Block, including an easier-to-use network diagram worksheet (seen in figure 4.2

with an example of a hand-drawn network diagram), a speed test log designed to capture more useful data, and a "rack diagram" example showing users how to sort out and document the specific equipment in their network closets.

Notes

1. Texas State Library and Archives Commission, "You Can Do I.T. Basic Library Technology Series," https://www.tsl.texas.gov/ld/workshops/youcandoit.
2. Carson Block, Cindy Fisher, and Henry Stokes, "You Can Do I.T.: Raising Tech Confidence and Competencies in Rural Texas," in *Tech for All: Moving Beyond the Digital Divide,* ed. Lauren Comito (Lanham, MD: Rowman & Littlefield, 2019), 67–78.
3. Holly Woldt, conversation with author.
4. Nebraska Library Commission, "Sparks: Nebraska Schools and Libraries: Breaking the Ice and Igniting Internet Relationships," http://nlc.nebraska.gov/grants/sparks/about.aspx.
5. Clare McLaughlin, "The Homework Gap: The 'Cruelest Part of the Digital Divide,'" National Education Association, April 20, 2016, https://www.nea.org/advocating-for-change/new-from-nea/homework-gap-cruelest-part-digital-divide.
6. "Amanda B.," "The More You Know," Know Your Meme, 2014, last updated August 1, 2021, by "13acab12," https://knowyourmeme.com/memes/the-more-you-know.
7. Readers are invited to do their own search: "knowledge is power meme."
8. Alaska State Library, "Internet and Technology Inventory Toolkit: Towards Gigabit Libraries: Home," last updated August 10, 2021, https://lam.alaska.gov/tgl.
9. For an example, see Arkansas State Library, "You Can Do I.T.! Arkansas," https://www.library.arkansas.gov/events/you-can-do-i-t-arkansas/.
10. Arkansas State Library, "ARPA Technology Assessment and Buyers Guide with Carson Block," https://www.library.arkansas.gov/events/arpa-technology-assessment-and-buyers-guide-with-carson-block/.
11. Idaho Commission for Libraries, "Broadband Toolkit Improvement Program (BTIP)," https://libraries.idaho.gov/digital-inclusion/btip/.
12. Massachusetts Libraries, "2019 Telco Survey Results," https://mblc.state.ma.us/programs-and-support/e-rate/2019-telco-survey-results.php.
13. "mlbn," "MLBN Open Data and Final Docs Published," *Measuring Library Broadband Networks* (blog), Simmons University, May 17, 2021, https://slis.simmons.edu/blogs/mlbn/.
14. Montana State Library, "Broadband in Montana Libraries," last updated February 2, 2021, https://about.msl.mt.gov/publications/broadband.
15. Nebraska Library Commission, "NCompass Life: The 'Toward Gigabit Libraries' Project Update," YouTube video, 1:03:25, recorded September 2, 2020, posted September 3, 2020, https://www.youtube.com/watch?v=8dk2o_3cmN8.
16. OneNet,"Internet2LibraryTechnologyToolkit,"https://onenet.net/internet2-library-technology-toolkit/.
17. KINBER, "Toward Gigabit Libraries in PA," https://kinber.org/toward-gigabit-libraries-in-pa/.
18. South Dakota State Library, "South Dakota State Library Services," LibGuide, last updated August 10, 2021, https://libguides.library.sd.gov/services/toolkit.
19. Texas State Library and Archives Commission, "You Can Do I.T. Basic Library Technology Series," last updated September 14, 2017, https://www.tsl.texas.gov/ld/workshops/youcandoit/networks.
20. Wyoming State Library, "Toward Gigabit Libraries Toolkit Available," November 20, 2018, https://library.wyo.gov/toward-gigabit-libraries-toolkit-available/.

Scaling the Toolkit for Greater Reach

On the merits of the results of the Toward Gigabit Libraries (TGL) grant, in 2020 the IMLS funded a new grant, called Gigabit Libraries and Beyond (GLB; logo in figure 5.1) to further scale the project to impact more libraries in the US.

The purpose of the new project is to further leverage IMLS investment in the agency-level objective of building the capacity of libraries by scaling the successful TGL program to more US rural and tribal libraries and improving the well-being of their communities.

The key concept of the GLB project is to extend the use of the toolkit and training to empower and equip state library staff, move more significantly into tribal areas, and train the trainers.

In 2019, subject matter experts who contributed to the development of the TGL project were asked if the toolkit has been effective for the libraries they serve and whether and how the toolkit should be scaled. Respondents enthusiastically confirmed the positive results of the toolkit and offered specific suggestions to address unmet needs, including connecting with state library organizations, tribal organizations, and research and education (R&E) networks to deploy the toolkit.

The GLB project's activities include the following:

- Perform minor updates to the TGL toolkit. The library community has been using the open-source toolkit since 2018, often remixing toolkit content into training materials at local, regional, and state levels. The project will continue to learn from reuse and remix activities to identify areas of improvement and refinement to the core toolkit.
- Expand toolkit use and effectiveness in rural and tribal libraries. The project will increase outreach and education opportunities for rural and tribal libraries, training materials, and train-the-trainer activities.
- Formally connect state library organizations, R&E networks, and other partners for toolkit deployment. The project will continue TGL's practice of convening meetings of state library organizations and technology experts from R&E networks, universities, and tribal entities while building pathways, methods, and opportunities to sustain and expand these connections demographically and geographically.
- Enhance tribal library outreach. Of the fifty-eight libraries visited in the TGL project, eleven were tribal. This project will build upon and expand the use of the toolkit in tribal libraries.
- Simplify the toolkit and seek opportunities to make the content sustainable. Although TGL toolkit participants reported that it was easy to use, the GLB project will increase accessibility to promote easier understanding.
- Expand partnership opportunities. The project will engage in outreach to potential partners, including state library organizations, R&E networks, universities, the Association for Rural and Small Libraries, the Association of Tribal Archives, Libraries, and Museums (ATALM), and tribes and tribal universities.

Figure 5.1
The Gigabit Libraries and Beyond logo; used for the second grant cycle.

- Explore libraries that are located in potential urban tech deserts and other library environments where the toolkit might be of benefit.

The Gigabit Libraries and Beyond Project Team

Project Codirectors

- Carson Block
- Stephanie Stenberg—Stephanie Stenberg is director of Internet2's Community Anchor Program, where she works with regional networking partners, community anchor institutions, and Internet2 membership organizations to support mutually beneficial goals of bringing networking, trust and identity services, and advanced applications to community anchor institutions nationwide.

Project Support

- Therese Perlowski—Therese Perlowski is the program manager of the Internet2's Community Anchor Program, where she works with internal and external stakeholders to demonstrate the value of advanced networking and identity services to community anchors across the nation.
- Bonnie Nichols—assistant, Carson Block Consulting, Inc. Bonnie Nichols provides office, research, and document assistance to Carson Block, after working in the circulation department of her local library for almost ten years.

The mission of the Community Anchor Program (CAP) is to connect regional research and education (R&E) networks with schools, public libraries, colleges and universities, health care, museums, and other institutions and advance broadband access and use throughout the country. This program works to:

- Connect community anchor institutions to advanced R&E networks
- Convene the Internet2-enabled formal and informal education community nationwide
- Catalyze effective uses of advanced networks to serve education
- Communicate impactful stories of learning and transformation[2]

Active Project Advisory Boards

There is a spectrum of roles for project advisory boards. For some projects, it's appropriate to have members who focus on the big picture and offer advice on how to steer projects in the right direction. Starting with the TGL project, the team wanted a group that certainly possessed a big-picture view, but perhaps more importantly deep expertise in library technology and technology used by tribal libraries, as well as a willingness to roll up their sleeves.

Both the TGL and GLB projects have benefited from strong advisory boards: actual subject matter experts contributing strong and insightful ideas for all aspects of the toolkit, including topics, approaches, content, resources, and edit suggestions.

Having a group with such expertise offered a welcome challenge: finding the right middle ground when suggestions from one board member were seemingly in conflict with suggestions from another, or when a suggestion might lead the toolkit away from the goal of being layperson-friendly. An old joke that applied to many fields certainly resonates here: "How many technologists does it take to change a light bulb? One to change it, and four others to explain how it could have been done better." To the uninitiated, it may seem that technology is a cut-and-dried process. Those in the field, however, know that there are many possible technological paths that could address a particular need. This tension was healthy; considering and balancing diverse opinions proved to be an excellent way to refine the toolkit content in an iterative manner.

One area in particular that the project team struggled with was the fine line between explaining a technology item too simply (glossing over important details) or explaining it too far in the weeds (sharing unnecessary details). The strong, expert, and sometimes opposing voices from advisory board members created a healthy tension to find the right middle path for the toolkit.

Of course, not all suggestions or ideas made it into the toolkit. The project team created a log of all suggestions, discussed and examined them, and then decided what action (if any) would be taken as a result. Naturally, some suggestions were an easy yes; many were difficult to fit in and needed more attention; and others we were unable to adopt (see figure 5.2).

In January 2021, a project advisory board composed of subject matter experts (figure 5.3) was convened for virtual meetings over two days. Advisory board members shared their experiences with the toolkit; provided suggestions for edits and improvements to the toolkit; discussed strategies for connecting with state library organizations, R&E networks, and others; participated in breakout groups to determine strategies for outreach to tribes, urban libraries, and rural libraries and ideas to simplify the toolkit; and evaluated who or what perspectives might be missing from the advisory board.

One key outcome from the advisory board meeting was suggestions for restructuring the toolkit to make it more friendly, accessible, and future-proof.

Gig Libraries Toolkit - Incremental Changes 2020-2022

File Edit View Insert Format Data Tools Add-ons Help Last edit was made on May 18 by Stephanie Stenberg

F47 Would be great to discuss the community support angle at a team meeting- Stephanie can do the follow up work after the meeting

	A	B	C	D	E	F	G
1	Date	Source	Page/s OR Whole Document	Issue (pertains to this document	Assigned to	Resolution/ Action/ No Action	Rslvd? (X for yes, S for started)
2	1/13/21	Dylan Baker	33	Page 33 - Question 1 text and answers to Q1 text don't match context	BN		
3	1/13/21	Dylan Baker	5	Page 5 -Should emerging satellite broadband technologies like Amazon's Project Kuiper and SpaceX's Starlink receive a special mention to distinguish them from traditional satellite broadband? (Carson's Note: Referring to projects in general terms)	CB	"Non-terrestial"	S
4	1/13/21	Matthew Rantanen (originated comment)	6	Page 6 - this selection for satellite [internet speeds] should be broken down into Geosynchronous Earth Orbit or GEO (Think HughesNet, WildBlue, ViaSat) and Low Earth Orbit or LEO, like Starlink etc. The key difference is the latency in transporting information. LEO allows bi-directional communications in real-time, the GEO has a lag time that restricts this type of communication being easy and smooth.	CB	Tie into Dylan's page 5 Conversation; 5/4 CB looking for authoritative and comprehensive source	
5				Tom Rolfes - I concur with Matthew's comment. Also, the SpaceX/StarLink LEO pilot has been tested at up to 40Mbps upload and 100Mbps download with less than 25milliseconds in latency.			
6				Sharon Strover - Yes, given new developments, LEOS would be worth noting (they received $ from USDA)			
7		Tom Rolfes	6	Tom Rolfes - Rural Digital Opportunities Funding (RDOF)	SS		
8	1/13/21	Dylan Baker	41	Page 41 - Consider a question asking if/how the library collects Wi-Fi usage statistics with information about how to get those statistics by logging into the Wi-Fi access point's administrative interface.	CB	no standards for wifi counts; need too address PLA situation and different methods to count	
9	1/13/21	Dylan Baker	44	Page 44 - Might be beyond the scope of the Toolkit, but consider a question/information on how to secure public computers from changes made by patrons using tools like Faronics Deep Freeze, Horizon Datasys Reboot Restore Rx, or Windows 10 built-in Unifed Write Filter (UWF).	CB	Yes; but be careful that we dnt wander too much from scope; maybe best practices	
10		Stephanie Stenberg	73	Page 73 - Update with tribute to James	BN		
11				Carson: RIP and tribute to James, add Stephanie; posthumously awarded the Rose-Werle award			
12	1/13/21	Tom Rolfes	73	Page 73 - 12 states including....Nebraska, ... Do you think that Nebraska could be mentioned in the Acknowledgements?	BN		
13	1/13/21	Tom Rolfes	Whole	Throughout Document - Throughout the entire document, make "E-rate" vs. "E-Rate" consistent. "E-rate" is more common, but both can be found in FCC and USAC references.	BN	All "E-Rate" is changed to "E-rate" (excepting web addresses)	
14			Whole	WiFi - not wifi Wifi etc.	BN	All "wifi" (and other types) changed to "WiFi" (excepting web addresses)	x

Figure 5.2
A screenshot of the spreadsheet used by the GLB project team to discuss and track incremental edits to the toolkit.

One consistent experience reported by users is that once they start using the toolkit, they have excellent experiences. However, for the uninitiated, just cracking the cover open could be one of the biggest barriers to adoption. Board members offered substantial input for making the toolkit user-friendly, as well as ideas for approaching tribal libraries and for meeting the needs of urban libraries.

Several excellent suggestions for making the toolkit more accessible to users included the following:

- Reformat the toolkit into smaller, more manageable chunks to make working through it much less intimidating and make dropping in on different sections as needed easier.
- Make the appearance friendlier by using more graphics; consider adding graphics to the glossary.
- Create a workflow to "build as you go" when completing the toolkit. As a user works through the toolkit and discovers needs, have an easy path to start creating the list of services, maintenance, or equipment needed to address those needs.
- Create a basic version of the toolkit to create a friendlier on-ramp for tech assessments. (One-room/one-person libraries don't necessarily need the full toolkit at first.)
- Create a more effective digital version of the toolkit.
- Bridge some gaps between the Broadband Funding section and the Broadband Improvement Plan by somehow adding information about broadband partners and organizations in areas near the library and integrating advocacy and rationales for better local funding for broadband.
- Add a section about exploring community needs and how the library might be able to help before even starting the toolkit.
- Document pathways libraries can take to form their own local technology support network, including other organizations and opportunities for volunteers to lend a hand.
- Suggest price ranges for the equipment and sources to help estimate costs for gear.

Figure 5.3
A screenshot from a Zoom meeting with the advisory board of the GLB project, featuring subject matter experts from around the country.

Board members also suggested strategies to create a deeper reach to tribes, including culture-appropriate approaches, and ideas to forge stronger relationships

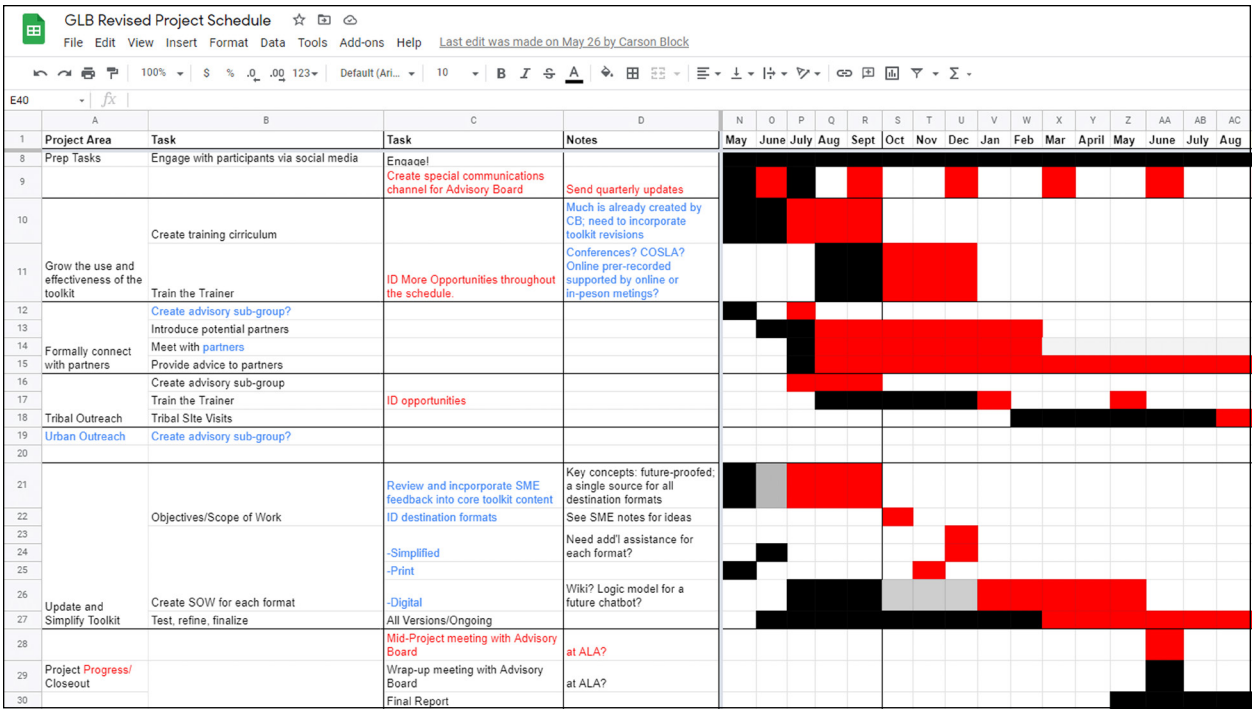


Figure 5.4
A screenshot of the revised schedule for the GLB project. The project team used varying color text and time blocks to compare and contrast adjustments to the project schedule as a result of COVID impacts.

between state libraries and tribal libraries. These suggestions included the following:

- Document how some states (including New Mexico, South Dakota, California, and others) have created formal connections between state library organizations and Native American communities to allow tribal libraries to participate in E-rate discounts.
- Consider what would provide incentives to complete the toolkit, including increased funding opportunities.
- Form a subcommittee to focus on outreach to tribes to ensure that the toolkit is further developed as a tool for self-empowerment, not an external to-do list imposed from outside of the tribe.
- Survey the original tribal pilot participants, see how they used the toolkit after the initial pilot, and share their outcomes and challenges.
- Invite the initial pilot libraries to participate in train-the-trainer activities.
- Show that a toolkit outcome is creating avenues to long-term support, lasting partnerships, and ongoing opportunities for effective technology for users, increased opportunities for partnerships, and ongoing support for libraries.

The board also offered suggestions on how to properly focus GLB efforts on the new exploration of urban libraries. Group members suggested that the most important areas for urban outreach are probably not the biggest US cities, but larger library systems in smaller urban areas (including those surrounding big-city library systems) in need of help. Guidance in this emerging area included the following:

- Understand that the toolkit is probably not right for the largest urban centers in the US; these large library systems tend to have highly sophisticated and specialized technology support already.
- Recognize the intersectionality of some urban systems; some might be part of multiple technology support organizations (individual libraries, libraries that are part of a consortium, and others), yet there may still be gaps in the technology support available.
- As a possible target, consider bedroom communities around larger cities—places that are technically urban but don't have the same level of support as larger city library systems.

Next Steps

As with the rest of the world, COVID has impacted the launch sequence for the GLB grant, requiring remote work for activities that were designed to be performed in person. Project managers have pivoted by

developing new processes and techniques for remote engagement using prerecorded video, videoconferencing, new worksheets, and interactive workshop design to help people on both ends of the connection communicate powerfully.

Interestingly, COVID may have presented more opportunities to spread the word about the toolkit via webinars. In late 2020 and early 2021, project managers presented the toolkit to multiple audiences.[3] Even as changes to public health conditions allow for live presentations and in-person activities become possible, a hybrid approach to outreach (online and live) is likely to continue throughout the GLB grant period.

During the first eight months of the GLB project, the team has reworked the schedule multiple times (see figure 5.4) to accommodate a COVID pivot; further tweaks are anticipated.

The project team anticipates that initial toolkit modifications (as suggested by the advisory board and other sources) will be completed by the early fall and a new working copy of the toolkit will be provided for users. As with the TGL grant, the project team will continue to incorporate iterative suggestions into the toolkit until the current GLB grant is complete. Due to the slow start caused by COVID, the project team may also file for a one-year no-cost extension of the GLB grant to allow time to launch and complete in-person activities. Any possible extension must be approved by the IMLS, so the team is also prepared to accelerate in-person efforts if an extension is not granted.

Also planned to be in progress by later summer 2021 is the formation of several subcommittees of advisory board members for tribal, rural, and urban outreach.

The area in most need of startup development is urban outreach; while rural and tribal needs are great, significant work has been done in both areas. Early conversations with our advisory board has indicated that defining the right urban areas and right approaches will take some care (since very large systems are probably fine, but smaller semi-urban or suburban systems may have gaps). The project team looks forward to defining urban outreach in more detail and is buoyed by the experiences that library people of all stripes have reported when using the toolkit to solve their technology problems.

Starting in early 2022, the project teams plan to

- perform more fieldwork and site visits to tribal libraries
- convene state library organizations and research and education partners to implement the toolkit more broadly in states
- launch train-the-trainer activities to equip state library organizations, R&E partners, and tribal libraries to implement the toolkit more widely
- perform ongoing work to make the toolkit more accessible and as future-proof as possible

For readers interested in the toolkit, you can contact Carson at Carson Block Consulting, www.carsonblock.com, or by e-mail at libraryland@gmail.com, or Stephanie Stenberg at Internet2, Contact Us, https://internet2.edu/contact-us/, or at sstenberg@internet2.edu.

Notes

1. Internet2 home page, https://internet2.edu/.
2. Internet2, "Community Anchor Program (CAP)," https://www.tx-learn.net/documents/I2-CAP.pdf.
3. A listing of presentations is provided in the Resources chapter (chapter 6) of this document.

Resources

Article

Spellman, Susannah, James Werle, and Carson Block. "Toward Gigabit Libraries." *D-Lib Magazine* 23, no. 5/6 (May/June 2017). http://www.dlib.org/dlib/may17/spellman/05spellman.html.

Recent Presentations

What's a GIGABIT Library if the Building Is Closed?

OCTOBER 22, 2020

The Toward Gigabit Libraries toolkit and the Gigabit Libraries and Beyond project were featured on episode 19, "What's a GIGABIT Library if the Building Is Closed?" of a webinar series produced by telecommunications consultant Don Means. YouTube video, 1:08:03. https://www.youtube.com/watch?v=C3KM6vUUYxg.

The Toward Gigabit Libraries Toolkit and Broadband Improvement Plan

APRIL 9, 2021

Presentation description: Interested in deepening your understanding of your library's broadband and IT environment and identifying areas that need improvement? Join Internet2's Stephanie Stenberg and Carson Block, hosted by E-rate consultant Emily Hart, to learn how to use this free toolkit and plan. Hosted by Florida Department of State, Division of Library and Information Services. YouTube video, 58:24, https://youtu.be/XehNzzZGyl8.

Understanding and Improving Library Broadband Challenges and Resources with the Toward Gigabit Libraries Toolkit

ALA CORE SERIES, ASSOCIATION FOR RURAL AND SMALL LIBRARIES VIRTUAL CONFERENCE, SEPTEMBER 29, 2020

Presentation description: Interested in deepening your understanding of your library's broadband and IT environment and identifying areas that need improvement? Join Internet2's Stephanie Stenberg and Carson Block, hosted by E-rate consultant Emily Hart, to learn how t9o use this free toolkit and plan. Presentation website, Whova, https://whova.com/portal/webapp/arsla_202009/Agenda/1231150 (requires Whova account); YouTube video, 1:57:14, https://www.youtube.com/watch?v=_bi8a7bg4oQ&feature=emb_logo.

NCompass Live: The "Toward Gigabit Libraries" Project Update

SEPTEMBER 2, 2020

Presentation description: Learn how to improve your library's broadband service with the Toward Gigabit Libraries toolkit! Presentation website, Nebraska Library Commission, http://nlc.nebraska.gov/scripts/calendar/eventshowasp?ProgID=19805; YouTube video, 1:03:25, https://www.youtube.com/watch?v=8dk2o_3cmN8&feature=youtu.be.

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