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

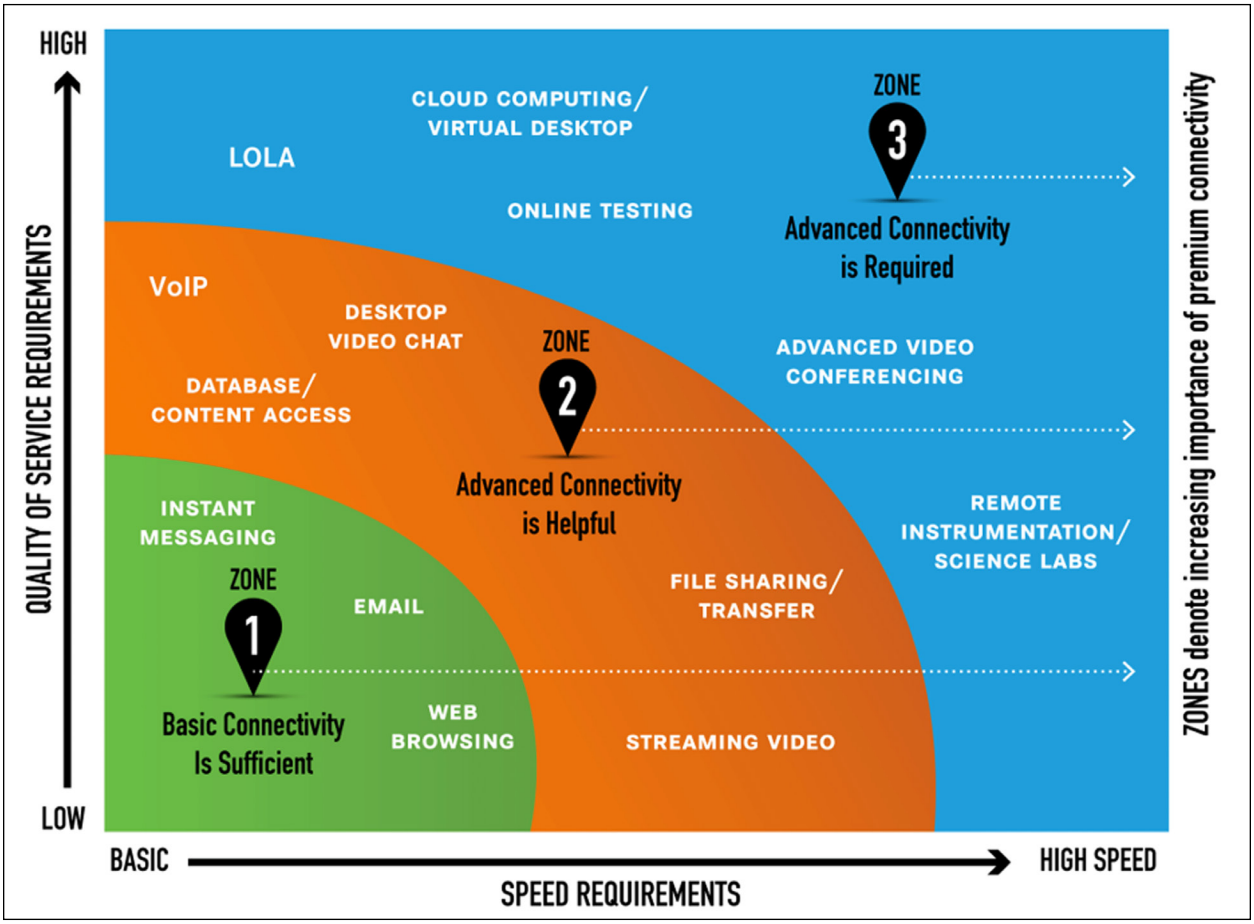


Figure 2.1
Graphic representing the relationship between quality and speed of internet service and what online capabilities they can support.

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

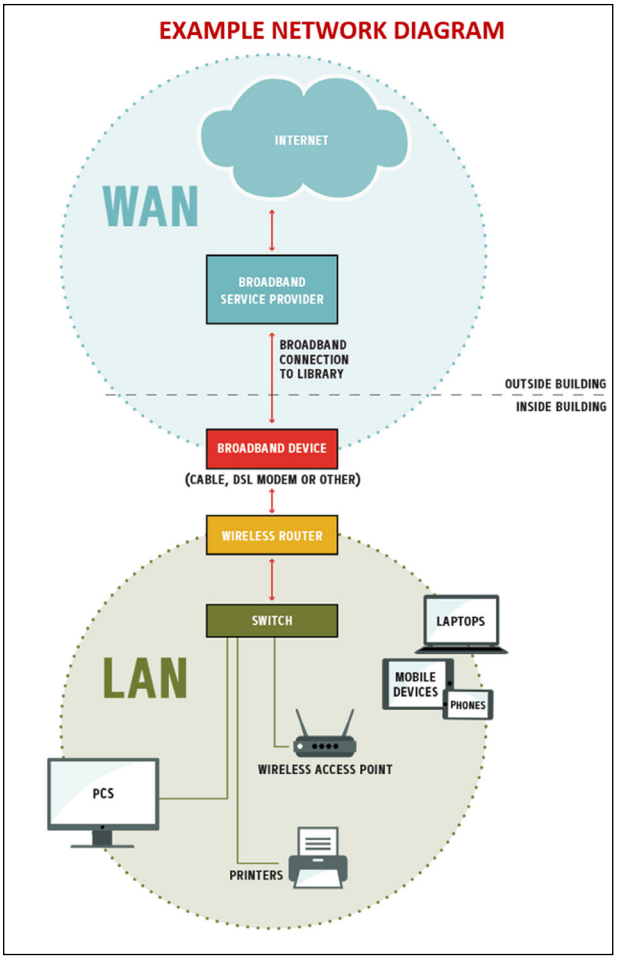
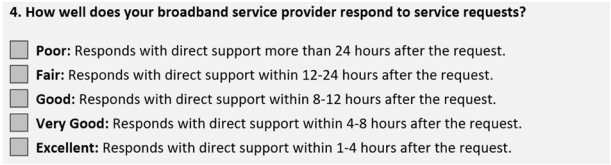


Figure 2.2
An example network diagram from page 15 of the toolkit, which shows users "outside" and "inside" network functions and how they relate to each other.

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).

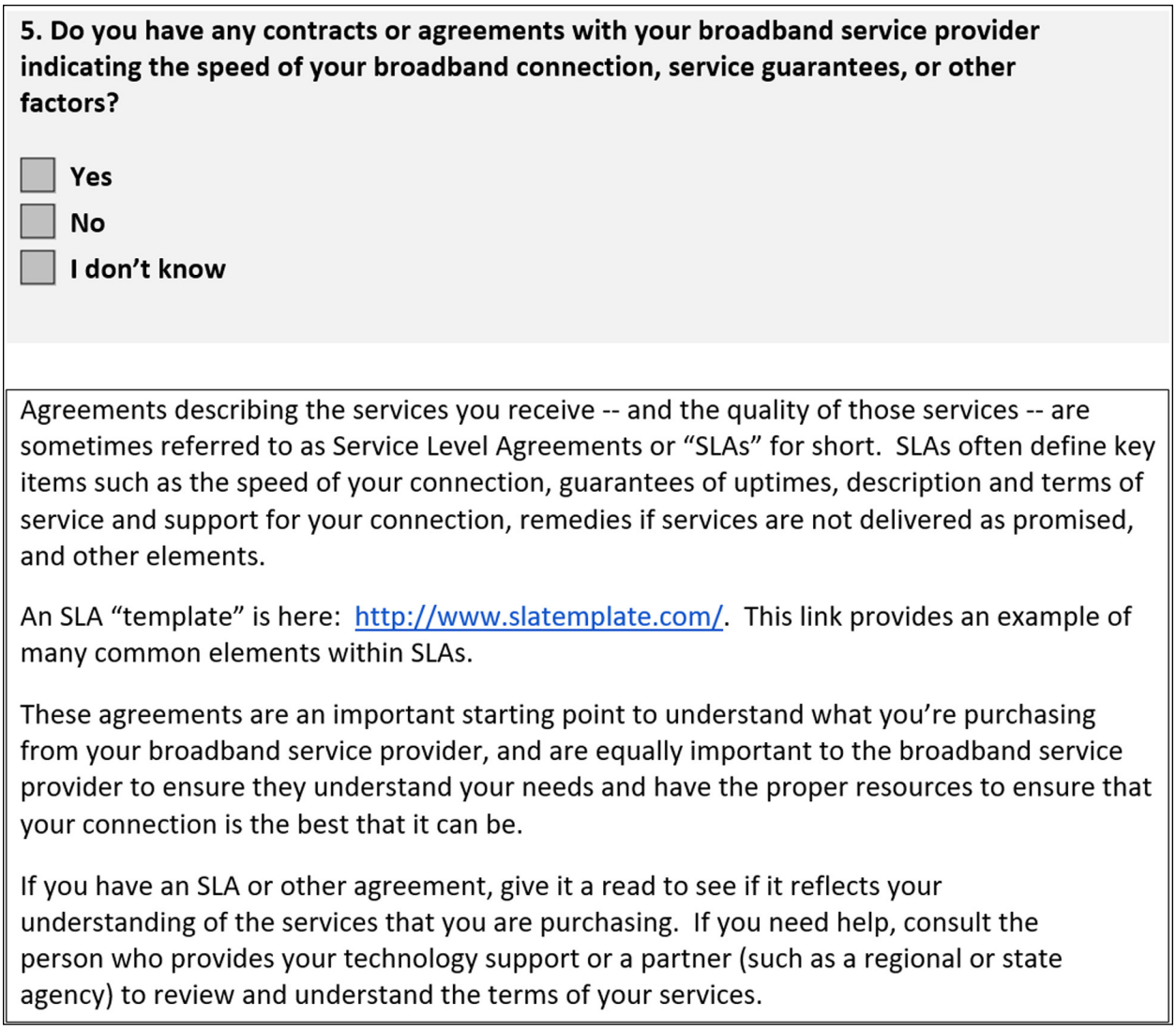


Figure 2.4
An example from page 43 of the toolkit, explaining the importance of a Service Level Agreement (SLA) and giving the users an opportunity to note its existence (or absence).

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.

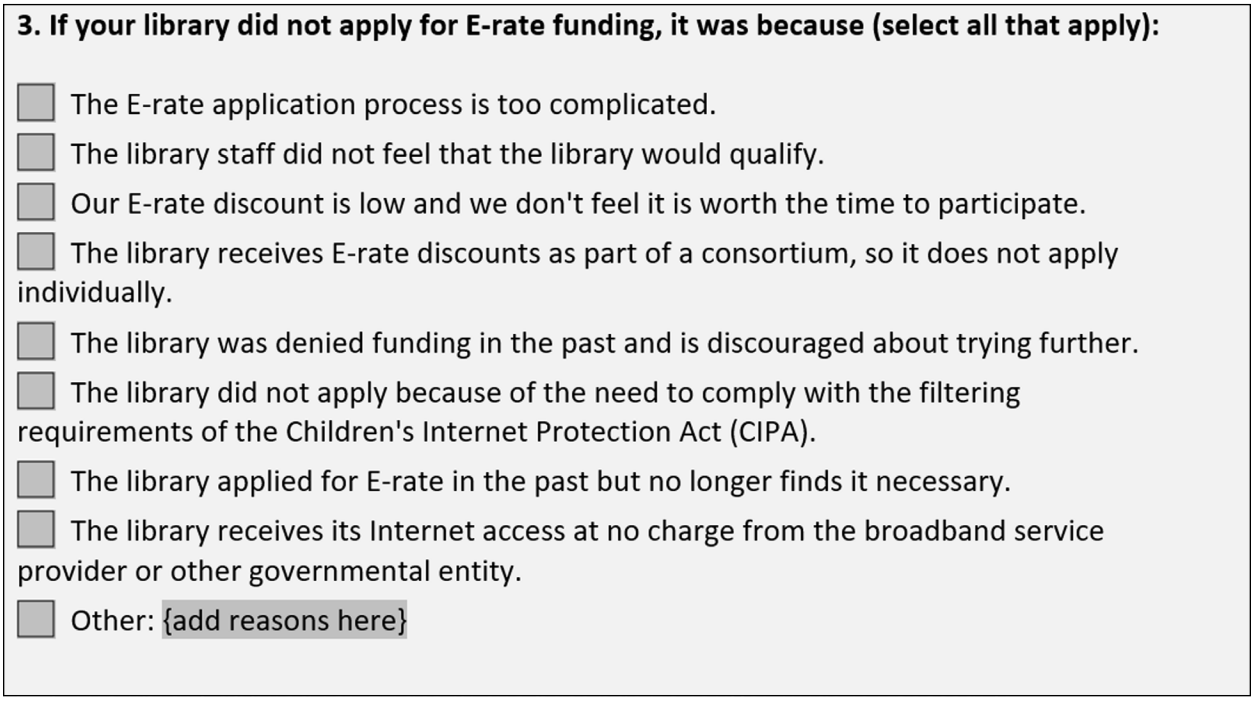


Figure 2.5
An example question from page 47 of the toolkit identifying reasons the library may not have filed for E-rate funding.

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.