INSTITUTE *of*
Museum and **Library** SERVICES

TOWARD
GIGABIT
LIBRARIES TOOLKIT

Welcome to the Toward Gigabit Libraries

A free toolkit to help you understand and improve your library's IT and broadband.

https://internet2.edu/tgl

TOOLKIT

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TOWARD GIGABIT LIBRARIES TOOLKIT

INSTITUTE of Museum and Library SERVICES

Welcome to Internet2's free Toward Gigabit Libraries (TGL) Toolkit. This toolkit is designed for small, rural, Tribal, and urban libraries with limited information technology (IT) support. The Toward Gigabit Libraries (TGL) toolkit helps libraries understand and improve upon their IT environment and broadband services. This project was made possible in part by the Institute of Museum and Library Services (IMLS)[1] through a Laura Bush 21st Century Librarian Program grant (RE-246219-OLS-20).[2] The TGL toolkit is available for free online at https://internet2.edu/tgl.

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EXECUTIVE SUMMARY

The purpose of the (TGL) Toolkit and the entire process, including the Broadband Improvement Plan, is to support your library staff's understanding of your library's broadband connection and related information technology (IT) infrastructure.

Libraries are an integral part of the digital inclusion ecosystem. Digital inclusion can be thought of as a three-legged stool with legs representing internet access, computer devices and digital literacy (also called digital skills and readiness). Each leg is critical–without one, the stool will fall.

Libraries make essential broadband services, devices, and technology training available to everyone. Using the Toward Gigabit Libraries toolkit helps libraries better serve their communities by helping them understand, evaluate, and improve their IT and broadband environment.

Americans still lack access to broadband, devices, and training

Nearly 14.5 million U.S. households do not have home broadband. "Broadband" is defined by the Federal Communications Commission (FCC) as 25 Mbps download and 3 Mbps upload speeds.[1] In its 2021 Broadband Deployment Report, the FCC found that over 17% of rural areas and nearly 21% of tribal lands did not have access to broadband service.[2] On rural Tribal lands, only 46.6% of housing units have access to fixed broadband (25/3 Mbps) service– as compared to 73.3% of housing units in non-Tribal rural areas.[3]

Urban residents are often shut out from connectivity because of the high price of service, even when connectivity is available -- almost three times as many urban households (13.6 million) lack a connection as compared to rural households (4.6 million).[4]

Income plays a huge factor in internet access–households that make less than $35,000 are 6.8 times more likely to have no internet access as compared to households making $75,000 and above.[5] Moreover, household income was the biggest factor in measuring digital readiness.[6] Digital readiness looks at device and internet access, digital resourcefulness and utilization, and internet benefits and impact. We also know in today's society, 25/3 is not sufficient for a household where multiple family members may be doing homework, watching Netflix, conducting a job search, or attending a telehealth appointment all at the same time.[7]
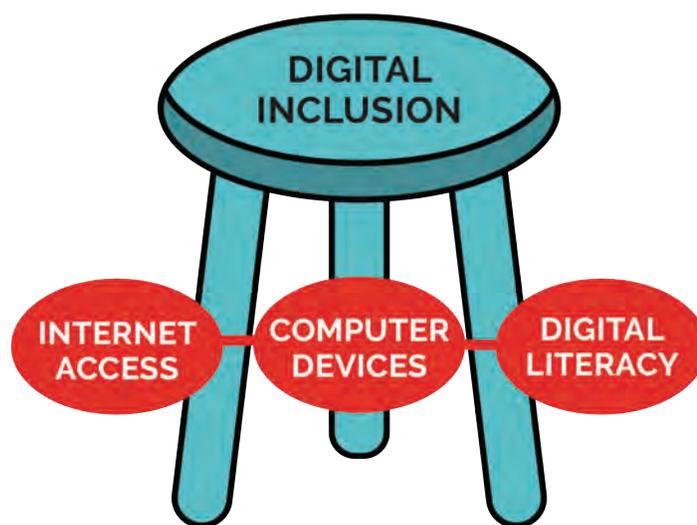
Libraries adapted to provide a "digital safety net" to communities during the pandemic

During the COVID-19 pandemic, libraries provided necessary internet access, devices, and technology to community members who otherwise would have gone without. Librarians know their community and the people who live there, so, when the pandemic shut down society as we knew it, librarians were uniquely positioned to identify community needs, connectivity gaps, resources, and partner organizations. Libraries provided connectivity by extending WiFi into library parking lots and lending patrons Wifi hotspots.[8] They leveraged their strong relationships with local government and community organizations to collectively identify areas needing connectivity and deploy resources to bridge the digital divide.[9] Importantly, libraries also provided in-person and virtual resources and technical support to their communities.[10]

Libraries themselves still lack internet access, devices, and training

Improving libraries' IT and broadband infrastructure is essential to promote digital inclusion and equity. We know that town/rural libraries have a speed problem. Eighteen percent of town/rural libraries report that their public computer speeds and 22% of wireless speeds are sometimes or rarely sufficient for patrons.[11] Of the 2020 Public Library Technology Survey respondents, 1 in 5 single outlet town/rural libraries reported having download speeds of less than 25 Mbps.[12] The picture was even bleaker for multiple-outlet town/rural libraries– 39.2% of them reported download speeds of less than 25 Mbps.[13]

Speed is inherently tied to access–over 43% of town/rural libraries reported that they could not increase their internet speed because there was no faster service available, as compared to approximately 15% for both city and suburban libraries.[14] Even if greater speeds were available, rural libraries do not have the necessary funds to buy better service or upgrade IT equipment– over half of all town/rural libraries did not apply for e-rate in fiscal year 2019.[15] Many tribal libraries have been completely shut out of the e-rate process–according to an Association of Tribal Archives, Libraries and Museums (ATALM) 2021 Digital Inclusion Survey, only 12% of tribal libraries have ever even applied for e-rate, and 38% of tribal library survey respondents had never even heard of the program.[16] Only in January of 2022 did the FCC finally expand the definition of "library" to include tribal libraries that had previously been ineligible for e-rate.[17]

Even though libraries provide such critical access to the Internet, devices, and training, technical help is often not available to the library itself. The Public Libraries of America (PLA) 2020 Public Library Technology Survey found that only 11% of rural libraries, 32% of suburban libraries, and 65% of urban libraries have full-time IT staff.[18] Without sufficient technical help, the task of managing the library's IT and broadband issues often falls on library staff without much technical experience.

The Toward Gigabit Libraries Toolkit Helps Libraries Get the Access, Devices, and Training They Need to Help Their Communities

The Toward Gigabit Libraries toolkit aims to help nontechnical library staff bridge their technical awareness and knowledge gaps by walking them step-by-step through the process of surveying and assessing their library's IT and broadband setup. It uses questions, mini-training modules (via websites, videos, and other documents), and online tools to help library staff learn and potentially improve the library's broadband connection. This Toolkit takes a focused, "Broadband 101" look at the parts and pieces that make up the library's connection to the Internet, from "the pipe" or wireless broadband coming into the library to WiFi/inside wiring configurations to broadband-

based applications and computer resources—all at a level designed for lay people.

By leveraging the Toolkit's workbook/training format, library staff will better understand the facility's broadband connection and its ability to support current and intended library broadband applications, and staff will be able to identify some short-term "quick hits" and longer term actions to improve the library's broadband infrastructure. Further, library staff also will be able to better articulate to their leadership, policy makers, broadband service providers, and their community what the library needs in terms of broadband and IT infrastructure in order to improve how their library digitally serves the community. Using the toolkit, libraries can provide their communities with all three elements of digital inclusion– access to robust broadband connections, Internet-enabled devices to meet their needs, and the digital skills and readiness to explore, create, and succeed in the digital world.
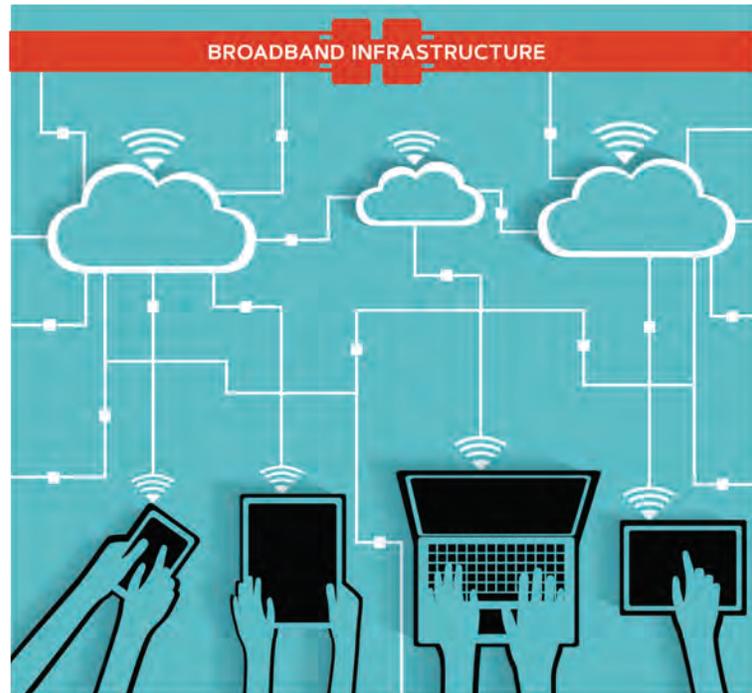
Endnotes

1. Fourteenth Broadband Deployment Report, Federal Communications Commission (released 01/19/21), FCC-21-18, at 20 (Fig.1). This report is widely known to overstate connectivity data because it is based on Form 477 data from carriers.

2. Fourteenth Broadband Deployment Report, Federal Communications Commission (released 01/19/21), FCC-21-18, at 19-20 (Fig.1). This report is widely known to overstate connectivity data because it is based on Form 477 data from carriers.

3. Federal Communications Commission, Consumer and Governmental Affairs Bureau, Wireless Telecommunications Bureau, and Wireline Competition Bureau Report on Broadband Deployment in Indian Country, Pursuant to the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018 (2019), https://docs.fcc.gov/public/attachments/DOC-357269A1.pdf (Tribal Lands Broadband Access Deployment Report), at 6 (Fig. 5).

4. "A Rural-Urban Broadband Divide, but Not the One You Think Of," New York Times, available at https://www.nytimes.com/2021/06/01/business/rural-urban-broadband-biden.html.

5. 2020 Digital Equity: % Homes with No Internet Access by Income, Purdue Center for Regional Development (PRCD) (analyzing 2018-2020 ACS data), available at https://twitter.com/robertoge/status/1508819031981240333 (accessed 03/31/22).

6. Gauging Household Digital Readiness (December 2018), Roberto Gallardo, Ph.D. and Maria Wiltse (December 2018), at 45 (Figure AB.2 (Average DIA, DRU, IBI, & DRI Scores by Household). The 2018 PRCD Household Internet Utilization Survey showed that the Digital Readiness Index (DRI) for households making $75,000 or more was 5.45 (out of 10), households making $35,000-74,999 was 5.05, and households making less than $35,000 was only 3.65.

7. The FCC recommends more than 25 Mbps for households with 2 or more users or devices doing activities like streaming HD video, multiparty video conferencing, online gaming, or telecommuting. FCC Household Broadband Guide, https://www.fcc.gov/consumers/guides/household-broadband-guide, accessed 03/20/22.

8. "Keeping Communities Connected: New report spotlights creative library broadband services during the pandemic," American Library Association, March 22, 2022, at 5 (Box 2). http://www.ala.org/news/press-releases/2022/03/keeping-communities-connected-new-report-spotlights-creative-library (Accessed March 29, 2022) Document ID: e76b00ad-c5e5-48c6-a707-81700b613201.

9. *Id.*

10. *Id.*

11. 2020 Public Library Technology Survey Summary Report at 16, Table 8. Percentage of Public Libraries Reporting Frequency of Patron Internet Sufficiency, by Internet Connection Type and Locale).

12. 2020 Public Library Technology Survey Summary Report at 15, Table 7, Summary of Responses to Internet Download Speed, by Administrative Structure and Locale).

13. *Id.*

14. 2020 Public Library Technology Survey Summary Report at 16, Table 9 (Percentage of Public Libraries Reporting Factors Affecting Ability to Increase Broadband Connectivity, by Locale).

15. 2020 Public Library Technology Survey Summary Report at 23, Table 20 (Percentage of Public Libraries that Applied for E-Rate in FY 2019 by Funding Category and Reasons for Abstaining, by Locale).

16. Comments of the American Library Association and the Association of Tribal Archives, Libraries and Museums, Inouye, Alan; Bocher, Robert; Feller, Susan, at 3 (11/12/21). These are preliminary results; the full survey results will be released in 2022.

17. FCC Report and Order, FCC 22-8 (January 27. 2022), available at https://advocacy.sba.gov/2022/01/11/fcc-releases-agenda-and-draft-proposals-for-january-open-commission-meeting/.

18. Public Library Association 2020 Public Library Technology Survey Summary Report, Table 13, Percentage of Public Libraries Using Types of IT Support Staff, by Locale, available at https://www.ala.org/pla/sites/ala.org.pla/files/content/data/PLA-2020-Technology-Survey-Summary-Report.pdf.

HOW TO USE THE TOWARD GIGABIT LIBRARIES (TGL) TOOLKIT

The TGL toolkit serves as an educational training tool aimed at guiding library staff through the sometimes confusing world of broadband technology in an easy to understand and accessible way. Using the TGL toolkit, library staff can assess and evaluate their library's broadband connection, including inside wiring.

Solo and Team approaches for the TGL toolkit

While you can complete the toolkit by yourself or as a team, it is helpful to identify the people you may call on for information to help you complete the toolkit. Depending on the size of your library, your toolkit team may be library staff members, government employees, volunteers, or your contact at your internet company. Where possible, working through the toolkit with a technical helper (staff member, volunteer, etc.) is beneficial, but not necessary. Regardless, it helps to identify the people you can call on to help complete the toolkit.

To assemble your toolkit team, ask the following questions and write each person's name and role in the table below.

- Whom do you contact when you have a problem with your internet connection?
- Whom do you contact if there is a problem with a computer or other piece of technical equipment?
- Whom do you contact for help when you need to identify or purchase new equipment?
- Whom do you contact for support of new initiatives or projects?

Name	Toolkit Role (examples: Toolkit Lead, Technical Support, Support Staff, Internet Troubleshooting, etc.)	Contact Information and Other Notes

### Print Out The Toolkit Or Use It On A Computer or Mobile Device

The majority of toolkit users have found it helpful to print out a paper copy to carry it around and make notes while they explored their library's technical environment! The toolkit is a fillable PDF format to make it easy to complete on your computer or print out to complete by hand. Either way is perfectly fine!

Toolkit Organization

The toolkit is organized as follows: Questions relating to the library's broadband connection, infrastructure, and related services and operations are posed in a series of highlighted boxes.

The person using this toolkit may type or write the answers to these questions in the same highlighted boxes. "Help text" appears immediately below each question, and is designed to assist in answering each question directly or provide additional information and resources on the topic.
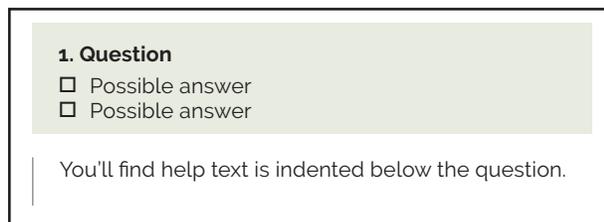
1. Question
- ☐ Possible answer
- ☐ Possible answer

You'll find help text is indented below the question.

How the toolkit is organized

Complete the Entire Toolkit, Or Just the Sections That Help You

You can complete the Toolkit from start to finish, or you can jump right to the section you know your library needs to focus on.

Broadband Improvement Plan

The Broadband Improvement Plan is your roadmap to improving your library's broadband and IT infrastructure. It may contain plans for new equipment, wiring, funding, partnerships, or training–– whatever you need to help your library.

As you complete each section of the toolkit, write your ideas about how to address the issues you uncover in the Broadband Improvement Plan. The Broadband Improvement Plan has an area for short-term plans that will take 0-3 months to complete, and long-term plans that will take more than 3 months to complete. Some of the activities and training that library staff may engage in while completing the Toolkit can also be listed in the Broadband Improvement Plan.

Action	
Intended Result	
Resources Required	**Timeline**

Example of Broadband Improvement Plan section

Glossary

Throughout the toolkit, you may encounter technical terms that are new to you. Most terms that may be unfamiliar are explained briefly in each toolkit section. More detailed definitions for technical terms can be found in the glossary section of the toolkit.

LIBRARY INFORMATION

Name Of Library	
Address	
Website	
Library Director **name, phone, email**	
Toolkit Lead Contact **name, phone, email**	
Library IT Contact **name, phone, email**	

Toolkit Revision History

Date	Completed/ Updated By	Notes

Before We Begin:
Understanding Your Library's Basic Computer Network Structure

Before we begin the toolkit, let's look at the major components that fit together to create a computer network.

The Internet

Wired Network

Printers

Staff PC's

Public PC's

WiFi
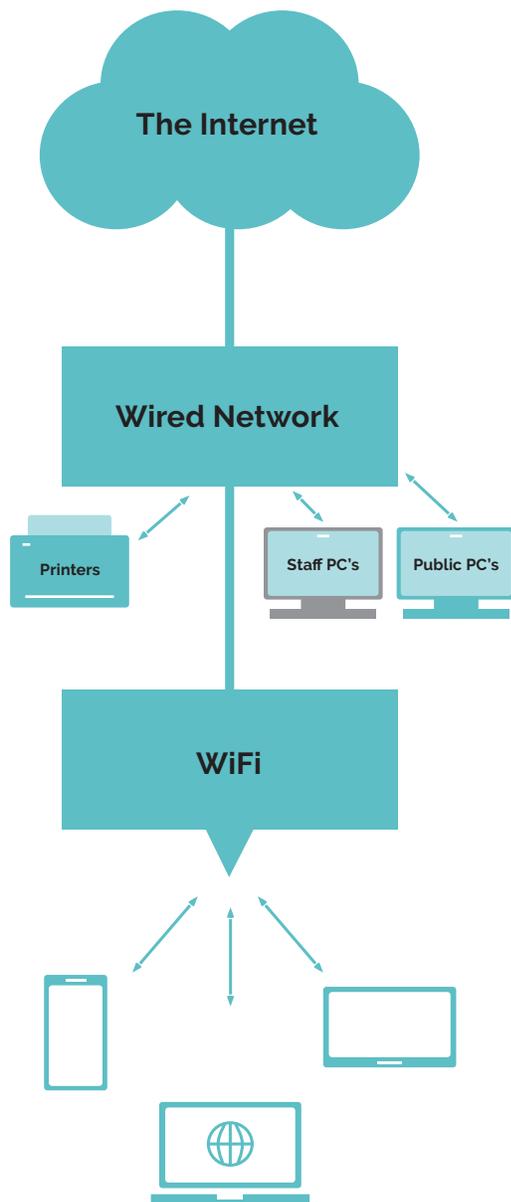
Internet Connection

For most libraries, the connection to the Internet is physical (wire or fiber optic) but for some it is wireless.

Wired Network

The wired network is comprised of cables and network devices (many with blinking lights indicating network traffic). Our wired devices (like computer workstations) often use a wired connection to connect to the Internet.

WiFi Access

Even though many of us think "WiFi" is the same as Internet access, it is actually just one way of connecting to the Internet wirelessly. At the heart of most WiFi connections is a wired connection of some sort, as shown in this diagram.

The other common wireless method is via cell phone connection.

TECHNOLOGY INVENTORY—YOUR LIBRARY

In this section, you will inventory some of the key pieces of the technology inside your library, including your computers, network, and other important technology components. This inventory will help you understand what sort of equipment you have now, and provides a basis to determine if you need different or additional equipment for the future.

SECTION 4A
BROADBAND CONNECTION

If you have more than one broadband connection, i.e., two different types of technologies or service providers, answer the following questions in this "Broadband Connection" question for each connection.

> **1. What type of internet connection does your library currently have?**
>   Choose all that apply.
>
> ☐ Cable Modem
>
> ☐ Digital Subscriber Line (DSL)
>
> ☐ Fiber Optic
>
> ☐ Satellite or other "Non Terrestrial" option
>
> ☐ Wireless
>
> ☐ Other: _____

There are three primary types of broadband—wired (DSL, cable modem, and fiber), wireless, and satellite. Definitions for the types of Internet connections listed here are available at the FCC website: https://www.fcc.gov/general/types-broadband-connections

THREE TYPES OF BROADBAND

① WIRED	② WIRELESS	③ SATELLITE AND NON-TERRESTRIAL NETWORKS
• DSL • CABLE MODEM • FIBER	• WIFI • CELL • POINT TO POINT	
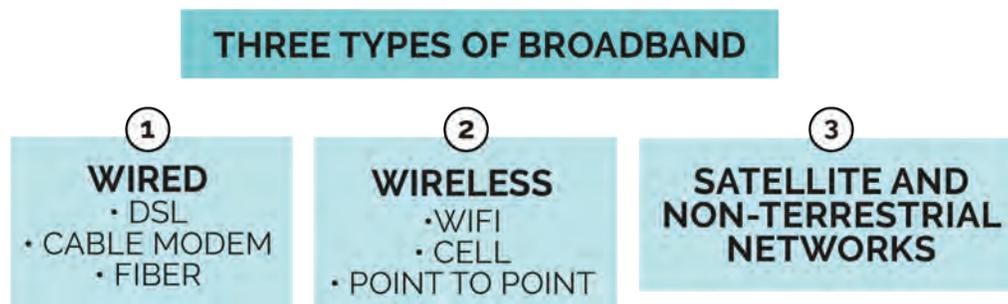
Speed Ranges by Type of Broadband
(Kbps - kilobit, Mbps - megabit, Tbps - terabit)

Technology	Type	Download Speed Range	Upload Speed Range
Fiber Optic	*Wired*	*100 Mbps - 1 Tbps*	*100 Mbps - 1 Tbps*
*Cable Modem**	*Wired*	*256 Kbps - 10 Gbps*	*256 Kbps - 4 Gbps*
*DSL**	*Wired*	*256 Kbps - 100 Mbps*	*256 Kbps - 16 Mbps*
Fixed Wireless/ Microwave	*Wireless*	*1 Mbps - 155 Mbps*	*1 Mbps - 155 Mbps*
Satellite	*Wireless*	*25 Mbps - 100 Mbps*	*5 Mbps - 10 Mbps*
*Non Terrestrial Networks (NTN)****	*Wireless*	*25 Mbps - 100 Mbps*	*5 Mbps - 10 Mbps*

Upper end of speed range depends on type of DSL (VDSL2) or cable modem (DOCSIS 3.1) technology. In rural areas, DSL and cable modem connections are more likely to be a max of 45 Mbps download. The upcoming DOCSIS 4.0 standard may deliver speeds from 4 Gbps - 10 Gbps. Sources: FCC, How Stuff Works, CableLabs, NetworkWorld

**NTN is in development as of the publication of this toolkit (2023)

*** NTNs are also referred to as "Low Earth Orbiting Networks"

Additional information on each type of broadband technology can be found in the U.S. Department of Agriculture's Rural Development presentation "The Pros and Cons of Different Broadband Technologies" http://www.rd.usda.gov/files/ AyleneMafnas-USDA.pdf

How do islands receive internet connectivity?

Have you ever wondered how islands, such as those that make up the State of Hawaii, get connectivity? One way is through subsea fiber (https://en.wikipedia.org/wiki/Submarine_ communications_cable) optic cabling. Cables laid across the ocean floor to connect islands to the mainland have been in use since the 1850s, when the first subsea telegraph cables were installed. Today's submarine cables used for telecommunications have multiple layers of materials including optical fibers and carry 99% of data that crosses oceans. The other 1% is carried by satellite connections.

A subsea fiber optic cable is laid along the ocean floor connecting the mainland with an island. Each end of a subsea cable terminates at a Cable Landing Facility, as seen in this illustration. Except for very short distances, optical signal amplifiers are also installed at regular intervals along each cable. And though early subsea cables were simple single point to

Subsea Fiber Optic Cable Connection from a Continent to an Island

single point connections, modern subsea cabling systems now employ submarine branching units (https://en.wikipedia.org/wiki/Submarine_branching_unit) are now used to increase redundancy and to split cable connections undersea to serve multiple locations.
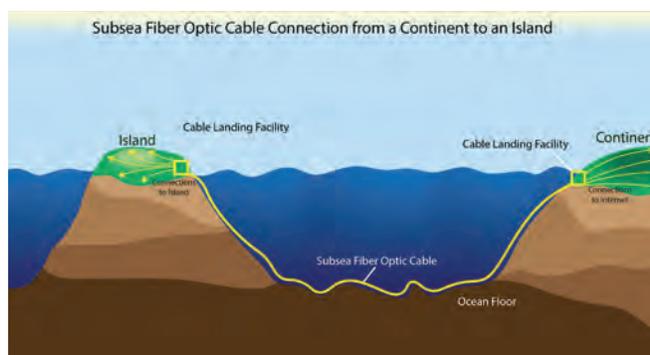
2. **Who is your broadband service provider?** _____

If you do not know your broadband service provider, use the speed test tool to identify them: https://www.speedtest.net When you run the test, the provider name is displayed. More information on testing the speed and quality of your internet connection is in section 4D of this toolkit.

3. **Who pays for your broadband service?** _____

4. **Do you have more than one broadband service provider?** Choose all that apply.

☐ Yes

☐ No

☐ Unsure

If "yes," identify your second broadband provider:

_____

Some libraries have two different broadband service providers in order to either increase overall broadband speed or to provide separate connections for the public and for staff.

Sometimes the different providers use different mediums and technologies to deliver broadband services, e.g. one that is terrestrial (fiber, DSL, cable) and one that is wireless (satellite, fixed wireless).

If unsure, you might have more than one broadband connection if you have two different routers (for more info, see the **section on Network Devices**) or two different WiFi networks available in your library. Connect to the two WiFi networks individually and run the above test to identify the service provider(s).

If you only have one broadband connection and the speeds are not sufficient or cannot be upgraded further, a potential solution is to get an additional broadband service/connection for the library, perhaps using E-rate funds if the library does not file for E-rate.

If you have more than one broadband service provider, please answer the questions below for both connections.

5. What are the options for broadband service providers/connection types in your area?

Choose all that apply and write the name of the service providers (where available) next to to the connection type.

Connection Type	Broadband Service Provider(s)
Digital Subscriber Line (DSL)	
Cable Modem	
Fiber	
Wireless	
Satellite	
Other {add here}	

Your state may have also created and still host and update a "Broadband Map" to help identify service providers in the state, mapped by location. Google the name of your state and "broadband map" to find it.

To see what research and education networks (non-profit broadband providers serving higher education) may be available in your state, try this listing from Internet2: https://internet2.edu/network/state-and-regional-r-e-networks/

6. What is the download and upload speed of your Internet connection (expressed in Mbps)?

Measure your speed using the following (2) speed tests. Record your results in the table below.

Test #1: Measurement Lab - https://speed.measurementlab.net/#/
Test #2: Speedtest by Ookla - https://www.speedtest.net

Speed Test Results	Download	Upload	
Test #1 Measurement Lab			Mbps
Test #2 SpeedTest.net			Mbps

Testing the speed and quality of your Internet connection helps you understand several important things, including the general performance of your connection and (perhaps most importantly) whether you are getting all of the speed that you are paying for from your ISP. Speed tests can also help you troubleshoot any problems on your network, so it is a good skill to add to your own approach to technology.

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 physically close to the broadband router as possible (sometimes people will connect a laptop directly to the main data switch to perform this test). Consider repeating this once per day over a week, and taking the average or median of the measured values.

Note that the bandwidth or speed of your connection is dependent on many variables, especially depending on the type of technology being used. The relationship between distance and the performance of your Internet connection is often referred to as "last mile" and "middle mile."

It might be helpful to think of your Internet connection like a big, mature tree with big branches, smaller branches, and leaves.

Think of the trunk of the tree as being the "Internet" itself. The main, larger branches of the tree could be thought of as the **"middle mile"** of your connectivity - it's how an Internet Service Provider (ISP) connects to the Internet through its data network. The smaller branches can be thought of as the "last mile" of connectivity. The "last mile" is how your ISP connects to your library. And the leaves of the tree? One of the leaves is your library!

Distances and technology relationships between the Internet, the "middle mile," and the "last mile" have an impact on the speed and performance of your Internet connection.

Distance from the **"last mile"** broadband facilities is the most important. The further away, speeds decrease. The speed of your connection can also be impacted by your "middle mile" provider that works with your "last mile" broadband service provider. For more information on what can impact your broadband speed, please see this article from the United Kingdom: http://www.thinkbroadband.com/guide/broadband-speed.html
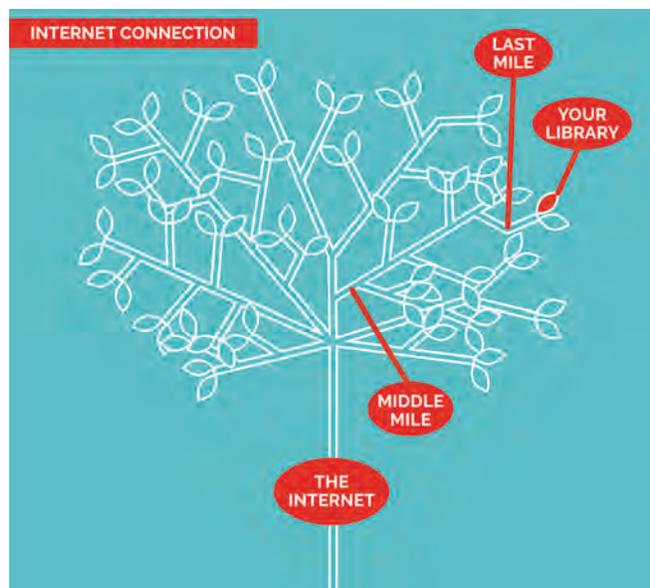
7. **Next, let's test the quality of your broadband service, specifically, the latency, jitter, and packet loss for your network connection.**

Revisit your Measurement Lab speed test results page (https://speed.measurementlab. net/#/), and record your results in the table below.

*As an option, you can also use another testing service such as "**Speedtest by Ookla**"*

Connection Quality Results		
Latency		Milliseconds (ms)
Jitter		Milliseconds (ms)
Packet Loss		Percent (%)
Other		

Along with broadband speeds, the "quality" of your broadband connection is important, especially for video and audio applications.

The same Measurement Lab test (https://speed.measurementlab.net/#/) we used for speed will also provide the additional "quality" measurements for your broadband connection.
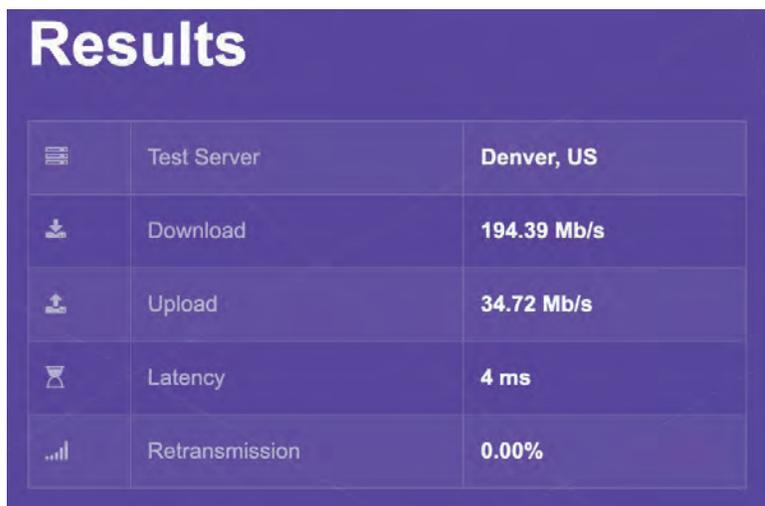
Results

	Test Server	Denver, US
	Download	194.39 Mb/s
	Upload	34.72 Mb/s
	Latency	4 ms
	Retransmission	0.00%

Example result page of the M-Lab speed test.

There are a number of technical factors that add up to an excellent - or poor - connection to the internet. While all Internet speed tests measure how fast a connection can download and upload data, some also measure the quality of the connection. Some common quality measures include latency, jitter, packet loss, and retransmission.

Latency, sometimes called "ping," is the amount of time required for a data packet to get

Latency

from point A to point B. It is usually measured in terms of round-trip delay expressed in milliseconds (ms). Higher quality connections have latency in the <100 ms range, the lower the better. Low latency is especially critical for real-time applications, such as live streaming video and interactive videoconferencing. For example, high latency causes a delay between when a person speaks and the party on the far end hears them, which can make two way conversations difficult. In other words, the video of the person speaking is delayed or out of sync with the audio.

Jitter is the amount of variation in the latency observed over time. Zero jitter means the amount of time it took for packets to go from point A to B were exactly the same every time. Anything above zero is the amount of time by which they varied. Similar to latency, you want your jitter measurement to be as low as possible, ideally <10ms.
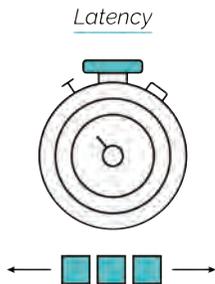
No Jitter - consistent

Jitter - inconsistent
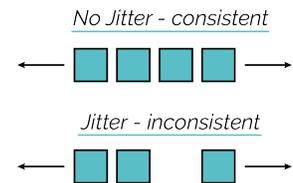
Packet Loss occurs when one or more individual data links along a network path needs to transmit more data than it has available bandwidth, i.e., congestion. Lost packets will either cause missing

Packet Loss
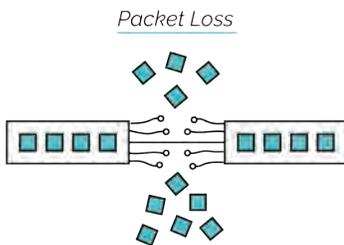
parts of a data stream, such as video that "tiles" or "pixelates," or will cause other applications to slow down as the missing date from the lost packets are resent.

Retransmission occurs when data packets are resent, which happens when the original data packets are lost, damaged, delivered out of order, or delayed for a long time. To ensure communications are solid, the sender of the data keeps a copy of the data handy until the receiver confirms that the data has been received. The process of retransmission is built into many of the communications systems of the Internet and is an automatic process.

Retransmission
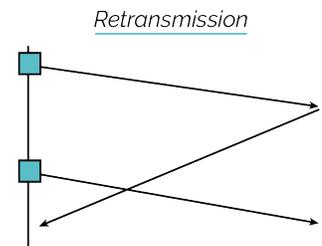
Network Quality Requirements for Applications in Milliseconds (ms)

Application	Minimum Bandwidth Required*	Max One-Way Latency	Max Jitter	Packet Loss
Voice over IP (VoIP)	100 Kbps Up and Down	150ms	30ms	<1%
Desktop Video Chat	0.5 Mbps Up and Down	200ms	30ms	<1%
High Definition Video Conferencing	2 Mbps Up and Down	100ms	10ms	0%

*Per single instance, i.e., one VoIP call or video chat
Source: Internet2, ITU, https://www.voip-info.org/wiki-QoS, Phone.Com, Ookla, Polycom, Lifesize

All networks have some level of latency and jitter. The lower the numbers for latency and jitter, the higher the quality of your data services. If your latency, jitter, and packet loss test poorly, share the results with your broadband provider and ask what can be done to improve performance.

Understanding the Relationship Between Broadband Speeds and Network Quality for Various Applications
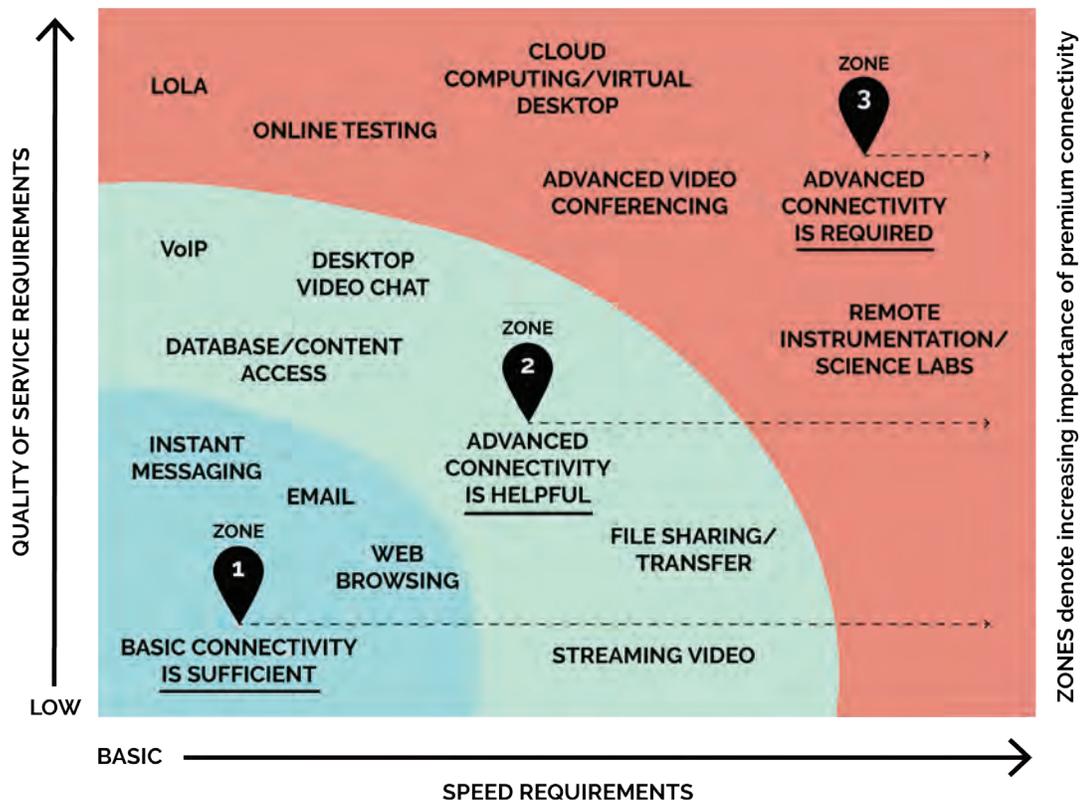
Sources: (this is a link to the Internet Archive: https://networkmaine.net/wp-content/uploads/2019/03/Connections_Capacity_Community.pdf) Connections, Capacity, Community: Exploring Potential Benefits of Research and Education Networks for Public Libraries, and Internet2.

8. **Do you work with other libraries or schools to contract for your broadband service?**

☐ Yes

☐ No

☐ Unsure

If "yes," please describe how below:

Many schools and libraries are joining together to aggregate their buying power as a buying consortium for better prices and services when signing broadband contracts with service providers or applying for E-Rate funds. For example, if the school or library is able to obtain a high capacity broadband connection, like fiber, and they are close by and in "line of sight," point to point wireless equipment on the roof of the institutions may allow the school and library to share broadband connections.

Libraries in other states and regions band together to boost their bargaining and buying power. For example, the Connecticut State Library created a statewide buying collective, the Connecticut Library Consortium, so that every library could use one request for proposal (RFP) to buy leased fiber. For more information and examples, read "Four Steps Toward E-Rate Connectivity and Competition," at https://www.benton.org/blog/four-steps-towards-e-rate-connectivity-and-competition.

9. **How would you or your patrons describe the speed of your library's wired Broadband connection on a scale of 1 to 5?**

☐ **1** - Very Slow

☐ **2** - Slow

☐ **3** - Neutral

☐ **4** - Fast

☐ **5** - Very Fast

10. **How would you or your patrons describe the consistency of the broadband speed, on a scale of 1 to 5?**

☐ **1** - Inconsistent (slow sometimes for days, fine other days)

☐ **2**

☐ **3**

☐ **4**

☐ **5** - Consistent (always the same speed)

11. How would you describe the reliabiliy or quality of your library's broadband connection?

☐ **Not reliable:** There are daily outages.

☐ **Sometimes reliable:** There are occasional outages (less than once a week).

☐ **Mostly reliable:** Outages are rare.

☐ **Dependable:** It would be a surprise to have an outage.

☐ **Very dependable:** You cannot recall ever having and outage.

- The purpose of these questions is to perform a "gut check" to determine how fast or slow and how reliable the library's internet connection seems to be based on your own perceptions as a user.
- Below is a chart that provides estimated times it takes to download various file sizes based on the broadband speed.

Time to Download based on Broadband Connection Speed

Item	Item Size	4Mbps	8Mbps	16Mbps	32Mbps	50Mbps	100Mbps
Webpage	*500Kb*	1s	0.5s	0.25s	0.12s	0.08s	0.04s
Book	*2.5Mb*	5s	10s	5s	2.5s	1.6s	0.8s
Single Song	*5mb*	10s	5s	2.5s	1.25s	0.8s	0.4s
YouTube clip	*50Mb*	1m 40s	50s	25s	12.5s	8s	4s
Album	*100Mb*	3m 20s	1m 40s	50s	25s	16s	8s
TV Show	*450*	15m	7m 30s	3m 45s	1m 52s	1m 12s	36s
Film	*4.5 Gb*	2h 30m	1h 15m	37m 30s	18m 45s	9m 22s	4m 41s

Sources: Wikipedia, FileCatalyst, Internet2

Some broadband technologies are negatively impacted by extraneous factors. For example, satellite broadband reliability can be impacted if there is bad or stormy weather.

Cable modem broadband can become congested during peak usage hours as it is based on a shared infrastructure—the more users on the network, fewer throughputs available and the network will be slower. Also, if there are a lot of users in the library, the network, locally, will be congested and users will see slower speeds.

It is important to track your network's speeds and reliability to help troubleshoot any issues with your broadband service provider. When tracking issues with speed or reliability, note if there are a lot of users in the library, the time of day, and any bad weather. Also note if there is a difference between people accessing broadband via a wired connection, i.e., PC on a local area network (LAN), or via WiFi. All of this information will help to pinpoint any issues there may be in your broadband and IT infrastructure.

12. Does your broadband service provider provide the library with a static internet protocol (IP address or range of IP addresses?

☐ Yes

☐ No

☐ Unsure

An internet protocol (IP) address is a unique, numerical identifier for a device connected to the internet or a local network. Every device connected directly to the internet has a unique address; this unique address enables communications to take place between devices.

SAMPLE IP ADDRESS

140.147.254.3

If you have a **dynamic IP address**, it may change over time.

If you have a **static IP address** or addresses, they will stay the same over time.

Internet Service Providers are responsible for providing IP addresses to customers (including libraries). ISPs often have a pool of addresses that they assign as needed (called dynamic addressing); this method allows ISPs to make efficient use of IP addresses among many customers. When using dynamic IPs, the library may have different IP addresses assigned to its internet connection over time. In most cases, the changing IP address is not noticed by the library and does not affect the performance of the library's connection.

Many libraries have access to online databases and other online resources. Libraries may purchase access to these resources themselves or they may receive access to them as part of a consortium or statewide purchase. These resources are provided by companies such as EBSCO, Gale, and ProQuest. Access to these resources is limited to the library or group of libraries that are subscribing to the resources. The companies selling access to these resources provide libraries with multiple ways to authenticate their users.

In some cases, libraries require what is called a static IP, which is an IP address permanently assigned to the library. A static IP (e.g. an IP address or range of addresses that does not change over time) is often required by subscription database vendors to ensure that the library (who is often paying for access to the subscription database) is an authentic, paying user of the service. This process is called "authentication" and it requires a static IP address.

Discovering the IP address assigned to your library is simple (just search for "What's my IP" in your favorite search engine), but knowing whether it is static or dynamic is a little trickier.

To know whether you have a static or dynamic IP assigned to your library, you will need to ask your internet service provider (ISP) if your library is set up with a static IP address or range of addresses. If you have residential-grade broadband connectivity, you likely do not have a static IP address. If you have business-class broadband service, you may have a static IP address, or can ask for one. Static IPs often are available at an additional cost.

Toolkit Notes for Section 4A
Broadband Connection
Use these notes to help build your Broadband Improvement Plan

NETWORK DEVICES

In this section, you will inventory the "heart and soul" of your network—the hardware components that make up your library's physical network infrastructure..

Your physical network (which includes your connection to the internet, network devices inside your library, wiring, WiFi and computing devices and other items) is likely spread across your entire library.

A great place to start in understanding your physical network is the spot where you connect to the Internet. For small libraries, this might be a shelf with some equipment (such as a broadband device) in a back room or office. Some libraries may have a dedicated equipment rack for this gear, or even a small room designated for network equipment.

As you go through the questions in this section about the various network devices, sketch out a diagram of the devices and how they are connected to one another. A sample network diagram on the next page will help walk you through this section. Please see the **Network Diagram Worksheet** in **Appendix A** of the toolkit — you can use it to create your own network diagram using the step-by-step directions in this section.

Example Network Diagram

INTERNET

WAN

BROADBAND SERVICE PROVIDER

BROADBAND CONNECTION TO LIBRARY

OUTSIDE BUILDING

INSIDE BUILDING

BROADBAND DEVICE

(CABLE, DSL MODEM OR OTHER)

SOMETIMES THE BROADBAND DEVICE AND ROUTER ARE COMBINED IN ONE PHYSICAL PIECE OF EQUIPMENT

ROUTER

LAN

SWITCH

LAPTOPS

MOBILE DEVICES

PHONES

WIRELESS ACCESS POINT

PCS

PRINTERS
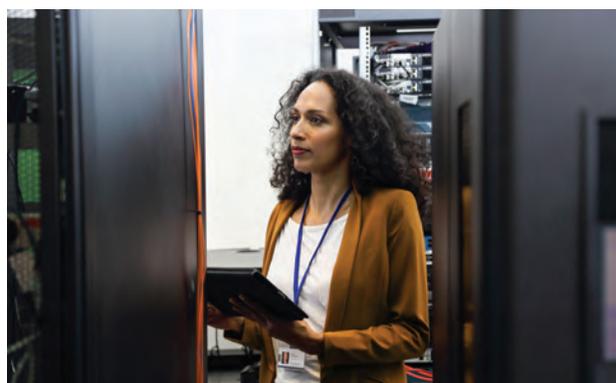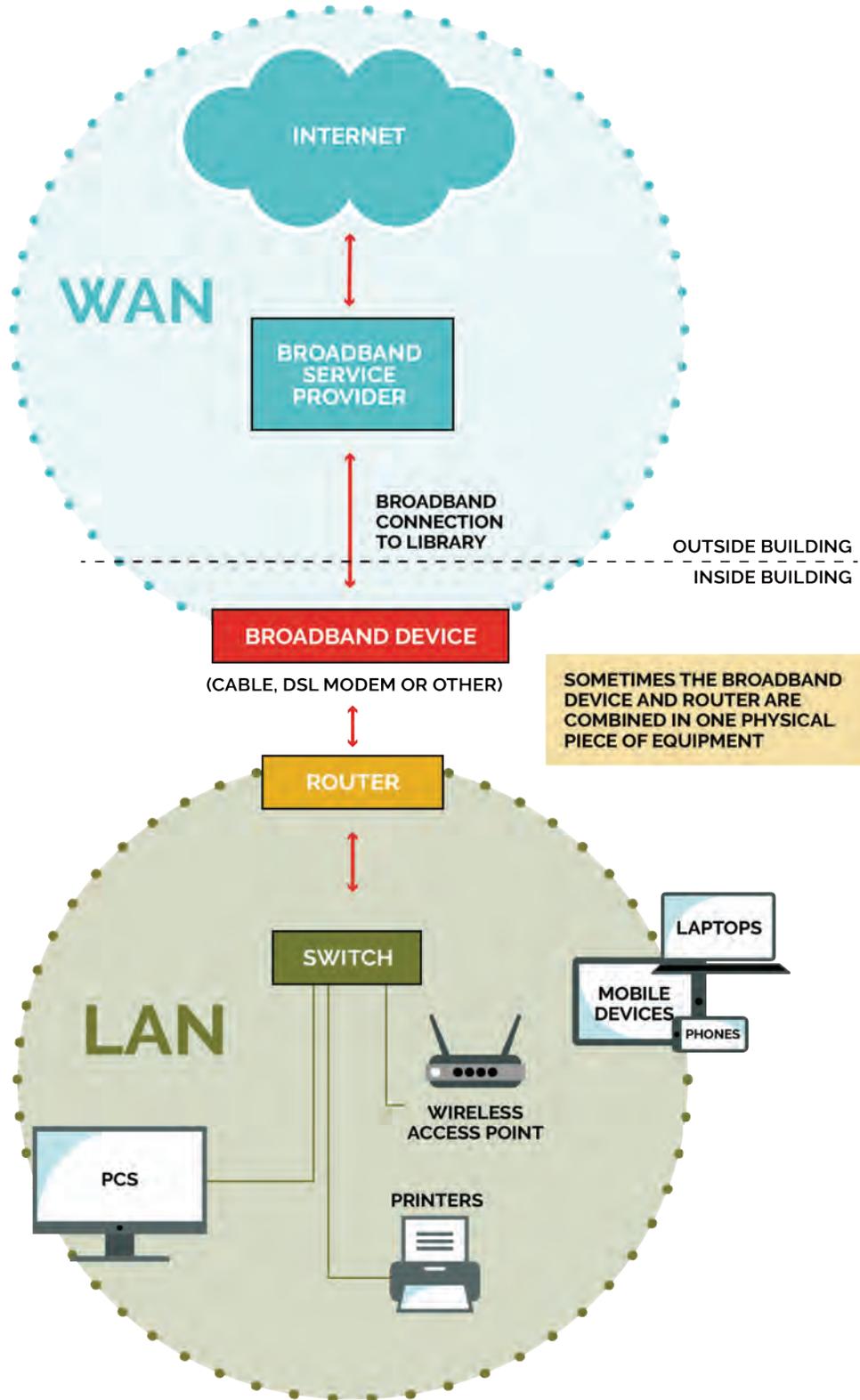
1. Do you have a list of all your broadband and IT equipment, including documentation on manufacturer, date purchases, login/password, etc.?

☐ Yes

☐ No

☐ Unsure

A best practice is to have a list of all broadband, network, and IT equipment, including PCs and other peripherals (like printers), documenting the following information:

- Manufacturer, model, and serial number
- Equipment purpose
- Location in the library
- Date purchased and installed
- Who owns equipment, i.e., broadband service provider, library
- Username and password (as applicable)

This library broadband network and IT equipment list can help with IT support, as needed and provide documentation in case there is a loss at the library (theft, weather or structural damage at library). Keep a hard copy in the library and an online version (on email, cloud storage) in case the hard copy is lost.

As you move through this section, some questions about specific devices or components may arise, including:

1. Is your firmware up to date? Some devices automatically update firmware (device-specific software updates) and software, and others require a manual update. Visit your device manufacturer's website to see if there are any needed updates to your devices. Devices without the latest update can disrupt your connection and slow down your speeds. You can also google the manufacturer and model number of your equipment along with "firmware update" (for example, "Netgear CM1000v2 firmware update").
2. Does your device still support your connection? Some outdated devices can slow a connection if they are no longer supported by your internet provider. For example, an out-of-date modem may slow your speeds greatly even if you pay for a faster speed.

2. What is the make/model of your broadband router?

Router Make	
Router Model Number	
Router's Location in the library	

3. **Do you have more than one router? If so, what is the make and model for each of them?**

Make	
Model Number	
Location in the library	

Make	
Model Number	
Location in the library	

A router is a networking device that forwards data packets between computer networks. A router is connected to two or more data lines from different networks. Your router is often a gray, black, or white device with multiple Ethernet ports for Ethernet cables.

You can find the make (manufacturer) and model (either the name of the device or a model number) of your router by looking at it - the information may be printed on the top of the unit or it may be located on the side or bottom, sometimes printed on a special label.

You will have a broadband router that connects your library's network to the incoming broadband connection from the service provider, as well.

4. **Does your broadband router also serve as a WiFi access point?**

☐ Yes

☐ No

WiFi routers are networking devices that do two jobs: they act as a network router, and also provide WiFi access. Note that wireless routers can also serve as wireless access points, but not vice versa. To find out if your router is also a wireless access point, you can look for physical clues (e.g. a visible antenna or antennas attached to the device) or find its model number and look up the specifications online.

5. How many wireless access points (WAPs) does your library have?

☐ 1

☐ 2

☐ 3

☐ Other: _____

Wireless access points (WAPs) are networking devices that allow WiFi-enabled devices to connect to a wired network; these are sometimes called "antennas" since the primary job of a WAP is to distribute WiFi access through a given area. WAPs are typically connected to a wired network and require a separate router to connect to the internet.

6. What is the make and model of the WiFi router(s), if not the same as the broadband router?

Make	
Model #	

Understanding the make and model of the WiFi router is important when needing to change the WiFi settings. Each router manufacturer has their own WiFi settings modules and administrative logins that allow changes to the WiFi access point's network name (SSID), channels, WiFi login and password, and process to install updated software (firmware) for the router. More information and a "how to" setup a WiFi router can be found here: http://www.wikihow.com/Set-Up-a-Wireless-Router

However, a best practice is to use the guide associated with your specific router. To find it, Google "(router manufacturer) (router model number) WiFi configuration."

7. Do you have any network switches?

☐ Yes

☐ No

If yes, how many: _____

A network switch (also called switching hub, bridging hub, or MAC bridge) is a computer networking device that connects devices together on a computer network by using packet switching to receive, process and forward data to the destination device.
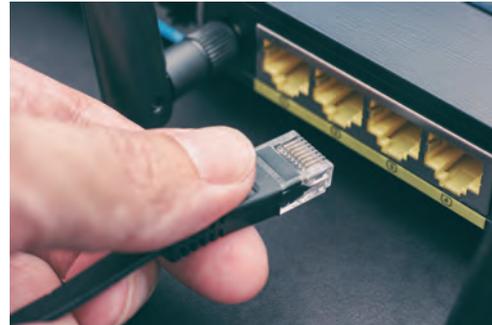
8. If you have more than one, how are your network switches connected to each other?

☐ Our switches are daisy-chained with an Ethernet cable using an available network port on each switch.

☐ Our switches use special high-speed ports to connect to each other.

☐ Other:

Please describe here: _____

_____

_____

_____

The technique of connecting two or more network devices of the same type together via data cabling is called "daisy chaining." Much like its botanical namesake (where flowers are connected to each other to create a bracelet), the technical term most often applies to situations where one network switch is connected to another via an ethernet cable through a standard network port.

While daisy chaining is a common strategy to create more physical network ports throughout a building, the technique comes with an impact on network performance, The more devices that are daisy-chained the slower the devices on the daisy-chain switches perform. Although some libraries daisy-chain switches together, it is not a best practice in terms of network speed and performance (this article explains more: https://www.techrepublic.com/blog/it-consultant/only-novices-daisy-chain-switches/)

To reduce "daisy chaining," have all data cabling possible run to a central location to a single switch or combination of switches that are properly interconnected.

If you are daisy-chaining switches to increase your capacity (number of available switch ports), consider buying a single switch with higher capacity. Professional-grade switches typically

come in 24-port or 48-port density.

You might wonder how locations requiring lots of data switches work without a daisy chain. For such installations, special switches with separate, high-speed data connections (called a "backplane" with speeds of 10 GB/sec and higher) ensure that multiple switches connected together do not have any bottlenecks for speed. This article shows one vendor approach to connecting multiple switches under one ultra-high speed backplane: https://blog.siemon.com/infrastructure/is-your-data-center-keeping-up-with-complex-high-density-fiber-links.

9. **How many empty switch ports do you have (i.e., how many ports do you currently have available to add more wired devices in the future)?**

Number of empty ports: _____

Every one of your wired network devices, like PCs and printers, need its own switch port to physically connect to the network. Having extra capacity in your wired data network, in the form of empty switch ports "standing by" for future needs or requirements, is an excellent way to ensure your network has some room to grow. This is an exercise in simply counting. Take a look at the switches in your main data wiring area and count the number of ports that do not have cables plugged into them.

A best practice for a LAN is to hard wire all stationary devices (i.e., PCs, access points, printers) with Cat cabling and use WiFi connectivity for non-stationary devices (i.e., laptops, E-Readers).

This image shows a device with five switch ports. Even with a small network, the ports available on this device are likely to fill up quickly!

10. **Does your library network have any hubs?**

☐ Yes

☐ No

If yes, number of hubs? _____

On a network, a hub (which is different from a switch, even though they often look identical) is a device connecting multiple segments of a local area network (LAN) and containing multiple ports. When a hub receives information (in the form of a packet) in one port, it copies that information to all of the other ports.

Since they look the same from the outside, the only way to tell is by either reading any text on the device (specifying "hub" or "switch") or looking up the make and model number online to find more information.

For a great explanation of the differences between a hub, a switch, and a router, see: http://www.webopedia.com/DidYouKnow/Hardware_Software/router_switch_hub.asp

Network "hubs" are obsolete networking technologies that perform poorly in modern data networks. If you have any "hubs" in your network you should consider replacing them with a network switch or switches.

Hubs and switches can look the same on the outside. But they are very different on the inside!

11. Do you have a "VoIP" (Voice Over Internet Protocol) or other IP Telephony system for your telephone service?

☐ Yes

☐ No

Modern digital voice telephone systems (otherwise known as Voice over IP - or VoIP systems) use the library's network to function, which may have an impact on the library's internet connection. Older-style analog telephones use separate wiring and connections for voice calls and do not affect the library's data network or internet connection.

Some digital phone systems share the library's Internet connection to provide voice telephony services for the library. Others use what are called SIP (Session Initiation Protocol) connections that do not impact the connection to the Internet. To determine what type you might have, you should refer to any documentation you have of your system, which should be available online by searching for the maker online.

In terms of the internal network, it is often recommended that digital phone systems are given their own, separate network. This is sometimes accomplished through advanced setups using Virtual Local Area Networks (VLANs) or simpler approaches (such as using a separate, dedicated network switch for the phone system).

If you are using a system that shares the library's internet connection and are experiencing issues with the quality of voice calls, you may need to ensure the performance of voice traffic by configuring "Quality of Service" (QoS) for the telephone connection on your network. Many systems automatically give priority to voice calls, but some systems require manual setup. Manually configuring QoS requires expertise with network configuration settings, so you may need assistance from someone with the skills to help such as your phone service provider or an IT tech.

12. If you are able, draw a simple diagram of your network.

Drawing a simple network diagram is easy. Here's a brief instructional video from the Texas State Library and Archives Commission (TSLAC): https://www.youtube.com/watch?v=nF_hoYlcNfY

You can draw your network by hand, or even try this online tool to create a network diagram using simple shapes and arrows:

Diagrams.net: https://app.diagrams.net/

Please see the [Example Network Diagram](#) at the beginning of this section. There is also a [Network Diagram Worksheet](#) in Appendix A of the toolkit that you can use to help draw your own network diagram.

As you draw your network map, you might find it helpful to add the make and model of your network components (including your router, switch, WiFi system and other components) to your network map.

Toolkit Notes for Section 4B
Network Devices
Use these notes to help build your Broadband Improvement Plan

_____

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SECTION 4C
WIRED NETWORK AND POWER

The questions in this section are related to your library's wired data network and the power capabilities of your building. A **wired network** uses Ethernet cables to transfer data between connected PCs, routers, switches, and wireless access points, depending on the configuration of the network. This part of your broadband IT infrastructure is also called "inside wiring" and creates the library's "local area network" (LAN). **Power capabilities** refer to your library's electrical system and how it is distributed to serve needs in your library.

1. Does your library have a wired data network?

☐ Yes

☐ No

If yes, what category of Ethernet cable do you have in your library? Check or highlight all that apply below:

☐ Cat 3 (typically used for analog telephones)

☐ Cat 5

☐ Cat 5e

☐ Cat 6

☐ Cat 6a

☐ I don't know

2. Have you installed any new data cabling since your network was originally installed?

☐ Yes, most or all cabling replaced

☐ Yes, some cabling replaced

☐ Yes, some cabling installed recently

☐ No

☐ I don't know

Your library most likely has a wired data network, especially if it has a network switch or hub. Ethernet cables connect devices to one another and to the broadband router, often through a switch.

For your network to operate at its best, it's important to know more about the speed capabilities of your Ethernet cabling. Some Ethernet cables can handle faster data speeds than others. The category ("Cat") number of the cable tells you how fast your in-building cable can carry data. All quality data cables print the "Cat" ranking on the cable itself – like the examples in the photograph showing "CAT. 5" and "CAT5e" cables.

To find the "Cat" number of your cable, check the Ethernet cables attached to your router or switch. The Cat number should be printed somewhere on the Ethernet cable (Ethernet cables have larger than phone-jack style plugs/terminations).

Cat	Length* (meters)	10 Mb/s	100 Mb/s	1 Gb/s	10 Gb/s
Cat-5	100m	Yes	Yes	No	No
Cat-5e	100m	Yes	Yes	Yes	No
Cat-6	100m	Yes	Yes	Yes	No*
Cat-6a	100m	Yes	Yes	Yes	Yes

At shorter distances, lower Cat cables can perform at higher speeds, for instance Cat-6 can transfer at 10 Gb/s over lengths up to 55 meters.

Category 3 cable is designed for analog telephone circuits and is not suitable for data connections. We recommend that you upgrade your data cabling as soon as possible to the current standard of Category 6 or 6a.

Category 5 and 5a cables are still good resources for library data cabling. If your budget permits, you might consider upgrading your cabling to category 6 or 6a.

If you are using category 6 or 6a - Excellent! You are in good shape in terms of your data cabling.

If your mix of data cabling includes any category 3 cabling it should be replaced soon with Category 6 or 6a. If you have some Category 5, you may consider upgrading to Category 6 or 6a in the future, but it's not a crucial upgrade. If you already have Category 6 in your building, those cable runs are excellent.

There are other categories of cable beyond 6a, including categories 7, 8, and 9. There are likely to be more category numbers in the future. If your Internet connection is 1 GB or less, category 6 or 6a cabling is a good choice for any new installations.

A helpful primer on ethernet cabling (from a network equipment vendor) can be found at https://www.tripplite.com/products/ethernet-cable-types

If you don't know what category of cable you have in your library, work with a person who can help you read the markings on the data cabling in your building.

3. How would you describe the quality of your inside wiring?

☐ Poor quality

☐ Average quality

☐ High quality

☐ I don't know

This question may be difficult to answer - here are some factors to consider:

- Does your wiring look "messy"?
- Has your data cabling runs been tested or certified to ensure quality connections?
- Do you have any intermittent problems with certain connections?
- Does your wiring reach all parts of your building where it is needed?
- Are your wall jacks labeled?
- Do you have a network "map" or other document that shows the relationship between your wall jacks and your central wiring area (the place where network equipment such as your broadband device, router, and network switch or switches) is located?

4. Does any of your data cabling run parallel (side by side) with electrical power cabling?

☐ Yes

☐ No

By its nature (literally using "twisted pairs" of wire), data cabling rejects electrical interference. However, it is still possible for the performance of data cabling (your inside wiring) to degrade if it comes into contact with electrical fields produced by sources such as power cables.

It is a best practice to never run data and power cabling parallel (side by side) or in the same conduits. When it's necessary to cross data and power cabling, it is recommended that the cables cross each other at a 90-degree angle.

When there are no options other than to run data and power in parallel, data cabling with extra shielding should be used. Cable manufacturers often offer cables with additional shielding at a higher cost than standard cables.

What about Power over Ethernet (PoE)? PoE Ethernet connections are where the power for devices is carried on the same cable as the data. PoE systems use much lower power (measured in volts and micro-amperes) than standard "from the wall" electrical systems. Ethernet cabling is often referred to as "low voltage" cable and is constructed to allow for the power and data to exist on the same cable without causing interference.

PoE switches generally don't cost much more than non-PoE switches. When buying new switches you might consider ensuring they have PoE capability, whether you need it right away or not. If you need it in the future (for devices that use PoE such as WiFi Access Points, wired digital telephones - Voice Over IP phones - and other devices) you'll be ready to plug and play!

5. Does your building have safe and adequate power capabilities to provide electricity?

☐ Yes

☐ No

This question is best answered by a licensed, qualified electrician who can evaluate the total electricity demand your library has and compare it to the amount of power currently available to your building.

Any layperson, however, can often see the signs of unsafe and/or inadequate power. If you have experienced any of the following, it is recommended that you call in an electrician to perform an evaluation:

- Do your lights occasionally/randomly "dim" for brief periods of time? This is sometimes noticed when an appliance that uses a lot of electricity (such as a microwave oven) is operated.
- Do you have circuit breakers that often "pop" (shutting of the electrical flow to a group of outlets or to special electrical circuits)?
- Are any of your electrical outlets not working?
- Do any of your light switches or electrical outlets feel warm or hot to the touch?
- Do any of your electrical connections (including light fixtures) make a buzzing or crackling sound - or even emit sparks? If yes, do any of these connections have a "burning" smell? Please note that it is normal for the electrical systems for fluorescent light fixtures to have a "hum" or buzz.

6. Does your library have adequate power receptables where power is needed?

☐ Yes

☐ No

When many libraries were built, the need for power throughout the building (to serve the needs of network equipment, desktop computers and other devices for staff and patrons, to recharge portable devices and for many other needs) was not envisioned.

Take a look at places where power is needed and ask yourself if there are enough outlets to serve the needs of your staff and patrons and then address these needs with a local electrician.

7. Do you have surge protectors or uninterruptible power supplies (UPS) for sensitive or essential computing equipment?

☐ Yes

☐ No

Many library buildings struggle with fluctuations in the quality of the power to the building. Sometimes the power (measured in volts) is too low (also called a "brownout"); too high (also called a "power surge") or even affected by huge spikes from lightning storms or other environmental factors.

For libraries in areas affected by frequent power surges, an investment in surge protectors is advised. Surge protectors come in various forms, but all are designed to protect sensitive equipment from overvoltage conditions that can damage or destroy the devices. Some surge protectors only work once (they protect the attached equipment by "blowing" an internal fuse and then no longer provide power) while others use a circuit breaker approach and can be reset after protecting equipment from a surge.

Surge protectors come in many forms. Common ones include units that plug directly into a wall socket and power strips that have built-in surge protection.

Uninterruptible Power Supplies (UPS) are often referred to as a "battery backup." These units are designed to provide power to connected devices for a short time if the power fails. UPS units are often used for network equipment to ensure that network services keep functioning in the event of a power failure.

As an added bonus, some UPS units also provide "voltage regulation" capabilities to keep power quality within the acceptable range, and provide displays to show the voltages of power at the outlet and the regulated power supply.

Check your power strips to ensure they offer surge protection.
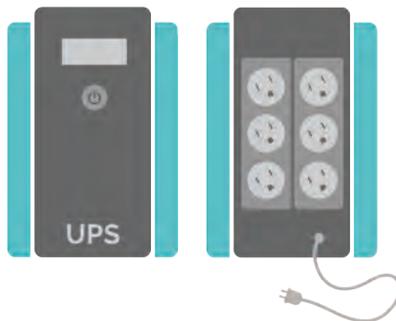
Uninterruptible Power Supply Unit

SECTION 4D
WIRELESS NETWORK AND POWER

This section addresses the library's wireless/WiFi network and provides insights in how to better manage routers, placement of wireless router/access points, and new technologies that can improve WiFi connectivity in your library.

"WiFi" is a term used to describe a technology that uses radio waves to provide wireless network connectivity, essentially wireless access to data networks. We usually use "WiFi" to refer to wireless connections to the Internet. Most Public Libraries in the U.S. provide WiFi for public Internet access.

1. Does your library provide WiFi?

☐ Yes

☐ No

2. Do you have separate Internet connections for staff and public access?

☐ Yes

☐ No

Some libraries have two broadband connections: one that is only for library staff and operations and the other for public computing devices and WiFi access for patrons.

Having separate Internet connections for staff and public use often allows for greater performance and higher security for your library.

When libraries have multiple broadband connections, they might be from the same Internet Service Provider (ISP) or from different ISPs.

If you are experiencing slowness or network congestion due to an overloaded network, you might consider adding an additional connection to serve the Internet needs for your staff and public networks separately. As well as the additional network connection, you may also need to purchase different or additional network components (including router and switch) as part of the solution.

3. Do you offer WiFi outside or surrounding your library building?

☐ Yes

☐ No

If yes, how many hours a day is WiFi available? _____

Many libraries project their WiFi signal into their parking lot to serve patrons outside or after hours. For example, the Marathon County Public Library in rural Wisconsin (like many others across the US) served its community by providing critical parking lot WiFi during the COVID pandemic. Depending on your environment (especially proximity to private residences), you might consider increasing your WiFi coverage to include areas outside of your building.

If WiFi is available outside of your library/in the surrounding area, you may want to make sure you have an Acceptable Use Policy (AUP) in place that includes use outside of the library. Some additional information about and examples you can leverage for an AUP (this link is an archive of an American Libraries Association at the Internet Archive) https://www.ala.org/advocacy/privacy/guidelines/public-access-computer. To ensure your Acceptable Use Policy complies with Emergency Connectivity Fund legislation, see Compliance With the Emergency Connectivity Fund: Library's Acceptable Use Policy and Patron Certification of Need (06/25/21).

4. Do any other organizations or businesses in your community offer free public WiFi?

☐ Yes

☐ No

If yes, list them here: _____

_____

_____

_____

Some communities have many options for free access to the Internet, while others, especially rural communities, may have very few if any. If your library is the only place in the community offering free WiFi, besides local businesses like a fast-food restaurant or a coffee shop, you have some powerful reasons to seek more funding for your current Internet connection or to improve your connection.

5. **If there are other places in your community to obtain free WiFi, how does your library WiFi compare in terms of quality?**

☐ Our library WiFi seems to be the only option in our community.

☐ Our library WiFi seems slower or less reliable than other options in the community.

☐ Our library WiFi seems as fast and stable as other options in the community.

☐ Our library WiFi seems faster and more stable than other options in the community.

☐ Our library WiFi seems the fastest and most stable available in the community.

☐ I don't know

Some communities are fortunate to have a number of WiFi options, but sometimes the quality of those options are not as good or reliable as Public Library WiFi. If your offerings are better than other options, it's an excellent opportunity to promote your services. In all cases, how you stand against other services is an opportunity to advocate for better broadband connections, newer equipment, and other needs you might have in serving your community.

6. **How would you describe the reliability of your library's WiFi?**

☐ **Not reliable:** There are daily outages or periods of slowness.

☐ **Sometimes reliable:** There are occasional outages or periods of slowness (<1/week)

☐ **Mostly reliable:** Outages are rare and the connection is only occasionally slow.

☐ **Dependable:** It would be a surprise to have a slowdown.

☐ **Very dependable:** I cannot recall ever having an outage or slow period.

The most significant component of your library's WiFi is the broadband connection which is the source of Internet connectivity that is distributed through the WiFi antenna(s) (also called Access Points or APs). However, there are multiple things outside of the broadband connection that can be slowing down the WiFi connection, many of which can be addressed with quick fixes and laptop/smartphone tools (and are detailed at the end of this section) in the WiFi frequency channels.

Congestion
Congestion is often found and other technologies (including cordless phones) may be using the same channel as your library's WiFi network. To deal with this issue, change the channel or use a more advanced router. Generally WiFi routers with the capability to use the 5 GHz and 6 GHz frequency ranges which do not have these congestion issues. Changing channels requires you to log in to the administrative functions of your router - if you feel unconfident in this area, ask someone with tech knowledge to help.

Power Cycling
Many broadband router and/or WiFi access points benefit from "power cycling," that is, turning each off for two to three minutes and turning back on. Like rebooting your computer, this process can help fix problems by creating a fresh start for your equipment.

Location

The location of your WiFi router or WiFi Access Points may not be optimal-- if your WiFi APs are near a large wall limiting the wireless range, not centrally located, or next to large structures, the location might interfere with signal distribution. You can also buy a WiFi repeater/range-extender or new antenna to improve the range of the signals.

Firmware

Broadband routers, WiFi access points and other network equipment should be running the current version of the "firmware." Firmware is the software that runs on network equipment, and just like a PC, needs updating every once in a while, too. You may find that you need to perform a firmware update for your router. Firmware updates are dependent on the type of router and directions on how to update can be found by visiting the website of the manufacturer. One word of caution: a failed firmware update can stop your equipment from functioning correctly until the firmware update is successful. If you are unsure, get help from someone knowledgeable with tech to perform firmware updates.

If you're having trouble with your WiFi, it can sometimes be tough to troubleshoot. There are a couple of simple tricks you can try -- even if you are a tech novice - to keep your WiFi humming.

"Cycle the power" on your **WiFi Router** on a regular basis: Sometimes the brain of your router can get a little "scrambled," cycling the WiFi router-- in other words turning it off and on again (also called "rebooting") -- can set things straight. Some libraries reboot their WiFi routers once a week at a time when there are no patrons using it, such as first thing in the morning.

Cycling the Power

TURN OFF FOR 2-3 MINUTES

"Cycle the power" on your **mobile device**: The "brains" on mobile devices can get scrambled, too. If any particular device is having trouble connecting to the WiFi network, try rebooting it to see if it helps.

Move the router or extend its antennas: WiFi uses radio waves to send and receive data signals and sometimes those waves can be hindered or even blocked by building materials, walls, shelving and other elements. If your signal seems weak, try moving your router (moving it up high is an especially good move to try). When moving your router, be sure to take care that all cables remain properly plugged in -- or replace them with longer cables if needed. If your router has an external antenna or antennas, you can try extending those too, in different directions, to see if it helps.
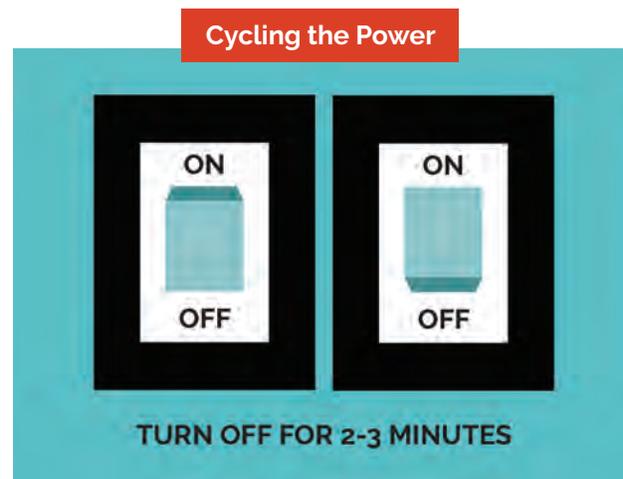
7. What "flavors" of WiFi does your wireless router support? Check all that apply:

☐ 802.11a (up to 54 Mbps, 5 Ghz)

☐ 802.11b (up to 11 Mbps, 2.4 Ghz)

☐ 802.11g (up to 54 Mbps, 2.4 Ghz)

☐ 802.11n (up to 600 Mbps, 2.4 & 5 Ghz) "WiFi 4"

☐ 802.11ac (up to 1 Gbps, 2.4 & 5 Ghz) "WiFi 5"

☐ 802.11ax (up to 9.6 Gbps, 2.4, 5 &6 Ghz) "WiFi 6"

☐ Other: _____

☐ I don't know

WiFi (also known by its technical name of 802.11x) supports different speeds, coverage ranges, and capacity as indicated by the lower-case letter that is represented as an "x" in this sentence. You can answer this question by viewing the specifications published on the web for your WiFi router (just search your make and model number).

As the letter progresses up the alphabet, the better the performance speed, distance and capacity of the router.

The most modern WiFi routers support the "ac" (WiFi 5) and "ax" (WiFi 6) speeds, those offer the highest performance for modern devices. Most routers, even the newest ones, will also support older speeds like "g" and "n" to ensure compatibility with older mobile devices. If you replace your WiFi Router, we recommend a model that supports" "ac" (WiFi 5) and "ax" (WiFi 6).

For more information about the different "flavors" of WiFi, see the toolkit glossary at the end of the document.

8. Are there other WiFi networks running nearby (within a 100 foot radius) of your library building?

☐ 2.4 Ghz

☐ 5 Ghz

☐ 6 Ghz

☐ Combination of 2 or more bands.

WiFi systems use three different frequency bands to provide wireless services: 2.4 gigahertz (GHz), 5 gigahertz (GHz) and 6 gigahertz (GHz). Some systems broadcast on all three bands simultaneously.

The 2.4 GHz band has been around the longest (and is also used by other wireless systems such as older cordless telephones, video cameras, and baby monitors). The 2.4 GHz band tends to provide a larger coverage area, but offers a slower connection speed than the 5 GHz band. It is also sometimes congested with other 2.4 Ghz networks or devices running nearby.

The 5 GHz band has faster speed capabilities, but offers a smaller coverage area than the 2.4 GHz band.

The 6 GHz band has even faster speed capabilities and potentially less interference than the crowded 2.4 GHz and 5 GHz bands.

If you have a multi-band router, a best practice is to broadcast the 2.4 GHz, 5 GHz and 6 GHz networks as some older devices, i.e., E-book readers, tablets, PCs, may not be able to connect to the 5 GHz or 6 GHz networks.

To find out which frequency bands your WiFi system operates on, you can search the web on your router manufacturer and model number or log into your router's administrative functions. If you're not sure how to access administrative settings, review this article: https://www.techadvisor.com/how-to/network-wifi/router-login-3633777/

9. **Are there other WiFi networks running nearby (within a 100 foot radius) of your library building?**

☐ 2.4 Ghz

☐ 5 Ghz

☐ 6 Ghz

☐ Combination of 2 or more bands.

If yes, there may be WiFi congestion that could be slowing down your WiFi services.

WiFi congestion is caused by multiple WiFi networks running on the same channel within the same WiFi frequency. This often happens in the 2.4Ghz WiFi systems, but can also happen on all bands in areas with lots of different WiFi access points (including areas of high-density housing or offices). There are tools at the **end of this section** that can help you identify overlapping WiFi networks (with neighbor WiFi networks). If you find overlap, you can change the channel your WiFi network uses on your router.

Access the list of tools at the **end of this section** to help you "see" the WiFi networks in your areas -- your own network, and others nearby.

10. **Are there areas in your library where the WiFi connection is very low or undetectable (dead spots)?**

☐ Yes

☐ No

Having consistent WiFi coverage throughout your building is considered a best practice; if you have dead spots you might consider adding an additional WiFi access point(s) to cover areas of your building where the signal is weak.

Often, you know where the WiFi in your building works and where it doesn't through experience. There are tools (from this Toolkit) that can help you determine the signal strength of your WiFi router/access points in different parts of the building. Another tool, sometimes called a WiFi stumbler, highlighted below, which you can use to create a "heat map" to show how WiFi coverage strength varies throughout your building.
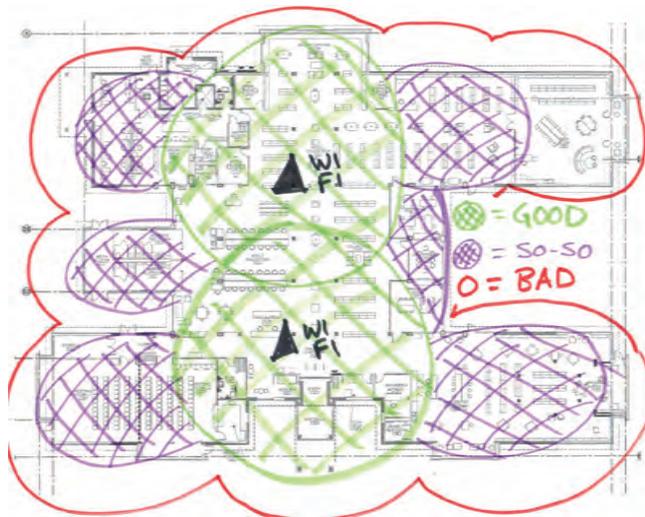
Example heat map

If you have areas of poor or no WiFi coverage, you might consider boosting the signal using WiFi "repeaters" or "extenders," or change to a WiFi "mesh" system.

- **WiFi extenders** communicate wirelessly with the primary WiFi system and receive the WiFi signal from the router and broadcast or "repeat" the signal into areas that need more WiFi coverage or signal.
- **WiFi repeaters** are hard wired connected to the WiFi router to extend or repeat the WiFi signal. In fact, many WiFi routers can double as repeaters. Some WiFi repeaters, called "powerline adapters," are plugged into the power outlet and Ethernet connected to the main WiFi router and a second power outlet adapter is plugged into the area that needs broadband and a device can be Ethernet connected to it. To learn more, visit: https://www.hp.com/us-en/shop/tech-takes/what-is-a-powerline-adapter
- **WiFi mesh router systems** spread a strong WiFi connection throughout a space using multiple devices as access points that operate as a single system throughout your WiFi coverage area. They are built to cover larger areas and buildings with multiple stories, as well as libraries that have interior walls (like a brick or adobe wall) or unusual layouts that may disrupt the WiFi. Mesh systems start with as few as two access points, but (depending on the system capability) can scale up to 3, 5, or more. Mesh systems communicate with each other via a special wired or wireless connection called a "backhaul" to ensure that all access points offer speedy and efficient performance.

To learn more about WiFi extenders, repeaters, and mesh router systems, visit https://www.pcmag.com/how-to/wi-fi-range-extender-vs-mesh-network-whats-the-difference

WiFi strength scale

11. Do you have a "managed" wireless or WiFi system?

☐ Yes

☐ No

While some technology devices are simple (e.g. you plug them into power and connect them to your network and they just work without any adjustments), others are designed to be actively managed.

A managed WiFi system is a software and hardware solution that provides an online interface (sometimes called a "cloud interface") to all components of the WiFi system in a location (and in some cases, in multiple locations). It allows for a single interface to monitor and manage the WiFi network, even remotely. These solutions are flexible, and often include the ability to add, remove, or change multiple WiFi access points.

The benefits of using a managed WiFi system include the ability to fine-tune the performance of the system, collect and report data, and make changes to the system on-the-fly. Additionally, managed systems tend to be designed for heavy-duty use and are designed to operate 24 hours a day, 7 days a week.

A key benefit of managed systems is that they can be managed remotely. While many small and tribal libraries may not have the expertise to configure their own systems, a cloud-managed system offers the opportunity to get help from a skilled technician almost anywhere in the world.

Managed systems tend to be sold under service agreements (e.g. an annual fee is required for the equipment to operate). While this is more expensive than buying consumer gear, it has the benefit of ensuring that the system is always functioning - and if there is a problem (such as an equipment malfunction) the service agreement provides for immediate replacement.

Some software/hardware companies that provide managed WiFi include UniFi, Meraki, Ruckus Wireless, and Open Mesh. Your broadband service provider or local IT company may also offer managed WiFi services.

You can tell if your current system has the capability to be managed by looking up its make and model number on the Internet.

12. Optional: Log into router to adjust administrative settings.

Advanced Wireless Configuration / Troubleshooting Via Your Router

If you've used one of the tools (listed at the end of this section) to perform a scan of your WiFi environment, you are likely delighted to "see" what was previously invisible.

The information gathered can help you adjust settings in your router, if needed, to improve performance of WiFi.

To perform these advanced wireless activities, you will need access to login to your router. The login is usually performed via a web browser, and you will need to know your administrator username and password. The administrative settings of your router should always have a password that you or your technical staff has changed from the default password.

Basic guide to accessing your WiFi router (also known as "access point" or "configuration") settings: https://www.cnet.com/tech/computing/home-networking-explained-part-5-setting-up-a-home-router/

13. Optional: Perform a scan of the WiFi environment in your library to see how your WiFi is performing.

If you perform a scan, share your thoughts about the results here.

Tools to Scan WiFi Networks in Your Library

These software tools can automatically scan the WiFi networks in your library as well as others nearby. They can operate on PCs and Macs, as well as mobile devices with Android and Apple operating systems.

Results from the software tools vary, but all can provide insight into your library WiFi, and you may wish to perform a scan with someone with knowledge of WiFi networks (and who can help you interpret the results).

Things to look for when scanning include:
- Other WiFi access points sharing the same channel as yours (which can cause interference and poor performance);
- WiFi signal strength inside your building (if you use a mobile option below you can use it to map out where the wifi is strong - and weak - in your building); and
- WiFi signal strength outside your building.

Some of the software listed is free, and some is available for a fee. There are other options as well – to ensure you are using the best option for you at any given time, we recommend using technology review sources that you trust to help discover and evaluate the latest options.
- PC: Acrylic WiFi Home (Available free for non-commercial use): https://www.acrylicwifi.com/en/wlan-wifi-wireless-network-software-tools/wlan-scanner-acrylic-wifi-free/
- Mac: WiFi Explorer (available for a fee at the Mac App Store): https://itunes.apple.com/us/app/wifi-explorer/id494803304?mt=12
- IOS (iPhone; iPad:) Network Analyzer Lite (available for free from the iTunes App store): https://itunes.apple.com/us/app/network-analyzer-lite-wifi/id562315041?mt=8)
- Android: WiFi Analyzer (available for free from the Google Play store): https://play.google.com/store/apps/details?id=com.farproc.wifi.analyzer&hl=en

COMPUTER AND END USER DEVICES

1. How many Internet connected computers do you have at your library?

Public computers	
Staff only computers	

Public Computers are those made available at the library for public use. Most often these are used to provide access to the Internet and access to "office" applications such as word processing and spreadsheets. This may also include any computers that you have in a "training lab" or laptops that you allow patrons to use.

Staff computers are those that only staff are able to use and not available to the general public.

2. What are the average ages of your library computers, in percentages?

	Public Computers	Staff Computers	
1-3 years old			%
3-5 years old			%
> 5 years old			%

It's a best practice to design your computer areas with the best possible experience for patrons in mind. Computers that are more than 5 years old will not perform as well as newer computers. They have slower processing power and less RAM, which can create the illusion that there is a slower broadband connection, especially with gaming, streaming, voice, and video conferencing applications. Further, when libraries have old or poorly maintained computers, it can put a significant burden on staff instead of making work easier.

- If your computers are 1-3 years old: Excellent! Your computers are relatively recent. Have you made plans or reserved budget dollars to replace your computers when they are 3 - 5 years old?
- If your computers are 3-5 years old: To ensure the best performance, replacing computers on a regular schedule is considered a best practice. If budgets allow, we recommend replacing computers within a 3-5 year timeframe.
- If your computers are more than 5 years old, you are likely experiencing performance problems. We recommend that you replace computers that are five years or older with newer models.

To find the age of your computers, it is easiest if you can locate the computer's serial number and Google it to find the manufacture date. For desktop computers, the serial number is usually found on the tower, or desktop casing. On a laptop, the serial number is usually located on the bottom of the laptop or under the battery.

For more information, read this article, "How can I tell the age of my computer?": https://www.techwalla.com/articles/how-can-i-tell-the-age-of-my-computer.

IF YOUR COMPUTER IS...

1-3 YEARS	3-5 YEARS	>5 YEARS
EXCELLENT!	REPLACE, IF BUDGETS ALLOW	PRIORITIZE REPLACEMENT
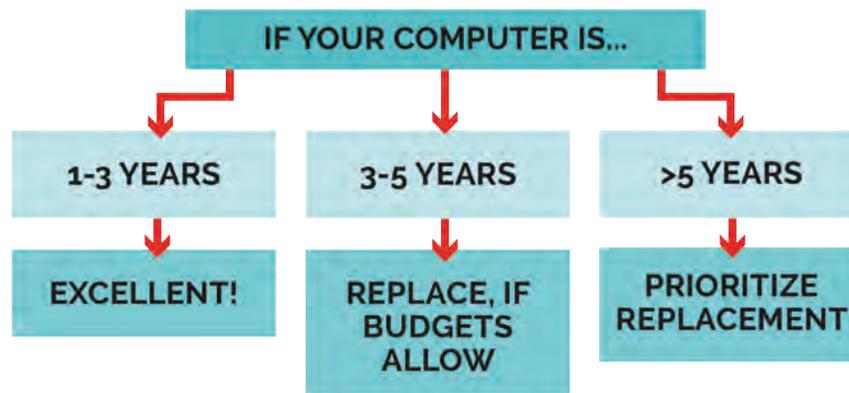
3. **List the quantity and types of mobile devices that you provide to patrons for use inside your library. Mobile devices include tablets, laptops, eReaders, and other devices.**

Laptops	
Hard wired desktop PCs	
Desktop PCs using WiFi only	
Tablets	

eReaders	
Hotspots	
Other	

Many library patrons bring their own mobile devices to the library and connect to the Internet (also known as BYOD or "Bring Your Own Device." Generally, how many BYOD users do you have at peak use times in your library?

_____ Mobile Phones   _____ Tablets/eReaders

_____ Laptops   _____ Others

More mobile devices in your library means an increased demand on your WiFi networks. The use of mobile devices is increasing, and you want to be sure you have enough internal capacity (your WiFi network) and broadband capacity (your connection to the Internet) to serve this growing need.

There are a few ways you can see the number of devices on the WiFi network at any given time. You can either log in to your router manufacturer's website to view connected devices, or you can run a special tool. Some routers will create statistics of the number of connections over time. For more information, read this PC Mag article: https://www.pcmag.com/how-to/see-whos-on-your-wi-fi. WiFi tuning tools, including those listed in the **WiFi/Wireless section** of this Toolkit, can also help to identify what devices are connected.

See the **Advanced WiFi** section of this Toolkit to learn how your router can show you what devices are currently connected to your network.

If you don't have ways to count electronically (or are unsure how to gather electronic counts) you can always do a physical tally during peak times by counting the number of devices that you observe in use.

Toolkit Notes for Section 4
Technology Inventory — Your Library
Use these notes to help build your Broadband Improvement Plan

BROADBAND SERVICES AND ACTIVITIES

In this section, the types of broadband services and applications are discussed in order 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.

1. **How much bandwidth do you need?** This can be tricky to estimate, with download speed recommendations ranging from 512 kbps to 1Mbps per simultaneous user. Read the article below to get a better idea of the amount of bandwidth your library needs.

Identifying how much bandwidth your library needs based on the types of services offered, number of devices connected, etc., can be difficult, especially as needs change over time and at different times of day.

Although not a technical measure, you may already know through experience if you have enough bandwidth or not. If you consistently experience a slow Internet connection when you have many people using your library computers and WiFi at the same time, it's possible that your broadband connection is too slow for the demand.

For E-rate applicants, the FCC says "With respect to libraries, the (E-rate) Order adopts as a bandwidth target the American Library Association's recommendation that all libraries that serve fewer than 50,000 people have broadband speeds of at least 100 Mbps and all libraries that serve 50,000 people or more have broadband speeds of at least 1 Gbps." https://www.fcc.gov/general/summary-e-rate-modernization-order

Would you like to dig more deeply? This article offers an excellent description of an approach to produce a number: http://www.broadband4education.nm.gov/uploads/FileLinks/a6cbda6b6c3345ecbadd0cafa50aa1ae/Edge_Benchmark_9.2_Bandwidth_Article_8.19.13.pdf

This approach requires you to do some counting (the inventory you may have performed earlier in this toolkit will come in handy) and also do a little math.

The Edge website also has resources on how to advocate within your community for better broadband: https://www.libraryedge.org/. This site requires a login.

2. **Do you provide a broadband hotspot lending program to your patrons?**

☐ Yes

☐ No

Some libraries are loaning their patrons mobile wireless broadband hotspots, or devices that provide connectivity via cellular networks. This is enabling patrons to check out the small wireless broadband device to create a WiFi hotspot at home to access the Internet. To learn more, read this article," Questions Asked When Trying to Start a Hotspot Lending Program": https://www.digitalinclusion.org/blog/2017/06/15/questions-asked-when-trying-to-start-a-hotspot-lending-program/. For more information, the Public Library Association has a comprehensive Hotspot Playbook linking to many helpful resources: https://www.ala.org/pla/initiatives/digitallead/hotspot-playbook.

3. **Do you filter your Internet content? Check or highlight all that apply:**

☐ Yes, staff connection

☐ Yes, all patron connections

☐ Yes, some patron connections, ex. child, youth. List here: _____

☐ No

☐ I don't know

Internet content filtering is something that some libraries employ in their public broadband connections in order to ensure that the connection is being used for lawful purposes. Further, libraries using E-rate or Library Services and Technology Act (LSTA) funds for their broadband connections are required to use content filtering to be compliant with the Children's Internet Protection Act (CIPA).

Are you unsure if you filter or not? Additional information on content filtering and related best practices can be found in the **"Additional Resources and Best Practices"** section at the end of this Toolkit.

Toolkit Notes for Section 5
Broadband Services and Activities
Use these notes to help build your Broadband Improvement Plan

_____

_____

_____

_____

_____

_____

_____

BROADBAND TECHNICAL OPERATIONAL SUPPORT

Technology in libraries is more than just a collection of gear. People, including library staff and those who provide technical support, are just as important. In this section you will learn more about the people who help make technology available in your library and determine if there are any areas where you could benefit from additional support.

1. **Describe the technology support available to your library.**

☐ Library staff expertise

☐ Community volunteer(s)

☐ Broadband provider

☐ IT service contract

☐ Consortium

☐ State library

☐ Local school district, municipal government or agency or other partnership

Describe the technical support you receive from these sources below. What additional support does your library need?

Small, rural, and tribal libraries often have limited access or availability of technical resources to support the library's IT and broadband infrastructure and operations.

Your state library may offer technical support for your library ranging from online resources, site visits, and in person and online training programs for library staff.

List of state libraries and archives: http://www.cosla.org/Directory

See **"Section 10: Additional Resources and Best Practices"** below for links to even more technology support opportunities for your library.

2. **Do you have access to technology training resources for staff?**

☐ Yes

☐ No

If yes, list:

If no, are there types of training you would like to receive?

3. **Does your broadband service provider offer any type of technical support?**

☐ Yes

☐ No

If yes, list:

Technical Services from Your Broadband Service Provider

Your broadband service provider may be able to provide the library with assistance for their broadband and networking needs. Broadband provider services could include network configuration and management assistance. This type of support is often referred to as "managed network services." Managed network services may include network device monitoring, firewall and security installation and management, software and firmware updates for network equipment, and even email and data center hosting.

Managed services is considered a step above self-service support options (such as a web or telephone-based technical support) and generally includes remote monitoring of the equipment, the library's connection, and even in-person support.

Managed services typically have increased costs, but if your library does not have technical support, the benefits may be worth the money.

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.

5. Do you have any contracts or agreements with your broadband service provider indicating the speed of your broadband connection, service guarantees, or other factors?

☐ Yes

☐ No

☐ I don't know

Agreements describing the services you receive (and the quality of those services) are sometimes referred to as Service Level Agreements or "SLAs" for short. SLAs often define key items such as the speed of your connection, guarantees of uptimes, description and terms of service and support for your connection, remedies if services are not delivered as promised, and other elements.

An SLA "template" is here: http://www.slatemplate.com/. This link provides an example of many common elements within SLAs.

These agreements are an important starting point to understand what you're purchasing from your broadband service provider, and are equally important to the broadband service provider to ensure they understand your needs and have the proper resources to ensure that your connection is the best that it can be.

If you have an SLA or other agreement, give it a read to see if it reflects your understanding of the services that you are purchasing. If you need help, consult the person who provides your technology support or a partner (such as a regional or state agency) to review and understand the terms of your services.

Other sources of support

Beyond your broadband provider, IT companies can provide ad hoc or contracted, regular support visits to support the library's broadband infrastructure.

Typical services often include hardware repair, software installation, network maintenance, and other items.

To find a reputable service provider, ask area businesses and other local public service organizations (K12 schools, local government) for suggestions on IT service providers.

Toolkit Notes for Section 6
Broadband Technical Operational Support
Use these notes to help build your Broadband Improvement Plan

BUILDING A NETWORK OF SUPPORT AND ADVOCATING FOR YOUR LIBRARY

In this section, you will explore your community networks and identify key people and groups who can support your technology work within your library. This exercise will provide resources around how to begin initial outreach and build relationships to expand support for your initiatives.

Clarifying your goals and message

1. **Why is adequate broadband important for your library and library patrons?**

You may have never written your thoughts about this topic, but articulating how important library broadband is to people in your community is a powerful way to also create awareness of the vital role your library plays in serving essential needs.

For some ideas, see the School's, Health, & Libraries Broadband Coalition (SHLB)'s Broadband Action Plan gathers ten policy papers focused on the importance of bringing strong broadband to community anchor institutions like libraries. The policy papers provide compelling narratives and data around the importance of broadband generally that you can use to support your message and clarify your goals.

https://www.shlb.org/action-plan

For more data regarding the importance of broadband, review these resources from the Benton Institute:
- Broadband for America's Future: A Vision for the 2020s
- Libraries' Increasing Role in Broadband Adoption
- CLA's Collection of Library Advocacy Issues - Broadband Access Articles

2. What makes your library unique and valuable?

Think about your library's unique strengths:
- How does your library contribute to your community's success?
- How does your library support patrons in their individual success?
- What does your library provide that is unique or special?
- What do your patrons like best or value most about your library?

These declarations from ALA may be a good place to start as you consider the benefits your library offers to your community: https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/DECLARATION%20-%20TEXT%20ONLY.pdf

Consider gathering information from your patrons through surveys or interviews to fully answer this question.

> **"A few carefully chosen statistics can be impressive, but stories bring the library message to life. The most effective stories are not about what the library does. They are about the people who use and benefit from our libraries. They are the inventor who did his research at the university library, the school child who talks online to a scientist at the North Pole, and the grandmother who sees her new grandchild for the first time online at her library."**
>
> **-ALA Library Advocates Handbook (https://www.ala.org/ala/advocacybucket/libraryadvocateshandbook.pdf)**

3. How will library patrons benefit from better broadband?

Consider what services, programs, and opportunities your library could offer with better broadband:
- What could you do if only your library had the resources to do it?
- What is happening in the world now that you would like to take advantage of?
- How can your strengths (above) open doors to opportunities for your library?

If you're struggling to come up with ideas of how broadband could improve your impact, look at some examples of what other libraries as represented in some of these resources:
- ALA's digital inclusion resources: https://www.ala.org/tools/research/digitalinclusion
- Internet Society Blog: https://www.internetsociety.org/blog/2021/03/libraries-are-bridging-the-digital-divide/
- ALA Fact Sheet on Internet Access: https://www.ala.org/tools/libfactsheets/alalibraryfactsheet26

4. How will the library benefit from stronger relationships with stakeholders?

5. **What are your goals and objectives? (What are you trying to accomplish and why is it important?)**

Start this process by asking yourself:
1. What are you trying to accomplish? (This is your goal, state it as simply and clearly as you can)
2. What are the reasons this is important? (These are your objectives- start by listing all the positive results you expect if this goal is accomplished)
3. What are the negative effects if the goal is not achieved?
4. Why should people care? How does it impact them?
5. How are you going to persuade them? What will your actions be? (These are your strategies)

More resources regarding getting started with goal setting can be accessed through the ALA frontline Advocacy Toolkit: https://www.ala.org/advocacy/frontline-advocacy-public-libraries

6. **What is your message? How are you going to communicate your value, goals, and objectives to community members to get them invested in your desired outcomes?**

Before reaching out to members of the community, it's helpful to have a clear idea of your goals and objectives so you can effectively communicate them to potential partners. You will want a simple, powerful way to communicate your goals when asking for support. Your message should be easy to remember and ideally include two to three talking points, a few strong statistics and stories or examples or build your case.
- Review these suggestions on crafting a message from ALA's Media Guide:
  - Develop messages that are extremely understandable so they can be used to reach all or most of the audiences identified.
  - Be proud of your messages. This is especially important for libraries because your constituencies – library, Friends, donors, and politicians – need to get your messages so they can easily convey your key messages in one or two sentences or talking points. These constituencies can be your best advocates!

- Your message(s)—boiled down to a tagline—might represent a core value of your library ("Libraries are centers of democracy." or "Our library meets the need of our children") or be a call to action ("Get involved—get a library card!"). We also recommend you incorporate The Campaign for America's Libraries messages that include the phrase "@ your library."
  - Review the ALA Media handbook for specific examples
- Download the ALA's Crafting Your Message Worksheet (PDF) to begin drafting and refining your message.
- Define your message using the ALA Library Advocate Handbook, which includes a "Defining the Message" worksheet:: https://www.ala.org/ala/advocacybucket/libraryadvocateshandbook.pdf
- Consider creating an even shorter version of your message for a a 30-second "elevator speech" pitch:
  - https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/Frontline-Advocacy-Parking-Lot-Speech.pdf (part of the ALA Frontline Advocacy toolkit).
  - https://www.ala.org/everyday-advocacy/sites/ala.org.everyday-advocacy/files/content/elevator-speech-infographic.pdf
- This free training guide provides additional support on how to craft your message: https://libwww.freelibrary.org/assets/pdf/programs/ccl/ccl-materials-community-connections.pdf
- Access this resource from the NTIA for support on clearly identifying your goals and objectives and transforming them into a concise message: https://broadbandusa.ntia.doc.gov/sites/default/files/publication-pdfs/bbusa_introduction_stakeholder_outreach.pdf

Engaging Your Personal Network

7. How can you work with your existing team to support your goals?

Consider the individuals on your current team and their personal talents. While some may be obvious choices to assist in getting your message out, others may have valuable organizational or technical skills to support the achievement of your goals. Don't overlook anyone on your staff, each person has valuable perspectives and a wealth of personal contacts, too.

- Who is really organized?
- Who is a good writer?
- Who is the person who always seems to think outside the box?
- Who is good at explaining new ideas?
- Who has technical knowledge or expertise?

8. Who exists within your personal network or your team's network that you can collaborate with for technical expertise and support?

To help answer this question, consider and think about:
- Who do you know on a local level that has technical knowledge or expertise and how could they help you?
- Which of your peers has technical knowledge or expertise and how could they help you?
- Who do you know on a regional level that has technical knowledge or expertise and how could they help you? (Example: County resources and/or staff)
- Who do you know on a state level that has technical knowledge or expertise and how could they help you? (Example: Research and Education Network, State Library, Universities)

Potential ways to collaborate:
- Talk through common problems and potential solutions (in person or virtual)
- Identify and use support resources
- Share training offerings and expertise
- Identify community volunteers with technical expertise

9. Who can you identify from your team's internal networks to aid in achieving the specific technical objectives that are part of your broader goals?

Technical Objective	Potential Support	Contact Information and Other Notes
Technical Support and Training		
Equipment Repair or Replacement		
Internet Troubleshooting		
New Project Support		
Privacy Issues		

Identifying Community Advocates

10. **Who in your community would be a valuable advocate to help you achieve your broader goals and objectives?**

To help answer this question, consider and think about:
- Who do you already know?
- Who does your staff, trustees, friends of the library, or foundation groups know?
- Which organizations have you developed personal and professional relationships with?
- Who are the busiest and most visible people in the community?
- Who is already a library user and advocate for the library?
- Which organizations and people share the same values and mission of the library?
- Who shares an interest in the types of services your project will deliver?
- Who shares an interest in the populations you will serve?
- Who could provide resources or support to increase the project's success?

Examples of potential partners:
- Current internet service providers
- Community residents
- Active community organizations
- Community activists
- State library
- R&E networks
- K12 schools
- Local government

You can use this "Working with Community Leaders" guide from ALA and the ALA Ecosystem Initiative Resources to further explore this question and to create a map of your community to guide and focus your outreach efforts.

For help identifying these individuals and institutions, use the ALA's Target Audience Planning Worksheet (Word doc).

Create and Execute an Outreach Plan

11. Who are your priority partners for impacting your project?

Once you've crafted your message and identified potentially supportive members in your community, it's important to make a plan to begin the process of reaching out and connecting with them. It can be really useful to outline who the potential organizations and individuals are, the priority for outreach, and the type of support you hope to receive.

As you plan and prioritize your outreach to partners consider:
- Who do they serve? What is the overlap with community members the library serves?
- What is their stated mission and/or vision?
- Do you have any common friends – or foes?
- What is the history of interaction between each stakeholder group and the library?

YOUR LIBRARY ECOSYSTEM

Your Library

K12 Schools | Local Government | State Library | Current Internet Service Providers

Active Community Organizations | Community Activists | Community Residents | R&E Networks

Organization/ Individual	Type of Support	Connected Stakeholder	Priority
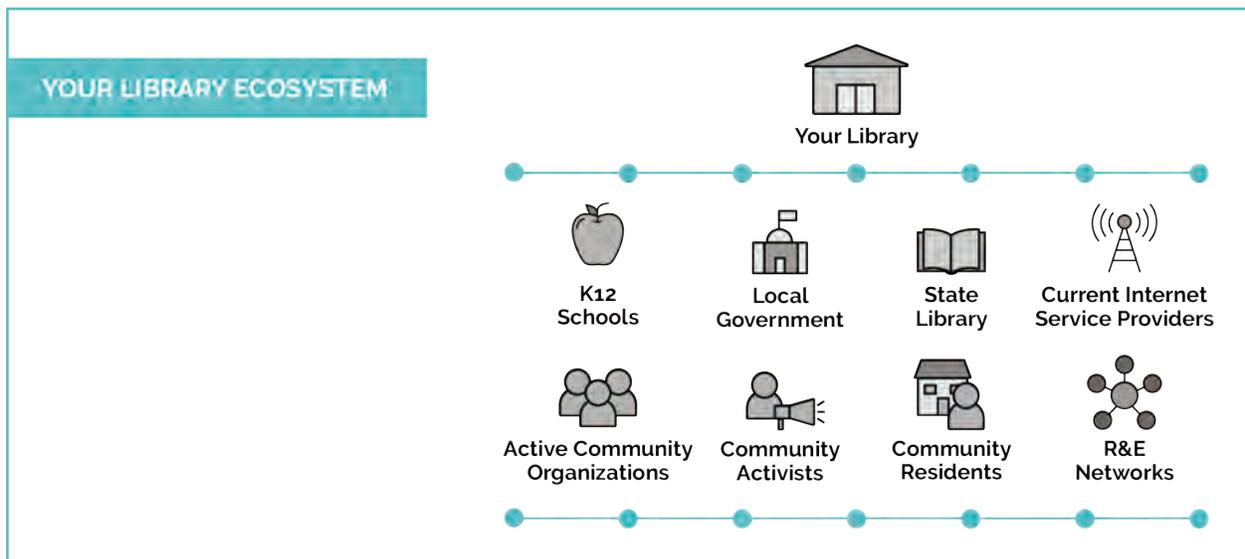
For an example of how to complete this partner prioritization worksheet, access the NTIA's toolkit: https://broadbandusa.ntia.doc.gov/sites/default/files/publication-pdfs/bbusa_introduction_stakeholder_outreach.pdf

Sample Partner Worksheet

Organization	Type of Support	Connected Stakeholders	Priority
School Board	Convener: Host events with school leadership Advocate: Share information with local schools	Local Schools Local Libraries	High
Chamber of Commerce	Convener: Host events with local businesses Advocate: Share information with local businesses	Local Businesses	High
Regional Planning Teams	Advisor: Share best practices and planning tips/considerations Convener: Bring groups together to discuss broadband at a regional level	Local Elected Officials Local Businesses	High
Economic Development Agency	Advisor: Share information about how to increase economic growth Funder: Award grant funds to community	Local Businesses State Offices	Medium
Internet Service Provider	Funder: Help cover network construction costs Manager: Provide support to network to increase sustainability	Existing Customers New Customers	Medium

As you reach out to various individuals and organizations, following these suggestions from the ALA will help you stay organized and consistent: https://americanlibrariesmagazine.org/2020/03/02/library-marketing-building-network-of-support/

Evaluate Your Efforts

12. **How successful were your efforts to build relationships with community partners and achieve your goals?**

Name/Organization	Goal Helped With	Outcome

Knowing which outreach and advocacy activities succeeded and why will help you know where to spend your time and resources in the future. For a simple worksheet that will help you with evaluation, download the ALA's Evaluating Your Efforts worksheet (Word doc) from the ALA Frontline Advocacy toolkit.

Access resources from Project Outcome: Project Outcome provides simple tools and an easy-to-use process for measuring outcomes and collecting insights about all the ways we are meeting the needs of our communities. https://www.projectoutcome.org/

Additional Resources:
- 2008 Tribal Library Advocacy Toolkit
  https://www.ala.org/aboutala/files/olos/toolkits/tribal_toolkit.pdf
- California Library Association Advocacy Tools (updated)
  https://www.cla-net.org/page/140
- SHLB Broadband Action Plan
  https://www.shlb.org/uploads/G2G/Broadband%20Action%20Plan_SHLB.pdf
- Harwood Institute Resources
  https://theharwoodinstitute.org/libraries
  https://theharwoodinstitute.org/resources-2021#tools
- Making Surveys Work for your Library
  https://www.barnesandnoble.com/w/making-surveys-work-for-your-library-robin-miller/1128682307

Toolkit Notes for Section 7
Building A Network of Support and Advocating for Your Library
Use these notes to help build your Broadband Improvement Plan

FUNDING BROADBAND AND IT IMPROVEMENTS

In this section, we will explore funding opportunities that can help fund your library's broadband and IT improvements to achieve the goals of your Broadband Improvement Plan. This exercise will help you outline your current sources of funding, identify what you need funding for, understand e-rate, and search for potential funding opportunities to help you achieve your goals. While it is not required, you may find it helpful to complete the Support and Advocacy section of the toolkit before this section.

Broadband and IT Funding: Budgeting, Grants, and Other Funding Strategies

In addition to e-rate funding (discussed later in this section), you may be able to fund broadband and IT improvements by analyzing your existing budget, creating a funding strategy, and pursuing grants and other funding opportunities.

Reviewing (or Creating) your Current Technology Budget

1. **How much of your current budget is devoted to technology?**

Total library budget: _____

Total technology budget: _____

Technology budget as a percentage of overall budget: _____

Do you know how much your library spends each year on technology? "Technology" can include computers, broadband, wiring, staffing, computer accessories, and consultants. If you don't know, you are not alone! Many libraries do not track technology spending as a separate category, but it can be very helpful to track. Once you know your current tech budget, you can better plan for future tech purchases and identify potential funding sources to defray costs.

Review your budget for the current year and add up all the tech-related categories. Divide your technology budget by the total budget. What percentage of your total budget is devoted to technology?

If you do not have a technology budget, create one for your library for the current year to see how much is being spent on technology. Here is a sample technology budget for a small library that you can use as a guide: https://docs.google.com/spreadsheets/d/11hTww449ZoLIWoNx6YhRplPmVXk063ck/edit?usp=sharing&ouid=100085473019724700740&rtpof=true&sd=true.

If you have more sophisticated budgeting requirements, consider this more complicated sample technology budget from Web Junction: https://www.webjunction.org/documents/webjunction/Sample_Technology_Budget_for_a_Small_Library.html.

Outlining Your Current Funding Sources

2. What are your library's current funding sources?

Funding Source	Dollar Amount	Percentage of Total Funds	Time or Any Other Limitations on Spending (if any)
Example: Estate of Kermit Leischner, donation in honor of wife, Lucille	$500	$500/$10,000 =5%	Before 12/31/2025; Must go toward assistive tech equipment for seniors with low vision

It is important to identify your current sources of funding before looking for new sources because: 1) it makes you aware of any time limitations on your funding (like if a grant will end in two years) so you can plan for how to continue to fund any associated activities, and 2) you may be able to go back to the funding source to ask for additional money.

Many libraries outline their funding sources in a document such as an annual report or sharing budget numbers with their board or other governing body. Consult your most recent budget and list your library's sources of funding in the table below. Separately identify larger donations or grants.

When it comes to funding, sustainability is key. If a grant or other funding source ends, it is critical to plan so you can either find another funding source or adapt your budget and resources accordingly. Remember to put sources of funding for the whole library (not just technology). Include any time constraints on the funding source such as "one-time donation," "millage up for renewal in 2024," "the library budgets $x for this annually," or "grant ends in September of 2025."

Thinking about sustainability is particularly important when considering one-time funding opportunities such as grant programs. When applying grant funding to technology items or services, the best practice is to either provide for the sustainability of the program (such as through another source of funding) or create an exit plan to discontinue offering the technology item or service when it reaches the end of its useful life.

Local funding sources may make up the majority of your library's funding. On average, public libraries have several sources of funding that make up their total operating revenue:
- Local funding: 85.9% (such as library millages, appropriations, or bonds)
- State funding: 6.7%
- Federal funding: 0.3% (includes federal funds, such as Library Services and Technology Act (LSTA) funds, that are distributed to public libraries through state library agencies
- Other: 7.2% (includes monetary gifts and donations received in the current year, interest, library fines, fees for library services, or grants)

Source: Institute of Museum and Library Services Public Library Survey (2019) (Total operating revenue of public libraries and percentage distribution of revenue, by source of revenue and state: Fiscal year 2019, Table 7) (n.b. Other federal funds that are used by state library agencies or library cooperatives to provide services that benefit local public libraries are not included in the table because they are not received as income by public libraries).

Setting Funding Goals

Think BIG: What programs, equipment, and other resources would your library have if money and bandwidth were no object? It could be anything from installing a WiFi repeater to establishing a tech training program for community members entering the workforce.

3. **If your library were not constrained by funds or broadband limitations, what sort of services or application would you like to offer your community?**

☐ Online testing

☐ Distance learning/Online courses

☐ Videoconferencing

☐ Virtual field trips for homeschool students

☐ Job interviews

☐ Patron video chat with family members and friends, etc.

☐ Streaming video (YouTube, Netflix, etc.)

☐ Makerspace

☐ eBook download

☐ Digital media recording studio (audio and/or video)

☐ Gaming and Esports

Add any additional ideas and aspirations on how your library would use new technology or more bandwidth below. Remember - your funding goals go beyond just equipment purchases and programs. For example, consider including tech training for staff in your budget.

4. What are the projects, improvements, equipment, or training you would like to get funded?

Write your funding goals into the "Funding Goals" row of the **Library Technology Budget Worksheet** in **Appendix C** of the toolkit. What would you like to try to get funded in the next 1, 5, or even 10 years?

Note: We will complete the other worksheet rows in the subsequent questions.

Funding Goal
Example: Need 4 WiFi repeaters

Example "Funding Goal" row from the Library Technology Budget Worksheet

To outline your funding goals, first consult your Broadband Improvement Plan (BIP), completed sections in this toolkit, and any other future planning documentation your library has, like a strategic plan or technology plan (see the Technology Plan section for more information). It is helpful, but not necessary, to complete the Support and Advocacy section of the toolkit before this funding section.

5. Estimate the required resources, cost, and timeframe required to reach each funding goal.

Write the required resources, cost, and timeframe required to reach each funding goal.

In the "Resources Required and Cost Estimate" and "Timeframe to Complete" rows of the **Library Technology Budget Worksheet** in **Appendix C**.

To realize any funding goal, you need to know in advance how much it will cost in terms of money, time, and resources. For each funding goal, outline how much it will cost to the best of your abilities.

It is important to think about the **whole process** of realizing a funding goal. For example, if the library needs $500 for new wiring, you also need to factor in the cost of installation.

Estimating Resources

To research tech product pricing, consult the Purchasing Computers, Software, and Equipment section of this toolkit. This Computers in Libraries article, "Comprehensive cost planning yields successful tech projects," discusses how to consider all costs in your budget, including some you may not initially think about: https://librarytechnology.org/document/12054.

Resources Required and Cost Estimate
• 4 WiFi repeaters ($500) • Installation to be done by library volunteer ($0)
Timeframe to Complete
within 3 months

Example "Resources Required and Cost Estimate" row and "Timeframe to Complete" row from the Library Technology Budget Worksheet

Estimating Cost

Next, identify potential funding sources for each goal. To do this, look to multiple sources of information:

- Library's existing technology budget
- Library's technology plan
- Library Grant Funding Opportunities Resources section
- Eligible equipment and services that E-rate discounts
- Also review the Support and Advocacy and Technology Plan sections of the toolkit—since the majority of library funds come from local sources, it is essential to think about what local resources can you access that may help you achieve your goals
- See if your state library maintains a contract or pricing list
- Look into state or local consortia for technology discounts and pricing

Remember to identify all potential funding sources for each goal. For example, getting an E-rate discount does not cover the entire cost of certain equipment or services, so it is beneficial to identify other additional funding sources.

Many states offer consortium pricing for libraries. For example, the Connecticut Library Consortium (CLC) allows libraries in the state to take advantage of group-rate pricing for discounts on library technology like computer stations. For more information, watch the free edWeb. net webinar, Cut the Cost of Digital Collection Building: Join a Consortium! (you must enter your email address to watch), or read the 2NDGEAR article, Don't Go it Alone: What You Need to Know About Participating in an E-rate Consortium.

Potential Funding Sources (include any due dates)
• *E-Rate (03./22/22)* • *Annual technology budget equipment allocation (07/01/22)*

Example "Potential Funding Sources" row from the Library Technology Budget Worksheet

6. For each funding goal, what are the next steps that will help you achieve your funding goals? Who is the best person to be responsible for that next step?

Look at the goals and funding sources outlined in your **Library Technology Budget Worksheet**.

In the "Resources Required" and "Cost Estimate" rows, list the steps you need to take to achieve each funding goal and who is responsible for taking each step. You may find that it would be beneficial to partner with another organization or seek outside assistance.

Next Steps (include who is responsible for each step and timeline if possible)
• *Lead E-Rate application process for the 2023 application cycle (Stephanie)* • *Analyze budget to see if we can reallocate money for tech purchases - this month (Carson)* • *Buy repeaters - this month (Bonnie)* • *Set up installation with library volunteer - within 3 months (Therese)*

Example "Next Steps" row from the Library Technology Budget Worksheet

Grant Funding Opportunities and Resources

To search and apply for IT- and broadband-related library grants, use the resources under Grant Funding Opportunities and Resources, Additional Resources and Best Practices.

E-Rate Funding

Technology expenses are important budget considerations for all libraries. In this section, you will learn about several opportunities available to help provide e-rate funding for your library broadband connectivity.

7. How much do you pay for your broadband connection (monthly or annually)?

i.e. what is the full cost (what the service costs, including taxes, before any discounts, such as e-rate, are applied). Enter per month or year in the box below.

The full cost of your broadband service is more than the monthly price your Internet Service Provider initially advertised as the monthly rate. You will notice that your broadband bill has a lot of different "costs" associated with it, including:

- Service cost
- Device rental cost (for items such as routers and access points)
- State and local taxes
- Universal Service Fund fees (the State and/or Federal government collects fees to subsidize telecommunications services for high cost of living and rural areas, schools, libraries, rural health care institutions, and income-eligible households)

8. Does your library currently take advanage ofthe Federal Communications Commission (FCC) E-rate program for discounts to help pay for technology-related costs like broadband connectivity, certain hardware, software, upgrades, tech support, and wire and cable maintenance?

☐ Yes

☐ No

The FCC's E-Rate program makes telecommunications and information services more affordable for schools and libraries. With funding from the Universal Service Fund (https://www.fcc.gov/general/universal-service-fund), E-Rate provides discounts for telecommunications, Internet access, and internal connections to eligible schools and libraries, as well as funding for repair and upkeep of certain hardware, wire and cable maintenance, tech support, and software upgrades.

How to learn whether your library uses E-rate or has used E-rate in the past:

You cannot search on the USAC website for certain E-rate information if your library is not registered, so the best way to figure out if your library does use or has used E-rate is to call USAC's E-rate Customer Support directly:

USAC E-Rate Customer Support
Hours: Monday-Friday 8 a.m. to 8 p.m. ET
Phone: (888) 203-8100

When you call, a customer service representative will look your library up by name for you and tell you. Here is a sample script of what to say: "I'm not sure if my library is using, has used, or has ever applied for E-rate. Can you please search whether my library is registered within E-rate?"

They will look it up for you. Be sure to ask any follow up questions about your library's history of applying for E-rate. If you do get E-rate, ask how your library gets it. For example, do you get E-rate because your state library applies on your behalf or because you are part of a consortium?

For more information on the E-rate program, visit the Federal Communications Commission's FAQs on E-rate: https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate.

Tribal Libraries and E-Rate Funding

In 2022 and 2023, the FCC updated the E-Rate rules to add "Tribal library" to the definition of "library," making it easier for Tribal libraries including Tribal College and University libraries to apply for E-Rate support. The Order also amended the rules to recognize that Tribal libraries are eligible for support from state library administrative agencies under the Library Services and Technology Act (LSTA) and the Museum and Library Services Act of 2018.

Tribal Councils can designate a library as a Tribal library through, for example, a Tribal resolution. Tribal libraries should be able to demonstrate that they have three basic characteristics of a library: 1) regularly scheduled hours, 2) staff, and 3) materials available for library users.

In 2023, the FCC created the Tribal Library Pilot Program. [hyperlink to According to the FCC, E-rate staff work with new Tribal library applicants throughout the entire E-rate lifecycle to enhance E-Rate training materials, simplify the application process, better understand the Tribal library applicant experience, and increase participation and streamline the E-Rate program. For more information and resources for accessing E-Rate funding for tribal libraries, explore these links:

- Tribal Libraries E-Rate Pilot Program (includes checklists and FAQs): https://www.fcc.gov/tribal-libraries-e-rate-pilot-program
- USAC E-Rate Tribal Training (includes videos, archived webinars, and ongoing training opportunities): https://www.usac.org/e-rate/learn/tribal-training/

9. 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.

☐ The library is not sure what it needs in terms of services or equipment.

☐ 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:

_____

See "Section 10: Additional Resources and Best Practices" for E-rate resources and information to determine the best way to leverage this program for your library. 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

Some libraries have found that working through this toolkit has helped identify service and equipment needs that may be eligible for E-Rate discounts.

10. Are you up to date with what the E-rate program allows libraries to receive discounts on?

i.e. internal network equipment and wiring installation of fiber optic connectivity

☐ Yes

☐ No

The Universal Service Administrative Company, an independent not-for-profit designated by the FCC, administers the Schools and Libraries (E-rate) Program.

Check out the USAC website for a list of eligible equipment and services that can be discounted with the E-rate program: https://www.usac.org/e-rate/applicant-process/before-you-begin/eligible-services-overview/

For more information on the the E-rate program and how to get started access the USAC "getting started" and overview pages:
- https://www.usac.org/e-rate/get-started/
- https://www.usac.org/e-rate/applicant-process/before-you-begin/

11. Does your library currently take advantage of local, state, private grants or other funding to assist with your technology funding?

☐ Yes

☐ No

If yes, please list:

_____

_____

Reach out to your State Librarian's Office to see if there are additional grants, special funding, or training programs that may be available to your library.
- https://www.cosla.org/Directory

Some funding is dependent on your library's status as tribal, urban, or rural, to determine your status you can use this USAC lookup tool: https://sltools.universalservice.org/portal-external/urbanRuralLookup/

The National Telecommunications and Information Administration (NTIA) supports a BroadbandUSA program focused on expanding broadband connectivity and promoting digital inclusion that frequently highlights new funding resources. Review available funding on their grants page: https://broadbandusa.ntia.doc.gov/resources/grant-programs

Toolkit Notes for Section 8
Broadband and IT Improvements
Use these notes to help build your Broadband Improvement Plan

LIBRARY BROADBAND IMPROVEMENT PLAN

Purpose of this Document:

- Identify immediate (performed during Toolkit Assessment) and short-term (0-3 months) actions your library can take to improve broadband and related IT performance and operations.
- Identify longer term (3-12 months) actions your library can take to improve broadband and related IT performance and operations.
- The technical consultant will work with the library on this plan during the site visit and the library will submit it to the project team in order to track trends in action items, and identify other means of support for action items, if available.
- "Sample" action items anticipated by the project are listed below.

Directions:

Review your responses in the Toward Gigabit Libraries toolkit to identify any gaps or issues uncovered, including any recommended mitigation strategies, to help populate this Broadband Improvement Plan. Some of the potential "fixes" or mitigation strategies are identified in the toolkit, depending on how the question was answered. Try to identify at least two short actions and two long term actions.

SAMPLE BROADBAND IMPROVEMENT PLAN

Short Term Action Plan   (0-3 MONTHS)

Action
Move WiFi router from back of library to central part

Intended Result
Improve throughout in library, reduce dead spots

Resources Required	Timeline
Additional LAN cabling	*One month*

Action
Obtain information on contract with broadband service provider, including speeds, SLAs, contract time, costs, etc.

Intended Result
Understand what speeds the library should be seeing, calculate cost per Mbps, understand if there is recourse for missed speeds.

Resources Required	Timeline
Name of service provider and billing name/ information.	*One week*

SAMPLE BROADBAND IMPROVEMENT PLAN

Long Term Action Plan   (3-12 MONTHS)

Action
Contract with an additional area broadband service provider and bond/combine with existing broadband capacity

Intended Result
Increase broadband capacity at library

Resources Required	Timeline
Additional broadband connection and equipment to combine connection	6 months

Action
Install WiFi repeaters

Intended Result
Reduce dead spots, increase access to WiFi outside of library for off-hour use

Resources Required	Timeline
WiFi repeaters	5 months

Action
Participate in E-Rate program

Intended Result
Obtain a subsidy for the broadband connection and inside wiring to improve broadband connections and connectivity

Resources Required	Timeline
Support from State Library, E-Rate consultant (possibly)	12 months

BROADBAND IMPROVEMENT PLAN

Short Term Action Plan   **(0-3 MONTHS)**

Action

Intended Result

Resources Required	Timeline

Action

Intended Result

Resources Required	Timeline

BROADBAND IMPROVEMENT PLAN

Long Term Action Plan   **(3-12 MONTHS)**

Action	
Intended Result	
Resources Required	**Timeline**

Action	
Intended Result	
Resources Required	**Timeline**

BROADBAND IMPROVEMENT PLAN

Long Term Action Plan   (3-12 MONTHS)

Action

Intended Result

Resources Required	Timeline

Action

Intended Result

Resources Required	Timeline

ADDITIONAL RESOURCES AND BEST PRACTICES

The topics listed here are designed to provide you even more insight and resources to improve your library's broadband connectivity and technology services. You may find these items helpful in gaining a better understanding of your broadband connection, data network, and computers.

**Broadband and Networking | Content Filtering | Data Backup
Digital Inclusion | E-rate
Free Technology Related Training Opportunities & Resources for Librarians
Grant Funding Opportunities and Resources | Internet Use Policies
Purchasing Computers, Software, and Equipment**

Broadband and Networking
A Technical Primer on Broadband Connectivity and Networking Strategies - Appendix A

https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/advleg/pp/pub/books/oitp-case-studies.pdf
See pg. 51-57. In the first section, some of the basic elements of broadband connectivity are described. The second section reviews some of the low-cost options available to individual libraries that are encountering congestion difficulties and are seeking ways to ensure that their administrative operations can continue to function even as patrons' Internet usage increases. The final section explains the benefits of cooperating with other libraries in addressing the need for greater bandwidth. Source: ALA Office for Information Technology Policy.

COSLA Planning Guide for Library Broadband Connectivity

To the Internet Archive: **https://web.archive.org/web/20160910011701/http://www.cosla.org/documents/Broadband_Guide_2014.pdf**
A guide for evaluating and acquiring high-capacity, high-quality broadband connectivity for local libraries. Source: COSLA.

Connections, Capacity, Community: Exploring Potential Benefits of Research and Education Networks for Public Libraries

This is an archived link at the Internet Archive: **https://web.archive.org/web/20160930012835/http://library.alaska.gov/pdf/anc/owl/CCCRENetworkPaper21Feb11.pdf**
The purpose of this paper is to highlight ways in which state research and education networks (R&E networks) and community anchor institutions, particularly public libraries, can collaborate to provide high-quality broadband connections for users in the communities they serve. Source: Bill & Melinda Gates Foundation.

Connect K-12: Internet Speeds and Pricing by School District

https://connectk12.org/

Connect K-12 is a free, actionable internet speed and pricing information tool that aggregates, analyzes, and visualizes E-rate data so you don't have to. for America's K-12 school districts. While Connect K-12 was built to provide transparency around the bandwidth school districts buy, libraries can explore local internet service providers and pricing by entering their school district into the tool. Connect K-12 has been designed as a resource for leaders in state government and for school district administrators, including superintendents and technology directors, who are helping school districts upgrade their connectivity.

Edge

https://www.libraryedge.org/

Libraries can use Edge toolkit to assess their current technology and plan for the future. Led by the Urban Libraries Council, Edge enables libraries to harness the power of data to make informed decisions, better serve their communities and clearly demonstrate their community leadership role. As a subscription-based service, some state library organizations and other groups have purchased access on behalf of member libraries. Source: Urban Libraries Council.

Extending your Library's WiFi Reach

https://www.tsl.texas.gov/ld/librarydevelopments/2020/05/13/extending-your-librarys-wifi-reach/

Learn how to extend your library's wireless footprint to allow patrons to access the library's WiFi from the parking lot and elsewhere outside of the library from the Texas State Library and Archives Commission.

Fiber to the Library

http://www.ala.org/aboutala/sites/ala.org.aboutala/files/content/oitp/PDFs/fiber%20brief_%20published.pdf

Articulates how public libraries can benefit from using fiber optics for their broadband internet connection. Source: American Library Association.

Wi-Fi Channel Optimizer

http://www.pcworld.com/article/2943644/home-networking/5-free-wi-fi-tools-that-help-maximize-your-home-network.html#slide2

This article offers a list of 5 free Wi-Fi channel optimizer tools that can help improve the WiFi experience for your patrons and staff. Source: PC World.

Wi-FI Dead Spots/Coverage

http://www.ekahau.com/wifidesign/ekahau-heatmapper

HeatMapper™ is a free WiFi mapping tool that helps identify areas in your library where the Wi-Fi signal is poor or non-existent. Source: ekahau.

You Can Do I.T.! : Basic Network Technology for Libraries

https://onlinetraining.tsl.texas.gov/course/view.php?id=298

This free online course, designed for small, rural public libraries, explains network technology in approachable, straightforward language and allows for self-paced learning with the use of short YouTube videos. Source: Texas State Library Online Training.

Content Filtering
Alaska State Library Tech Talk "Web Filtering"

http://lam.alaska.gov/filtering
This guide is a companion to the Tech Talk "Web Filtering" from the Alaska State Library.

Children's Internet Protection Act (CIPA) Key Issues for Decision Makers (this is an archived WebJunction link at the Internet Archive):

https://web.archive.org/web/20161112071753/http://www.webjunction.org/documents/webjunction/CIPA_Key_Issues_for_Decision_Makers.html

https://www.webjunction.org/documents/webjunction/Children_039_s_Internet_Protection_Act_045_Summary.html
These articles focus on common questions being asked in the library community about CIPA. Source: Webjunction.

Content Filters

https://libraries.idaho.gov/broadband/internet-compliance-filtering/
Provides an overview of filtering, FAQ, choosing a filter, implementing filtering policies, filtering options for DNS, software, and hardware filters. Source: Idaho Commission for Libraries.

E-Rate Central: CIPA

https://e-ratecentral.com/Resources/Educational-Information/CIPA
This overview of the Children's Internet Protection Act (CIPA) includes a CIPA primer, CIPA checklist, and a sample internet use policy.

Filtering and the First Amendment

https://americanlibrariesmagazine.org/2013/04/02/filtering-and-the-first-amendment
Discusses what CIPA does and does not require and offers a best practices guide for providing CIPA-compliant filtering in a First Amendment friendly manner. Source: ALA's American Libraries Magazine.

Data Backup
The Rule of 3-2-1

http://www.hanselman.com/blog/TheComputerBackupRuleOfThree.aspx
Description: This blog post suggests the "rule of three" best practice around data backup-- always have three digital copies of anything you really care about, use at least 2 types of backup media (hard drive, tape, cloud), and at least one copy should be stored offsite. Source: Scott Hanselman blog post.

Your Organization's Backup Strategy

http://www.techsoup.org/support/articles-and-how-tos/your-organizations-backup-strategy
Description: Is your organization prepared for a disaster? A solid backup strategy is one of the key elements of being prepared. Get started developing your organization's backup strategy with these tips and best practices. Source: Tech Soup.

Digital Inclusion

Digital Inclusion Coalition Guidebook

https://www.digitalinclusion.org/blog/2022/02/24/ndia-publishes-new-digital-inclusion-coalition-guidebook/

The Digital Inclusion Coalition Guidebook shares lessons learned from six established community-wide digital inclusion coalitions composed of libraries, community-based organizations, local governments, housing authorities, and others to cooperatively address equitable access and use of communication technologies. The guidebook was developed by the National Digital Inclusion Alliance (NDIA) with support from the Media Democracy Fund and the Cleveland Foundation.

Digital Inclusion from BroadbandUSA

https://broadbandusa.ntia.doc.gov/resources/digital-inclusion

The National In (NTIA's) BroadbandUSA convenes the Digital Equity Leaders Network (DELN), a group of state and local government leaders working to bridge the digital divide. The DELN meets regularly to share best practices, resources, and strategies. This page links to federal funding, federal digital inclusion resources, and a map with links to state and local government digital inclusion programs.

Digital Literacy Instruction Playbook

https://www.ala.org/pla/initiatives/digitallead/digital-lit-instruction-playbook

The Public Library Association (PLA) has a comprehensive Digital Literacy Instruction Playbook, which has comprehensive resources to help your library implement a digital literacy instruction program to enhance your community's ability to find, evaluate, consume, create, communicate, and share digital content. This resource was developed as part of the PLA program, DigitalLead: Rural Libraries Creating New Possibilities, supported by a grant from Microsoft Philanthropies, to help libraries establish and promote hotspot lending programs.

Digital Navigator Toolkit

https://www.urbanlibraries.org/initiatives/digital-navigators

The Digital Navigator Toolkit offers a replicable blueprint to help libraries meet the digital needs of under-resourced community members with phone-based support services. The toolkit was made possible by an Institute of Museum and Library Services (IMLS) grant (LG-248566-OLS-20).

Hotspot Playbook

https://www.ala.org/pla/initiatives/digitallead/hotspot-playbook

The Public Library Association (PLA) has a comprehensive Hotspot Playbook linking to many helpful resources to help you implement a mobile hotspot lending program at your library. This resource was developed as part of the PLA program, DigitalLead: Rural Libraries Creating New Possibilities, supported by a grant from Microsoft Philanthropies, to help libraries establish and promote hotspot lending programs.

Public Access Computers Playbook

https://www.ala.org/pla/initiatives/digitallead/public-access-computers-playbook

The Public Library Association (PLA) has a comprehensive Public Access Computers Playbook to help you provide public access computers to your community. This resource was developed as part of the PLA program, DigitalLead: Rural Libraries Creating New Possibilities, supported by a grant from Microsoft Philanthropies, to help libraries establish and promote hotspot lending programs.

Skillbase

https://skillbase.hks.harvard.edu/

Skillbase is a free collection of online career skills resources for job seekers and learners to teach them practical skills for future or current jobs. It is curated by Harvard students, graduates, and faculty with experience in education, technology, business, and job training.

E-rate
Common Barriers and Solutions for Small Rural Libraries in Filing for E-Rate

https://drive.google.com/file/d/0B67MuoyF-w3NbmI0TWROX0hNMm8/view?usp=sharing
Public libraries have many reasons for not participating in E-rate. We've tried to provide answers to the most common issues and concerns expressed by libraries that choose to not file for E-rate. Source: State Library of Iowa.

COSLA E-Rate Planning Tools

https://www.usac.org/e-rate/resources/tools/
COSLA (Chief Officers of State Library Agencies) developed two resources for State E-Rate Coordinators and others as examples to better understand and realize the opportunities presented by the federal E-Rate program: 1) Tips and Tools for E-Rate Success, and 2) Understanding E-Rate Category 1 and 2 Services. These activities were made possible in part by the Institute of Museum and Library Services (RE-00-15-0111-15).

E-Rate Central

https://e-ratecentral.com/
E-Rate Central provides a comprehensive range of information and consulting services about the E-rate program and E-rate funding opportunities. It sends a weekly E-rate newsletter about important program rules and updates, best practices to help you avoid E-rate filing mistakes, and strategies to help you maximize your E-rate funding and manage E-rate deadlines. It also lets you search your library's history of E-rate funding.

E-Rate Form 471 Workshop

https://www.youtube.com/watch?v=M0o4Rz3zcwE
This informative Ohio Public Library Information Network (OPLIN) webinar takes you through a line-by-line review and analysis of how to file the annual E-Rate Form 471, the application for discounts on eligible services.

Tribal Training for E-rate

https://www.usac.org/e-rate/learn/tribal-training/
The Universal Service Administrative Company (USAC) created the Tribal Training initiative to help Schools and Libraries (E-rate) program applicants on Tribal lands participate effectively in the E-rate program. Members of the E-rate program staff are available to help Tribal applicants navigate the program, assist with solving and preventing funding issues, answer questions, and provide training materials and guidance.

Universal Service Administrative Company (USAC) Resources
The Universal Service Administrative Company, an independent not-for-profit designated by the FCC, administers the Schools and Libraries (E-rate) Program. Provides an overview of E-Rate, eligible services, the application process, bulletins, and webinars.

Free Technology Related Training Opportunities & Resources for Librarians
A Technology Cookbook for Small and Rural Libraries

https://www.webjunction.org/documents/webjunction/Planning_for_Success_Cookbook_Overview_and_Toolkit.html
This all-encompassing cookbook contains chapters on configuring and maintaining public access computers, getting the technology training you need, setting up a wireless network, tech volunteer recruitment, and much more. Source: Tech Soup for Libraries.

Coursera

https://www.coursera.org/
Coursera partners with more than 200 leading universities and companies to bring flexible, affordable, job-relevant online learning to individuals and organizations worldwide. Includes free or fee-based courses, from hands-on projects and courses to job-ready certificates and degree programs.

Emerging Trends in Technology

https://infopeople.org/civicrm/event/info?id=536
As part of the Emerging Tech Trends series, this webinar introduces emerging technology trends and tipping points, and how these emerging trends are reshaping library services. Source: Infopeople.

Free Online Essential Technology Skills Training

http://www.gcflearnfree.org
Goodwill Community Foundation helps librarians and others gain the essential skills they need to live and work in the 21st century. From Microsoft Office and email to reading, math, and more, GCFLearnFree.org offers 125 tutorials, including more than 1,100 lessons, videos, and interactives, completely free. Source: Goodwill Community Foundation LearnFree.org.

Free Training Webinars, Courses, and Other Resources

http://www.webjunction.org/find-training.html
Description: Here you will find a variety of documents, webinars, and other resources aimed at helping rural libraries serve their communities in a scalable and sustainable manner. Source: Webjunction.

Khan Academy & Code.org Computer and the Internet Courses

https://www.khanacademy.org/computing/code-org/computers-and-the-internet
These free, easy-to-understand courses teach you how computers and the internet work, including the ways hardware and software work together, cybersecurity issues, and wires, cables, and WiFi.

Rural Library Sustainability Program

http://www.webjunction.org/explore-topics/rlsp.html
Here you will find a variety of documents, webinars, and other resources aimed at helping rural libraries serve their communities in a scalable and sustainable manner. Source: Webjunction.

State Library Agencies Directory

https://www.cosla.org/Directory
Description: Use this list to find free technology training opportunities offered by your local state library agency. Source: COSLA.

Grant Funding Opportunities and Resources
LSTA and IMLS Grants
Library Services and Technology Act (LSTA) Grants

https://www.imls.gov/grants/grant-programs/grants-states
LSTA grants are funded by the Institute of Museum and Library Services (IMLS) via the IMLS Grants to States program and administered by state libraries. The grants distribute over $150 million among state library administrative agencies. LSTA funds can be used for any purpose outlined in the Act. Because the state libraries administer these grants, visit your state library's website for state-specific LSTA information.

Institute of Museum and Library Services (IMLS) Grants

https://www.imls.gov/grants
IMLS has several grant programs to help your library improve its IT and broadband infrastructure. This page lists the available grants, lets you search previously funded grants, and outlines how to apply (with sample applications). Relevant grants include:

CARES Act Grants for Museums and Libraries program

https://www.imls.gov/grants/available/imls-cares-act-grants-museums-and-libraries
Supports the role of museums and libraries in responding to the coronavirus pandemic. Includes staff training and development, addressing the digital divide, and providing technical support and capacity building for digital inclusion and engagement.

IMLS American Rescue Plan Grants program

https://www.imls.gov/grants/available/imls-american-rescue-plan
Supports museum and library services in addressing community needs created or exacerbated by the COVID-19 pandemic and in assisting with recovery. Can be used to enhance or expand existing programs or to launch new ones.

Native American Basic Grants program

https://www.imls.gov/grants/available/native-american-library-services-basic-grants
Supports existing library operations and helps maintain core library services for tribal communities.

Native American Library Services Enhancement Grants program

https://www.imls.gov/grants/available/native-american-library-services-enhancement-grants
Supports efforts to enhance existing library services or implement new library services for tribal communities, including digital services.

Native Hawaiian Library Services Grants program

https://www.imls.gov/grants/available/native-hawaiian-library-services
Supports efforts to enhance existing library services or implement new library services for Native Hawaiian communities, including digital services.

Library Grant Search Engines and Blogs
Candid: Visualizing Funding for Libraries

https://philanthropynewsdigest.org/features/on-the-web/visualizing-funding-for-libraries
The Visualizing Funding for Libraries data tool, created with funding from the John S. and James L. Knight Foundation, can help libraries identify funding opportunities to support innovative projects and solutions for their communities. Using the tool, you can see who is funding library projects, analyze funder and library networks, support your knowledge about the field, identify gaps in funding, and discover natural collaborators. Their interactive funding research tool lets you filter grants by categories like capacity-building and technical assistance, capital and infrastructure, continuing support, financial sustainability, or network-building and collaboration. They also have several free training opportunities, including webinars and a comprehensive e-learning course, "Grantseeking for Libraries."

Grants.gov Grant Search

https://www.grants.gov/search-site.html
Search federal funding opportunities for organizations and entities supporting the development and management of government-funded programs and projects.

Library Grants Blog, by Stephanie Gerding

http://librarygrants.blogspot.com
Stephanie Gerding is a librarian, author, and trainer who specializes in library grants. Her long-running blog regularly announces new funding opportunities for librarians.

Writing Grant Proposals
**Creating Fundable Grant Proposals: Profiles of Innovative Partnerships,
by Bess G. de Farber, ALA Editions (2021)**

https://www.alastore.ala.org/content/creating-fundable-grant-proposals-profiles-innovative-partnerships
This book draws from profiles of over 50 grant proposals to funders including federal agencies, foundations, and library organizations. It gives you a detailed 10-step workflow to guide you through submitting and managing collaborative grant proposals.

Grant Writing 101: Basics for Programming Librarians

YouTube Video from the Programming Librarian channel from the American Library Association Public Programs Office

https://www.youtube.com/watch?v=Yudqt5kgkh8
This helpful 1-hour webinar recording from Tracy Herold of the Dane County Library Service is presented by ALA's Public Programs Office. It gives an overview of the grant-writing process and the tools to make your proposal as strong as possible. After watching, you will know how to clearly define your project in one or two sentences, communicate the problem you are trying to solve, and understand how grant budgets work.

Grantseeking for Libraries: Top 10 Practices for Foundation Funding

https://learn.webjunction.org/login/index.php
This free online course is from the Visualizing Funding for Libraries data tool, created with funding from the John S. and James L. Knight Foundation. The tool can help libraries identify funding opportunities to support innovative projects and solutions for their communities. The course takes you through planning, researching grants, forming relationships, and writing grants.

Planning and Writing a Grant Proposal: The Basics
University of Wisconsin-Madison

https://writing.wisc.edu/handbook/assignments/grants-2/
While the instructional materials for this UW-Madison Writer's Handbook are not specific to libraries, they contain a practical breakdown explaining each element of a grant proposal and lots of other grant writing tips.

Winning Grants for Small & Rural Libraries
YouTube Video from the Libraries 2.0 channel

https://www.youtube.com/watch?v=YgJnZwmh_bc
This compelling 30-minute presentation on winning grants for small and rural libraries is from library grants author and trainer Stephanie Gelding.

Internet Use Policies
Checklist for Creating an Internet Use Policy

This link is an archive of an American Libraries Association at the Internet Archive: **https://web.archive.org/web/20181106222536/http://www.ala.org/Template. cfm?Section=litoolkit&Template=/ContentManagement/ContentDisplay.cfm&ContentID=50647**
Here are a few suggestions to consider when creating or updating your policies. Source: The American Library Association.

Internet Use Policy Toolkit

This link is an archive of an American Libraries Association at the Internet Archive: **https://www.ala.org/advocacy/privacy/guidelines/public-access-computer**
The American Library Association (ALA) strongly encourages every library to adopt, implement and publicize a written Internet use policy in the same way it adopts other library use and access policies. This policy should be in keeping with your library's mission statement, other access policies and community needs. Source: The American Library Association.

Library Computer Use and Internet Safety Policies

https://www1.maine.gov/msl/erate/internet-policies.pdf
The Maine State Library offers a comprehensive set of guidelines for developing Internet Use Policies. Included are links to several exemplar policies from libraries around the country and links to additional resources. Source: The Maine State Library.

Wireless Policy Checklist

This link is an archive of Tech Soup at the Internet Archive: **https://web.archive.org/web/20170430072410/http://www.techsoupforlibraries.org/blog/steal-this-wireless-policy-checklist**
This article discusses how to ensure wireless use is covered in your Internet Use Policy. Source: Tech Soup for Libraries.

Purchasing Computers, Software, and Equipment
ALA Library Technology Reports Journal

https://journals.ala.org/index.php/ltr/index
Published by ALA TechSource, an imprint of the American Library Association (ALA), Library Technology Reports helps librarians make informed decisions about technology products and projects. There is a fee for this service.

Consumer Reports Buying Guide: Computers & Internet

https://www.consumerreports.org/electronics-computers/computers-internet/
Consumer Reports is an independent, nonprofit member organization that works side by side with consumers for truth, transparency, and fairness in the marketplace. It has buying guides for computers, WiFi extenders, wireless routers, printers, telecom services, password managers, and more.

How to Analyze and Negotiate Library IT Contracts

https://www.ala.org/lita/how-analyze-and-negotiate-library-it-contracts
In this June 2020 webinar, Michael Rodriguez introduces a framework and best practices for effectively analyzing and negotiating contracts for the purchase of IT products and services. Learn how to address common concerns such as learning the legalese, developing negotiation skills, reducing legal risk, and ensuring bang for your buck! The presentation also addresses the impact of cloud computing, the role of open source software, current industry changes, and privacy risks.

How-To Geek Buying Guide

https://www.howtogeek.com/buying-guides/

How-To Geek's product recommendations come from the same team of experts that have helped people fix their gadgets over one billion times. We only recommend the best products based on our research and expertise. We never accept payment to endorse or review a product.

Library Technology Guides

https://librarytechnology.org/

Library Technology Guides provides comprehensive and objective information surrounding the many different types of technology products and services used by libraries. It covers the organizations that develop and support library-oriented software and systems. The site offers extensive databases and document repositories to assist libraries as they consider new systems and is an essential resource for professionals in the field to stay current with new developments and trends. The site is run by Marshall Breeding, an independent library technology consultant, speaker, and author. His monthly column Systems Librarian appears in Computers in Libraries, and he authors the annual Library Systems Report published in American Libraries and Library Journal.

PC Mag Technology Picks

https://www.pcmag.com/picks

PCMag.com is a leading authority on technology, delivering Labs-based, independent reviews of the latest products and services. Its expert industry analysis (they test and rate hundreds of products each year) and practical solutions help you make better buying decisions and get more from technology.

PC World Best Picks

https://www.pcworld.com/best-picks

PCWorld is dedicated to helping tech users of all experience levels get more from the hardware and software that's central to a PC-centric universe. The site has reviews on everything from computers and PC apps to WiFI Routers and the latest chips.

Wrangling Services Contracts in Libraries

https://docs.lib.purdue.edu/charleston/2016/scholcomm/6/

This article focuses on 15 common problematic contract clauses to illustrate potential risks and how to ameliorate those risks.

GLOSSARY

802.11a

A specification developed by the Institute of Electronic and Electrical Engineers (IEEE) for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients.

802.11ac

A wireless LAN (WLAN) specification under development by the IEEE that delivers wireless data transfer rates in the range of 433 Mbps (Megabits per second) per spatial stream. With support for up to eight streams, the 802.11ac specification offers a theoretical maximum data transfer speed of more than 3 Gbps, and can deliver 1.3Gbps transfer speeds with a more common three-antenna (three streams) design.

802.11b

Also referred to as 802.11 High Rate or Wi-Fi, it is an extension to 802.11 specification developed by the IEEE for wireless LAN technology that applies to wireless LANS and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet

802.11g

An extension to 802.11 specification developed by the IEEE for wireless LAN (WLAN) technology that is used for transmission over short distances at up to 54-Mbps in the 2.4 GHz bands.

802.11n

An extension to 802.11 specification developed by the IEEE for wireless LAN technology. 802.11n builds upon previous 802.11 standards by adding multiple-input multiple-output (MIMO). The additional transmitter and receiver antennas allow for increased data throughput through spatial multiplexing and increased range by exploiting the spatial diversity through coding schemes like Alamouti coding. The speed is 100 Mbit/s (even 250 Mbit/s in PHY level), and so up to 4-5 times faster than 802.11g. 802.11n also offers a better operating distance than current networks.

802.11x wireless

802.11 and 802.11x refers to a family of specifications developed by the IEEE for wireless LAN (WLAN) technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients. The IEEE accepted the specification in 1997.

Access Point (AP)

Is a device that allows wireless devices to connect to a wired network using Wi-Fi, or related standards. The AP usually connects to a router (via a wired network) as a standalone device, but it can also be an integral component of the router itself. Also referred to as an Wireless Access Point (WAP).

Backup

In computing, a backup is any copy of a file stored on a medium separate from the location of the original data. "Backup" can also be used as a verb meaning to perform the copying of original files to a separate medium. The purpose of backups is to have copies of important information in case of failure or damage to the originals. Best backup practices follow the "rule of 3-2-1," which states that you should have three digital copies of any important data. These should be stored on two separate mediums (such as on an external hard drive, network drive, thumb/USB drive, or in cloud storage), and at least one copy should be stored off-site in case of disaster, etc.

Broadband

Broadband is the word used to, generally speaking, describe high-speed broadband telecommunications and, more specifically, high-speed internet. Operating at, responsive to, or comprising a wide band of frequencies (a broadband radio antenna); of, relating to, or being a high-speed communications network and especially one in which a frequency range is divided into multiple independent channels for simultaneous transmission of signals (as voice, data, or video). The FCC currently defines broadband as 25 Mbps download and 3 Mbps upload.

Broadband Device

A broadband device can refer to several different pieces of hardware; usually it means "modem," like a cable or DSL modem, but sometimes a broadband device can be a router that is connected to a Wide Area Network (WAN) or another device.

Broadband Service Provider

An organization that provides services for accessing, using, or participating in the Internet. Internet service providers may be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned.

Also known as an "Internet Service Provider (ISP)."

Category (Cat) 5 Cable

Cat 5 is a twisted pair cable for carrying signals. This type of cable is used in structured cabling for computer networks such as Ethernet. The cable standard provides performance of up to 100 MHz and is suitable for 10BASE-T, 100BASE-TX (Fast Ethernet), and 1000BASE-T (Gigabit Ethernet). Cat 5 is also used to carry other signals such as telephony and video.

Category (Cat) 5e Cable

The category 5e specification improves upon the category 5 specification by tightening some crosstalk specifications and introducing new crosstalk specifications that were not present in the original category 5 specification. The bandwidth of category 5 and 5e is the same – 100 MHz. The differences between category 5 and category 5e are in their transmission performance. Category 5e components are most suitable for a high-speed Gigabit Ethernet. While category 5 components may function to some degree in a Gigabit Ethernet, they perform below standard during high-data transfer scenarios.

Category (Cat) 6 Cable

A standardized cable for Gigabit Ethernet and other network physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards. Compared with Cat 5 and Cat 5e, Cat 6 features more stringent specifications for crosstalk and system noise. The cable standard provides performance of up to 250 MHz and is suitable for 10BASE-T, 100BASE-TX (Fast Ethernet), 1000BASE-T/1000BASE-TX (Gigabit Ethernet) and 10GBASE-T (10-Gigabit Ethernet).

Category (Cat) 6a Cable

Cat 6a operates at 500 MHz, twice the frequency of Cat 6, but supports the same maximum data transfer rate of 10 Gbps. The difference is that Cat 6 can only transmit data at 10 Gbps for 55 meters (180 feet), while Cat 6a supports 10 Gbps for 100 meters (328 feet). A Cat 6 cable will still work over 55 meters, but the speed may decline. The "a" stands for "augmented" and, in addition to the higher frequency, a Cat 6a cable has additional shielding built in, more twists, and is thicker and heavier than a Cat 6 cable. These features make a Cat 6 more robust and resistant to most forms of crosstalk.

Category (Cat) 7 Cable

A Category 7 cable (Cat 7 Cable) is a type of shielded twisted pair cable used in high-speed Ethernet based computer networks of 1 Gbps or higher. It is defined and specified in the ISO/IEC 11801:2002, Class F specification. The Cat 7 cable is backward compatible with Cat 6, Cat 5 and Cat 5/e cabling standard and equipments. A Cat 7 cable is also known as an ISO Class F cable.

Category (Cat) 8 Cable

Category 8, Cat8 cable or Cat-8 cable is an ethernet cable which is a different type of cable standing apart from the previous cables. It supports a frequency of up to 2GHz(2000 MHz). It is limited up to the 30-meter 2-connector channel. It requires shielded cabling as well. The major point to consider is that it can support a speed of 35 Gbps or 40 Gbps. Overall, its physical appearance is similar to lower category cables. They terminate in RJ45 connections or non-RJ45 connections. It is compatible with all its backward versions. You can use it with the standard connectors of previous versions such as Cat-7.

Device Authentication--MAC Address

Is used to authenticate devices based on their physical media access control (MAC) address. While not the most secure and scalable method, MAC-based authentication implicitly provides an additional layer of security authentication devices. MAC-based authentication is often used to authenticate and allow network access through certain devices while denying access to the rest. For example, if clients are allowed access to the network via station A, then one method of authenticating station A is MAC-based. Clients may be required to authenticate themselves using other methods depending on the network privileges required.

Endpoint

Anything attached to the network, including PC, laptop, tablet, phone, iPod, etc.

Ethernet

A computer network architecture consisting of various specified local-area network protocols, devices, and connection methods.

Ethernet Port

An Ethernet port is an opening on computer network equipment that Ethernet cables plug into. Ethernet ports accept cables with RJ-45 connectors, including Cat cables.

Firewall

A Firewall is a network or computer component (either hardware or software) intended to block unauthorized users from accessing a private network or computer while still allowing outward exchange of data.

Firmware

Firmware is software for a specific piece of hardware (device), like a modem or a router. Your device may receive firmware updates automatically, but others require you to download firmware updates from the manufacturer's website.

Gateway

A wireless gateway routes packets from a wireless LAN to another network, wired or wireless WAN. It may be implemented as software or hardware or combination of both. Wireless gateways combine the functions of a wireless access point, a router, and often provide firewall functions as well.

Hub

On a network, a hub is a device connecting multiple segments of a LAN and containing multiple ports. When a hub receives information (in the form of a packet) in one port, it copies that information to all of the other ports.

For an explanation of the differences between a Hub, a Switch and a Router, see: http://www.webopedia.com/DidYouKnow/Hardware_Software/router_switch_hub.asp

Internet Service Provider (ISP)

An organization that provides services for accessing, using, or participating in the Internet. Internet service providers may be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned.

Also known as "broadband service provider."

IP Address

An IP address is a unique string of numbers separated by periods that identifies each computer using the Internet Protocol to communicate over a network.

IPv6

Internet Protocol version 6 (IPv6) is the latest version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion. IPv6 is intended to replace IPv4.

Jitter

Jitter refers to a variation in the typical amount of delay between sender and receiver. In data networks, it's the measure of the variation over time of the latency of the network. Jitter is undesirable because it means the information relayed is delayed or otherwise interrupted.

Last Mile

The "last mile" is a colloquial phrase widely used in the telecommunications, cable television, and Internet industries to refer to the final leg of the telecommunications networks that deliver telecommunication services to end-users (customers). The "last mile" is the internet connection from the library to the larger fiber network. It is often the most expensive part of connecting to the internet.

Latency

Latency (sometimes called "ping") is the amount of time required for a data packet to get from point A to point B. It is usually measured in terms of round-trip delay expressed in milliseconds. Higher quality connections have latency in the <100 ms range, the lower the better. Low latency is especially critical for real-time applications, such as live streaming video and interactive videoconferencing.

Local Area Network (LAN)

A local area network (LAN) is a computer network that interconnects computers within a limited area (such as a home, school, computer laboratory, or office building) using network media. "Network media" refers to the medium by which communication travels between parts of your network, and there are 4 main types: twisted-pair cable, coaxial cable, fiber-optic cable, and wireless.

LAN (Local Area Network) Port

A LAN port, also called a "wireless connection," puts information from the WAN (Wide Area Network) port out over your wireless connection. The WAN port takes in information from the outside network or the Internet. The information is filtered through the router's internal firewall and routing system. Then the information is sent to the proper LAN port or out over a wireless connection to a wireless source. Most users will find a WAN port on a network router. A common home router has one WAN port and four LAN ports. Some routers refer to them as an uplink (for the WAN port) and wired connections (for LAN ports).

Managed Network Services

Services offered, often remotely, via a contracted broadband service provider that manages and assumes responsibility for providing a defined set of services to the client, often automatically or on an as-needed basis. Managed network services may include network device monitoring, firewall and security installation and management, software and firmware updates for network equipment, and even email and data center hosting.

Middle Mile

The "middle mile" is the connection between the "last mile" and the greater internet. For example, the middle mile may connect your town's internet to a larger metropolitan area where it connects to the major carriers.

Modem

A modem is the device that connects your library's internet connection to the outside world. It is the device that connects directly to the internet cable that comes into the library building. Many modems also act as routers and/or WiFi routers, but one or more WiFi routers or Wireless Access Points (WAPs) can also separately connect to the modem to broadcast the WiFi signal.

Network Media

Network media refers to the medium by which communication travels between parts of your network. There are 4 main types of network media: twisted-pair cable, coaxial cable, fiber-optic cable, and wireless.

Packet

A packet is the unit of data that is routed between an origin and a destination on a network or over the internet.

Packet Loss

The failure of one or more transmitted packets to arrive at their destination, causing noticeable interruptions in a transmission and affecting the quality of your Internet connection.

Ping

See "latency."

Powerline Adapter

A powerline adapter is a type of wireless repeater that connects your computer to your router using your existing electrical wiring. You plug one adapter into your router with an ethernet cable, and then you plug the other adapter into an outlet near where you want a WiFi signal.

Retransmission

Retransmission occurs when data packets are resent, which affects the quality of your Internet connection. It happens when the original data packets are lost, damaged, delivered out of order, or delayed for a long time. To ensure communications are solid, the sender of the data keeps a copy of the data handy until the receiver confirms that the data has been received. The process of retransmission is built into many of the communications systems of the Internet and is an automatic process.

Router

A router is a networking device that connects devices to your modem and forwards data packets between computer networks. A router is connected to two or more data lines from different networks. Libraries may have a wired router that connects directly to desktop computers with cabling, or they may have one or more wireless, or WiFi, routers.

Service Level Agreement (SLA)

A service level agreement is the contract you sign with your broadband service provider that describes the type and quality of services you receive. They often define key items such as the speed of your connection, guarantees of uptimes, description and terms of service and support for your connection, remedies if services are not delivered as promised, and other elements.

SSID (Service Set Identifier)

SSID is a case sensitive, 32 alphanumeric character unique identifier attached to the header of packets sent over a wireless local-area network (WLAN) that acts as a password when a mobile device tries to connect to the basic service set (BSS) -- a component of the IEEE 802.11 wireless LAN architecture.

Switch

A network switch (also called switching hub, bridging hub, officially MAC bridge) is a computer networking device that connects devices together on a computer network, by using packet switching to receive, process and forward data to the destination device.

Transmission Control Protocol/Internet Protocol (TCP/IP)

The suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is built into the UNIX operating system and is used by the Internet, making it the de facto standard for transmitting data over networks.

Voice over Internet Protocol (VoIP)

VoIP is technology that lets you make phone calls over your internet connection instead of a regular, analog phone line.

Wide Area Network (WAN)

Most networks consist of two major zones—the local area network (LAN) and the wide area network (WAN). A LAN is the internal network, regardless of whether it is a house with two computers or a high-rise office building with thousands. The WAN is the network outside the LAN; this is both other internal networks and the full Internet. A WAN port is the portal by which information passes back and forth between the LAN and the WAN.

WAN (Wide Area Network) Port

A WAN port, sometimes called an "uplink," is the portal by which information passes back and forth between the LAN and the WAN. Most users will find a WAN port on a network router. A common home router has one WAN port and four LAN ports. Some routers refer to them as an uplink (for the WAN port) and wired connections (for LAN ports). The WAN port takes in information from the outside network or the Internet. The information is filtered through the router's internal firewall and routing system. Then the information is sent to the proper LAN port or out over a wireless connection to a wireless source.

WiFi Extender

WiFi extenders communicate wirelessly with the primary WiFi system and receive the WiFi signal from the router and broadcast or "repeat" the signal into areas that need more WiFi coverage or signal.

Wifi Mesh Router

WiFi mesh router systems spread a strong WiFi connection throughout a space using multiple devices as access points. They are built to cover larger areas and buildings with multiple stories, as well as libraries that have interior walls (like a brick or adobe wall) or unusual layouts that may disrupt the WiFi. Mesh systems start with as few as two access points, but (depending on the system capability) can scale up to 3, 5, or more. Mesh systems communicate with each other via a special wired or wireless connection called a "backhaul" to ensure that all access points offer speedy and efficient performance.

WiFi Repeater

WiFi repeaters are hard wired connected to the WiFi router to extend or repeat the WiFi signal. In fact, many WiFi routers can double as repeaters. Some WiFi repeaters, called "powerline adapters," are plugged into the power outlet and Ethernet connected to the main WiFi router and a second power outlet adapter is plugged into the area that needs broadband and a device can be Ethernet connected to it.

WiFi Router

A WiFi router is a wireless router. For more information, see "router."

Wired Network

A wired network uses Ethernet cables to transfer data between connected PCs, routers, switches, and wireless access points, depending on the configuration of the network.

Wireless Access Point (WAP)

A device that allows wireless devices to connect to a wired network using Wi-Fi, or related standards. The WAP usually connects to a router (via a wired network) as a standalone device, but it can also be an integral component of the router itself. Also referred to as an Access Point (AP).

ACKNOWLEDGEMENTS

The first version of this Toward Gigabit Libraries toolkit was published in 2018 pursuant to an Institute of Museum and Library Services (IMLS) grant (RE-00-15-0110-15), and was led by PI Susannah Spellman, Internet2; co-PI James Werle, Internet2; and consultant 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

The Gigabit Libraries and Beyond Project Team
Project Co-Directors

- **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.
- **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** is the grant's Principal Investigator and 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 anchor institutions across the nation.
- **Bonnie Nichols** provides research, project management, and administrative support for Carson Block Consulting, Inc. Bonnie previously worked in the circulation department of her local library for almost ten years.

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 both the TGL and GLB projects were invited based on their subject matter expertise, interest, and willingness to roll up their sleeves to provide thoughtful, thorough, and detailed insight to the toolkit and process.

Toward Gigabit Libraries Advisory Board

- 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 Museum
- 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 Commissio
- 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

Two teams comprised of more than 40 subject matter experts from rural libraries, tribal libraries, higher education, state libraries, state and regional R&E networks, and urban libraries helped guide and inform the development of the toolkit and an evaluation of the toolkit help evaluate the process and results.

The project team appreciates the time and efforts of those assisting in the development of the toolkit. Over thirty state library and R&E network staff were engaged to assist in conducting the pilots in eleven states including Alaska, Arizona, Connecticut, Idaho, Kansas, Nebraska, New Mexico, Oklahoma, Pennsylvania, South Dakota, Texas, and Washington.

The project team would like to thank the rural and tribal library staff members who contributed their time and energy for the pilot visits.

Network Diagram Worksheet

Sample Network Diagram

INTERNET

WAN

BROADBAND SERVICE PROVIDER

BROADBAND CONNECTION TO LIBRARY

OUTSIDE BUILDING
INSIDE BUILDING

BROADBAND DEVICE
(CABLE, DSL MODEM OR OTHER)

SOMETIMES THE BROADBAND DEVICE AND ROUTER ARE COMBINED IN ONE PHYSICAL PIECE OF EQUIPMENT

ROUTER

SWITCH

LAN

WIRELESS ACCESS POINT

LAPTOPS

MOBILE DEVICES

PHONES

PCS

PRINTERS
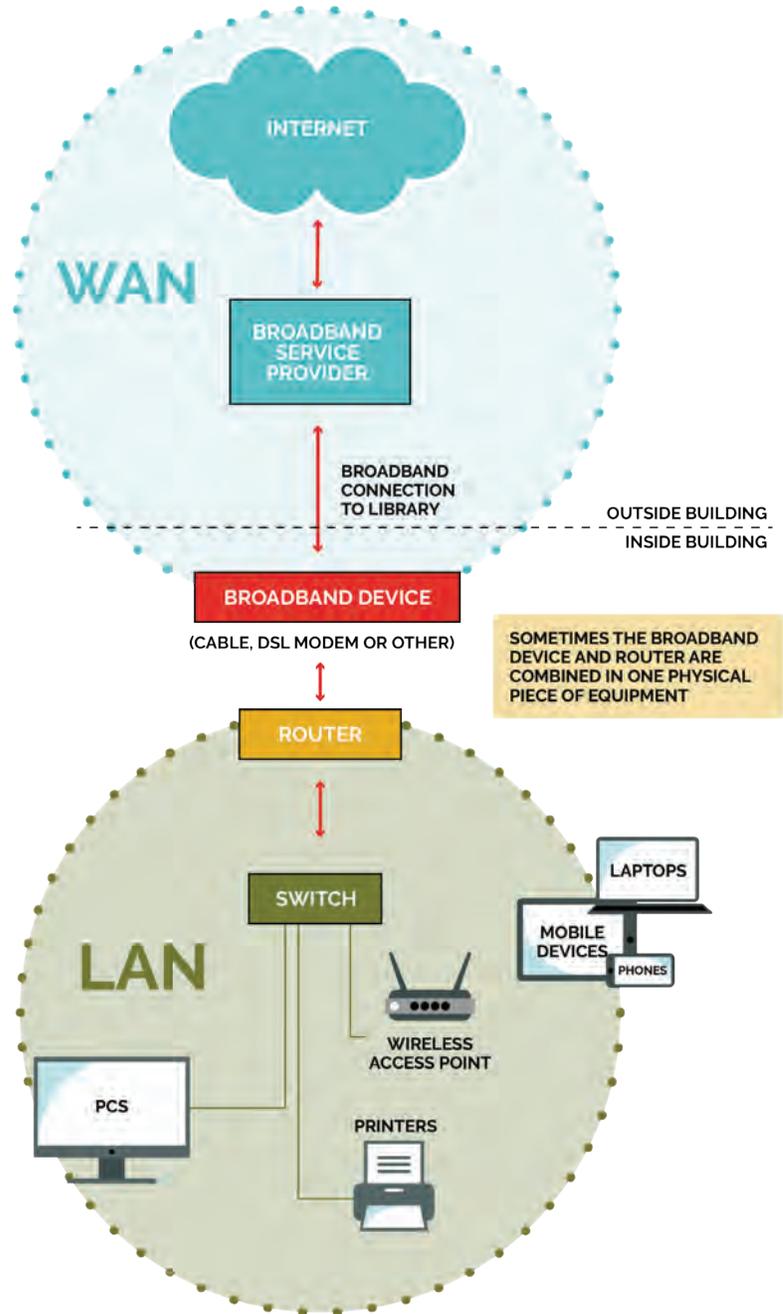
Network Diagram Worksheet

Your Network Diagram

Speed Test Worksheet

Speed Test (https://speed.measurementlab.net/#/ https://www.speedtest.net/)

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
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	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

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APPENDIX B:
Speed Test Worksheet

Speed Test (https://speed.measurementlab.net/#/ https://www.speedtest.net/)

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
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Date / Time	SPEED TEST RESULTS	Download	Upload		QUALITY TEST RESULTS			Notes
	Test #1 Measurement Lab			Mbps	Latency		Milliseconds (ms)	
	Test #2 SpeedTest.net			Mbps	Ping		Milliseconds (ms)	

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Sample Library Technology Budget Worksheet

Funding Goal
Example: Need 4 WiFi repeaters

Resources Required and Cost Estimate
• *4 WiFi repeaters ($500)* • *Installation to be done by library volunteer ($0)*

Timeframe to Complete
within 3 months

Potential Funding Sources (include any due dates)
• *E-Rate (03./22/22)* • *Annual technology budget equipment allocation (07/01/22)*

Next Steps (include who is responsible for each step and timeline if possible)
Lead E-Rate application process for the 2023 application cycle (Stephanie) *Analyze budget to see if we can reallocate money for tech purchases - this month (Carson)* *Buy repeaters - this month (Bonnie)* *Set up installation with library volunteer - within 3 months (Therese)*

Notes
May want to contact Dexter Public Library about their E-Rate application

Library Technology Budget Worksheet

Funding Goal

Resources Required and Cost Estimate

Timeframe to Complete

Potential Funding Sources (include any due dates)

Next Steps (include who is responsible for each step and timeline if possible)

Notes

Library Technology Budget Worksheet

Funding Goal

Resources Required and Cost Estimate

Timeframe to Complete

Potential Funding Sources (include any due dates)

Next Steps (include who is responsible for each step and timeline if possible)

Notes

Library Technology Budget Worksheet

Funding Goal

Resources Required and Cost Estimate

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Library Technology Budget Worksheet

Funding Goal

Resources Required and Cost Estimate

Timeframe to Complete

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Next Steps (include who is responsible for each step and timeline if possible)

Notes