



The Toward Gigabit Libraries Toolkit and Broadband Improvement Plan

Sponsored by: International Sustainable Library Development (ISLD) Interest Group of the ALA International Relations Round Table, Mortenson Center of International Library Programs, and Gigabit Libraries

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Project Managers



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(CAP)

About Stephanie

- Director of the Internet2 Community Anchor Program
- Works with regional networking partners, community anchor institutions, and Internet2 membership organizations to support networking, trust and identity services, and advanced applications.
- Since joining Internet2 in 2018, she has been part of three Institute of Museum and Library Services-funded grant projects focused on libraries and connectivity.



Carson Block
Library Technology Consultant
Carson Block Consulting, Inc.

About Carson Block

- 25 years of library technology experience
- Full-service library technology consulting firm since 2010
- Purpose: increase technological and other capacities in libraries to serve people everywhere, with a special focus on rural connectivity, staff skills and comfort, "complex situations"

About the Toward Gigabit Libraries Toolkit



The **Toward Gigabit Libraries (TGL) Toolkit and Broadband Improvement Plan** is a powerful, FREE tool to help libraries learn about and improve their current broadband infrastructure and internal information technology (IT) environment.

Using the TGL Toolkit and Broadband Improvement Plan, librarians will be better equipped to improve their broadband services and become stronger advocates for their libraries' broadband infrastructure needs.

Institute of Museum and Library Services (IMLS) Grants that Made the TGL Toolkit Possible



2015 Toward Gigabit Libraries (TGL) IMLS grant (RE-00-15-0110-15)

- Two-year grant developed training curriculum and self-assessment material (“Toolkit”) for library broadband infrastructure (with one-year extension)
- Targeted rural and tribal libraries
- Partners included State Library offices and Research & Education Networks
- Initial goal was to pilot toolkit in at least 30 libraries— we were able to reach nearly 60 libraries

2020 Gigabit Libraries and Beyond (GLB) grant (RE-246219-OLS-20)

- Two-year grant to improve upon the toolkit and expand its reach throughout the United States
- In addition to focusing on rural and tribal libraries, will expand the toolkit’s audience to address the needs of urban libraries in “tech deserts”

Download the Toward Gigabit Libraries Toolkit

To download the free Toward Gigabit Libraries Toolkit, visit www.internet2.edu/tgl

Watch this short video for an overview of the Toolkit:

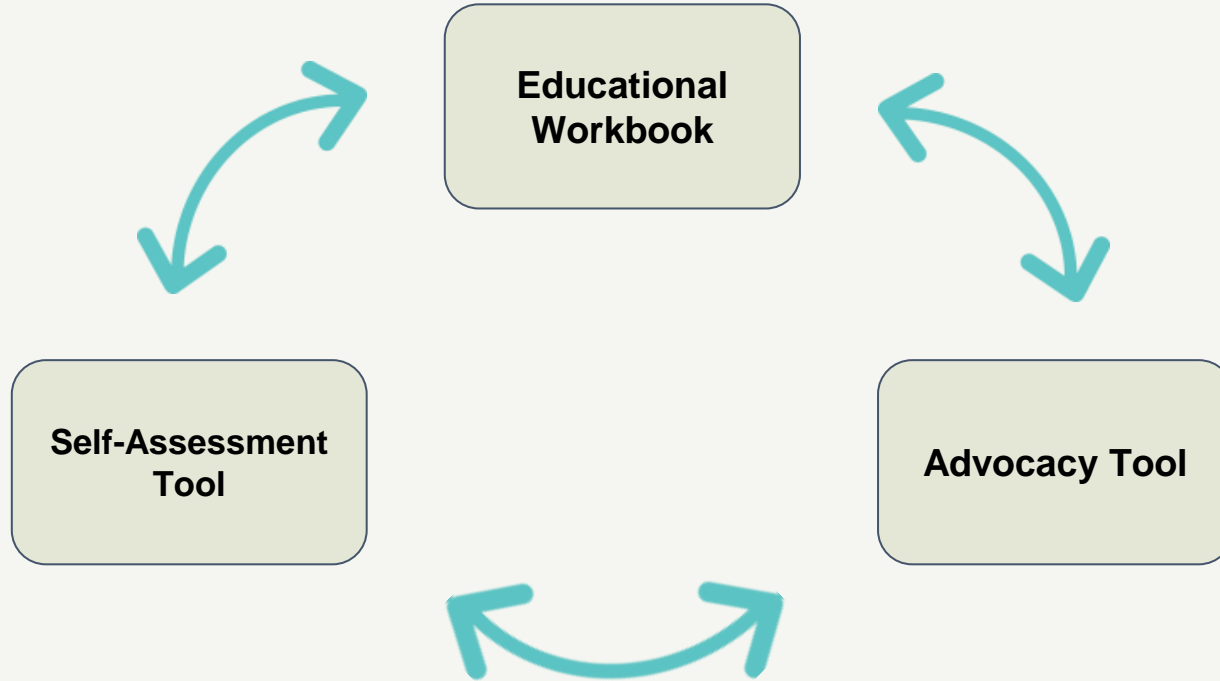
<https://www.youtube.com/watch?v=PXWv3-HYm-I&t=1s>





Toolkit Overview

What is the Toolkit?



Toolkit Components and Process

- *Technology Inventory*
- *Broadband Connection*
- *Wired Network*
- *Network Devices*
- *Wireless/WiFi Network*
- *Computer/End User Devices*
- *Broadband Services and Activities*
- *Broadband Technology and Operations Support*
- *Broadband Funding*
- *Additional Resources and Best Practices*

Pilot Site

Intake Survey

Pilot Visit/
Toolkit

Broadband
Improvement
Plan

Post-Pilot
Survey

Toolkit Approach

Questions are presented first, and additional information and resources follow in text boxes to help you answer all the questions

5. TECHNOLOGY INVENTORY—YOUR LIBRARY

In this section, you will inventory some of the key pieces of the technology inside your library, including your network, computers, 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.

5A. 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.

- Digital Subscriber Line (DSL)
- Cable Modem
- Fiber
- Wireless
- Satellite
- Other

There are three primary types of broadband—wireline (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>

Speed Ranges by Type of Broadband (Kbps - kilobit, Mbps - megabit, Tbps - terabit)


Technology	Type	Download Speed Range	Upload Speed Range
Fiber	Wireline	100 Mbps - 1 Tbps	100 Mbps - 1 Tbps
Cable Modem*	Wireline	256 Kbps - 10 Gbps	256 Kbps - 10 Gbps
DSL*	Wireline	256 Kbps - 100 Mbps	256 Kbps - 16 Mbps
Fixed Wireless / Microwave	Wireless	1 Mbps - 155 Mbps	1 Mbps - 155 Mbps

Using the Toolkit



iStock Photo

- Free, open-source technology learning, diagnostic, and advocacy tool
- Many ways to use the toolkit:
 - Record a shareable snapshot of your library's IT and broadband infrastructure
 - Prepare E-rate requests and budget cycles
 - Help open communication between library staff and tech workers
 - Address specific problems in your library by just completing certain sections
 - Get a baseline for proposed IT and broadband improvements
- ***The best part: No techies required!***

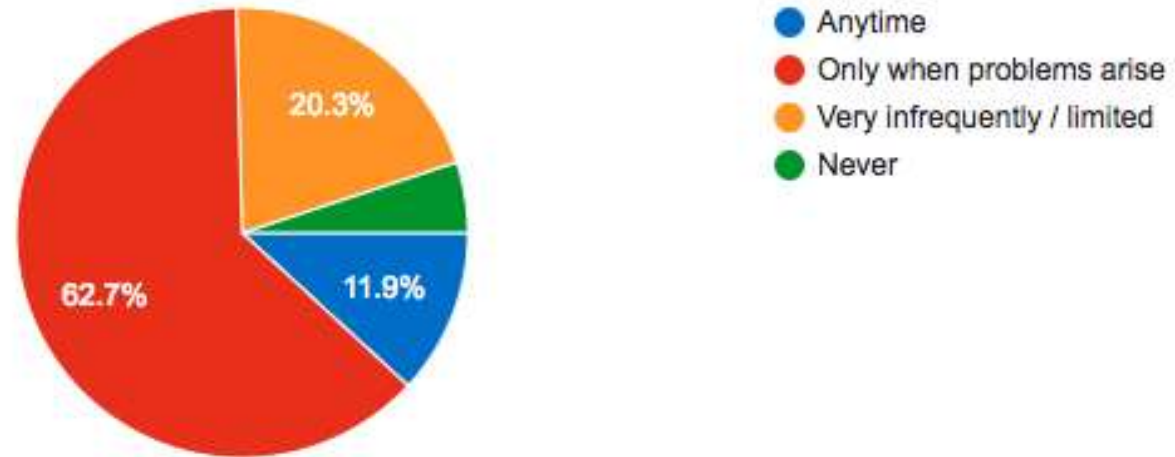


How the Toolkit was Developed

Pilot Libraries Intake Survey

How frequently is technical/IT support available in the library?

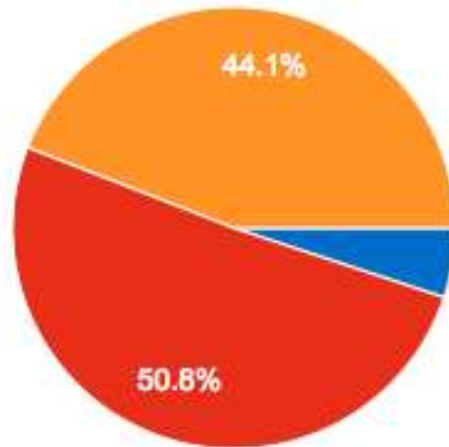
59 responses



Pilot Libraries Intake Survey

Describe your current level of expertise around procuring and delivering access to broadband as a service in your library.

59 responses



- Very Experienced— I've been responsible for ordering and setting up our Internet connection and feel I have a good understanding of the p...
- Limited Experience— I've had some experience with ordering and setting up our Internet connection, but I don't feel like an expert
- No Experience— I've had no experience in ordering or setting up our Internet connection.*

Toolkit Pilot Site Visits



- 58 site visits to rural and tribal libraries
- 12 states (AK, AZ, CT, ID, KS, NE, NM, OK, PA, SD, TX, and WA)

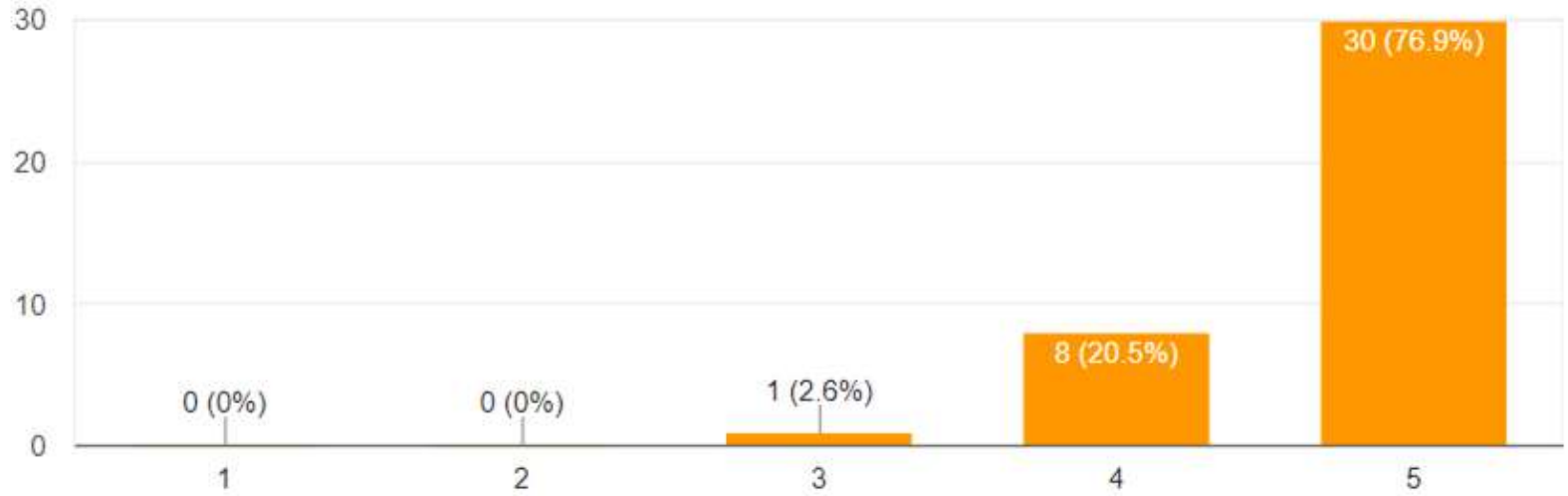
Created with input from:

- 70 library staff members from across the U.S.
- Advisory board of 20 subject matter experts from across the U.S.

Feedback– Post Pilot Visit Survey

How would you rate your overall experience with the pilot program?

39 responses



Feedback– Post Pilot Visit Survey

Would you recommend this pilot process to other libraries?

39 responses



- Yes
- Maybe
- No

Continuing Impact of the TGL Toolkit





Toolkit Sections

Technology Inventory

In this section, you will inventory some of the key pieces of the technology inside your library, including your network, computers, and other important technology components.

This inventory will help you understand what sort of equipment you have now and determine if you need different or additional equipment for the future.

- Broadband Connection
- Network Devices
- Wired Network and Power
- Wireless Network and Power
- Computer and End User Devices

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://www.measurementlab.net/tests/ndr/>
- Test #2: SpeedTest.net - <http://www.speedtest.net>

SPEED TEST RESULTS	Download	Upload	
Test #1 Measurement Lab	<input type="text"/>	<input type="text"/>	Mbps
Test #2 SpeedTest.net	<input type="text"/>	<input type="text"/>	Mbps

It is best to test the speed when no one else might be using it, perhaps early in the morning before the library opens for the public and before other staff might be using the connection. It is also best to test the connection using a computer connected by an Ethernet cable (i.e. using a wired connection instead of wireless) connected computer, as close to the broadband router as possible.



For more information on checking your speed, the Texas State Library and Archives Commission has an instructional video: <https://www.youtube.com/watch?v=855B4c5jtc>

Note that the bandwidth or speed of your connection is dependent on many variables, especially depending on the type of technology being used. 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 a great 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://www.measurementlab.net/tests/ndr/>). Record your results in the table below.

Connection Quality Results		
Latency	<input type="text"/>	Milliseconds (ms)
Jitter	<input type="text"/>	Milliseconds (ms)
Packet Loss	<input type="text"/>	Percent (%)

  TEXAS STATE LIBRARY AND ARCHIVES

Broadband Services and Activities

This section covers the types of broadband services and applications. The goal is 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.

- Bandwidth Needs
- Hot-Spot Lending
- Internet Filtering
- Offered Services

5. 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 1 gbps per simultaneous user, as described in this helpful and somewhat technical article: http://www.libraryedge.org/sites/default/files/Article-Benchmark9_2.pdf

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.

Would you like to dig more deeply? This article offers an excellent description of an approach to produce a number: http://www.libraryedge.org/sites/default/files/Article-Benchmark9_2.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.

2. Do you provide a broadband "hot-spot" lending program to your patrons?

- Yes
 No

Some libraries are loaning their patrons mobile wireless broadband "hot spots," or devices that provide connectivity via cellular networks. This is enabling members of their community to patrons to "check out" the small wireless broadband device to create a WiFi hotspot at home to access the Internet. One resource: <https://www.libraryjournal.com/?detailStory=hot-spot-techknowledge>



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.

- Available Technology Support
- Staff Training Resources
- ISP Technical Support
- ISP Service Requests
- ISP Service Guarantees

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.stateminate.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.

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Broadband Funding

Technology expenses are important budget considerations for all libraries. This section outlines several opportunities that may be available to help fund your library's broadband connectivity.

- Price For Connection
- E-rate Funding
- Other Funding Sources

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

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








See "Section 5: Additional Resources and Best Practices" some E-rate resources and information. Note that some libraries partner with their local school for E-rate applications and connections to aggregate demand, reducing application burden and potentially increasing services.

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

4. Are you up to date with what the E-rate program allows libraries to receive discounts? (i.e. internal network equipment and wiring and 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 the most up to date information on the E-rate program and how to get started <http://www.usac.org/about/e-rate/getting-started/default.aspx> and check out the USAC FAQ page <http://www.usac.org/about/faq/default.aspx>

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Additional Resources and Best Practices

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

- E-rate
- Content Filtering
- Additional Broadband 101 Resources
- Free Technology Related Training Opportunities & Resources for Librarians
- Data Backup
- Internet Use Policies

[Common Barriers and Solutions for Small Rural Libraries in Filing for E-Rate](#)
([http://drive.google.com/file/d/0B67HlucyEw3NbnIQ7WR02hVWt6/view?usp=sharing](#))

Description: 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.

Content Filtering

Content Filters
([http://libraries.iadps.gov/ich-funfina/libraries/e-rate/content-filters/](#))

Description: 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.

Children's Internet Protection Act (CIPA) Key Issues for Decision Makers
([http://www.webjunction.org/documents/webjunction/CIPA_Key_Issues_for_Decision_Makers.html](#))









Description: This article focuses on common questions being asked in the library community about CIPA. Source: Webjunction.

Filtering and the First Amendment
([https://americanlibrariesmagazine.org/2013/04/02/filtering-and-the-first-amendment/](#))

Description: 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.

Alaska State Library Tech Talk "Web Filtering"
([http://www.aslib.org/resources/](#))

Description: This guide is a companion to the Tech Talk "Web Filtering" Source: Alaska State Library.



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Glossary

The glossary section explains all the terms used in the toolkit, including ethernet, firewall, latency, router, and Wireless Access Point (WAP).

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).

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 attaches 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.



Common Issues

- Insufficient bandwidth
- Insufficient data wiring
- Inefficient network setups
- Old and/or obsolete equipment
- Poor WiFi coverage
- Not participating in E-rate (funding mechanism for U.S. libraries)

Is your issue listed here? What issues do you suspect your library has when it comes to broadband and IT infrastructure?

Broadband Improvement Plan

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

LONG TERM ACTION PLAN (3-12 MONTHS)			
Action	Intended Result	Resources Required	Timeline
Contract with an additional area broadband service provider and bond/combine with existing broadband capacity	Increase broadband capacity at library	Additional broadband connection and equipment to combine connection	6 months
Install WiFi repeaters	Reduce dead spots, increase access to WiFi outside of library for off-hour use	WiFi repeaters	5 months
Participate in E-Rate program	Obtain a subsidy for the broadband connection and inside wiring to improve broadband connections and connectivity	Support from State Library, E-Rate consultant (possibly)	12 months



Preview: Interactive Activities for Next Time

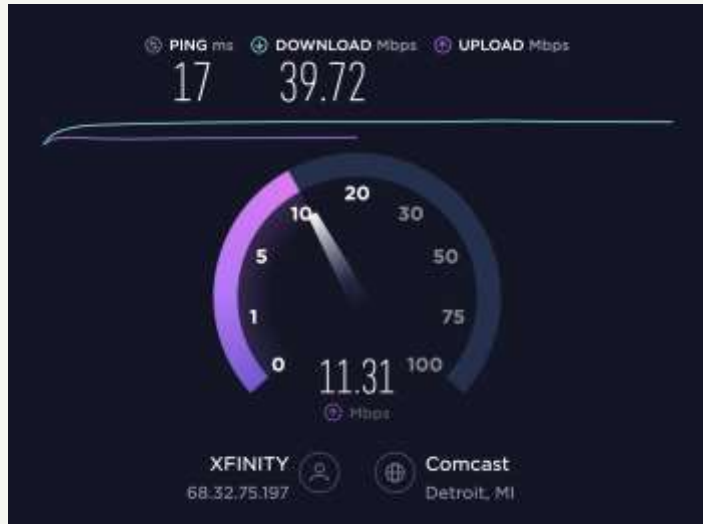
What to expect for the next presentation:

- An updated version of the Toolkit
- Discussion prompts before the presentation date
- Worksheets that will be explained during the next presentation

Conduct a Speedtest

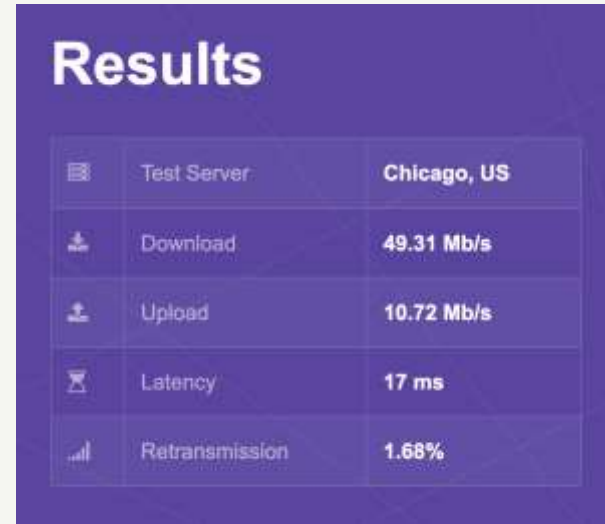
Ookla Speedtest

<https://www.speedtest.net/>



M-LAB Speedtest

<https://speed.measurementlab.net/>



Conduct a Speedtest

- Test at multiple times of day and on different days of the week
- Make sure to record all results
- Download and use this Speed Test Recording Worksheet:
<https://bit.ly/2PIO8pu>

Speed Test Recording 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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Carson Block

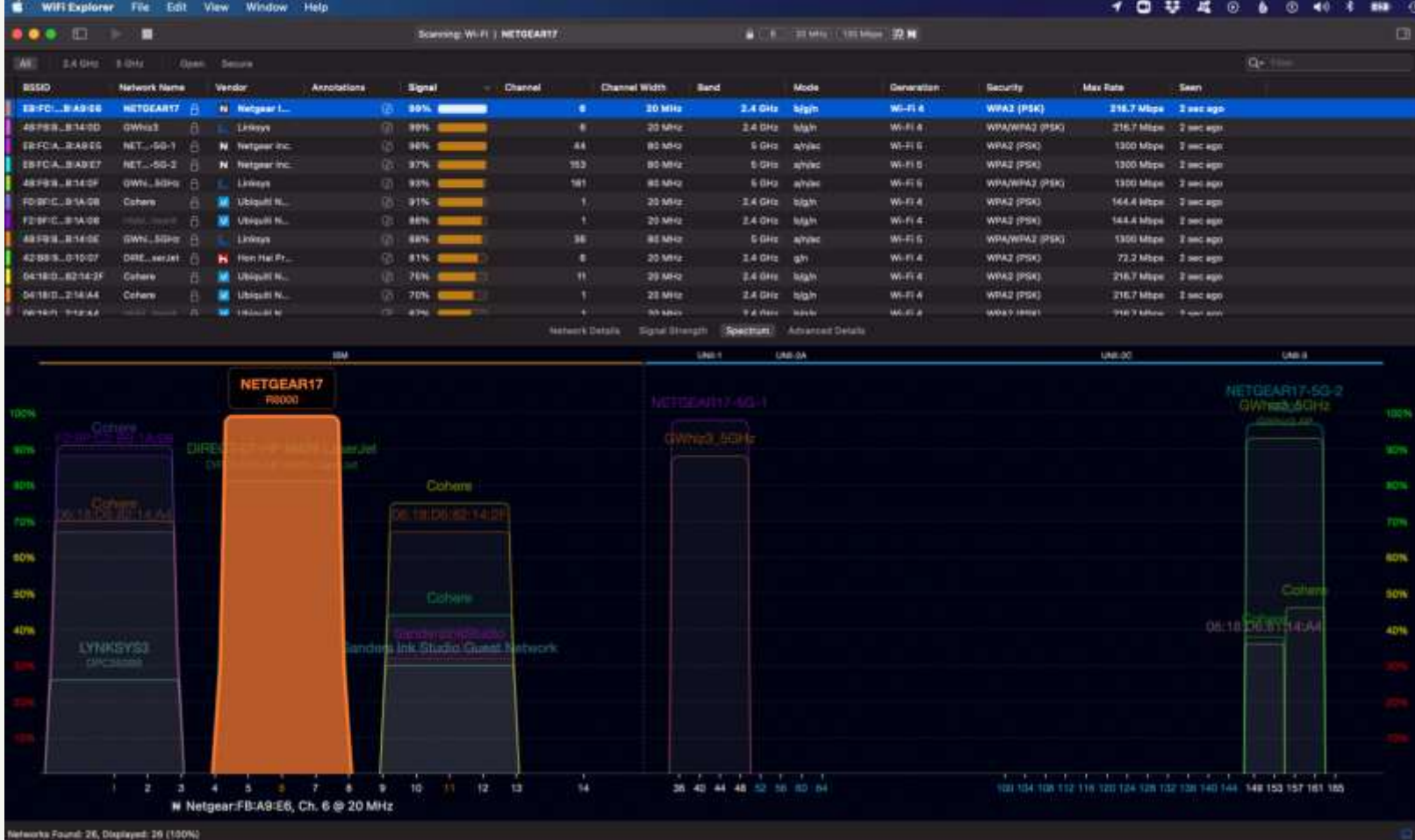
libraryandtech@gmail.com

(970) 673-7475

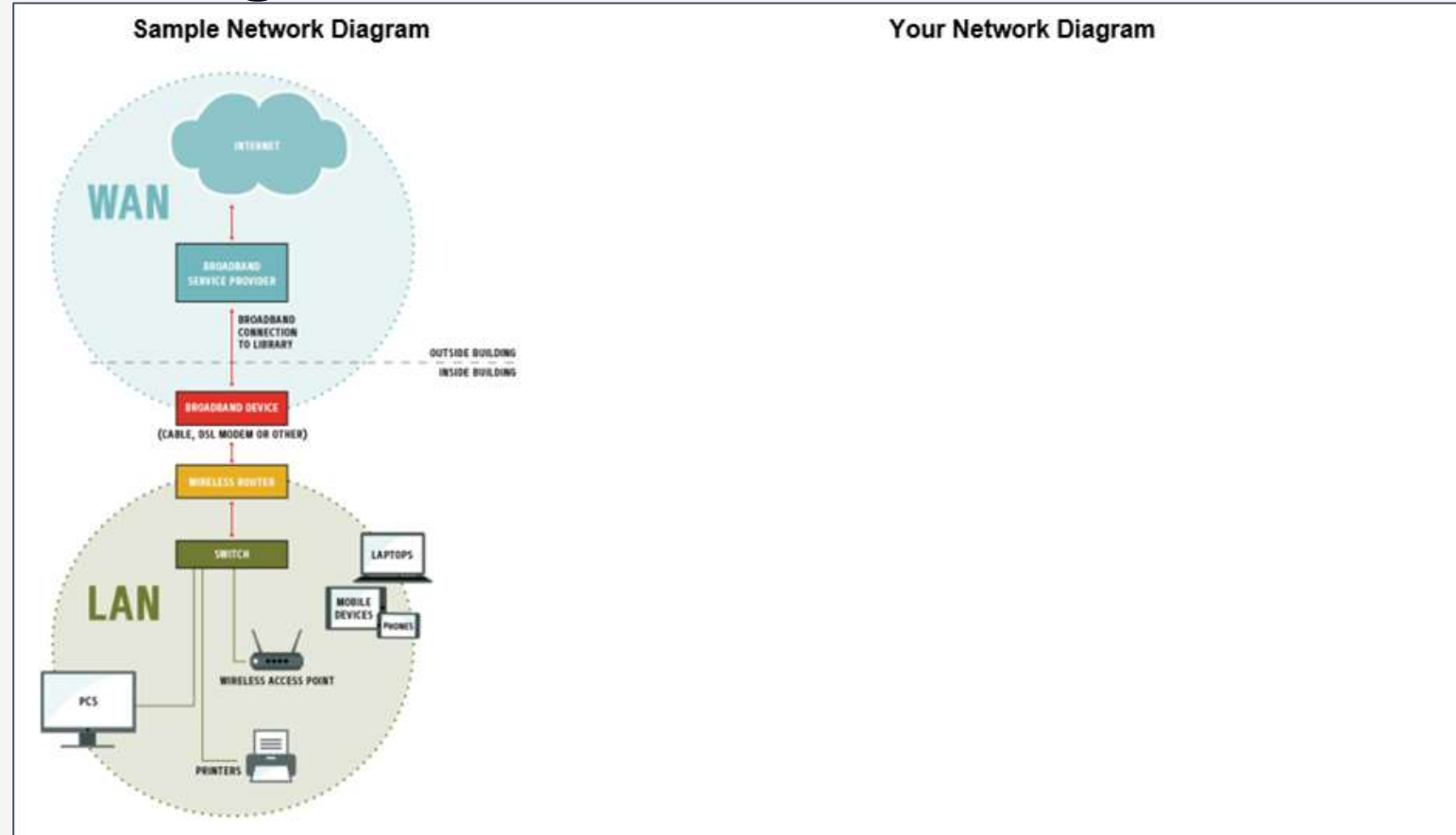
See WiFi Signals

Network Analyzer Lite (IOS; free):
<https://apple.co/39pLrk2>

WiFi Analyzer (Android, free):
<https://bit.ly/31vae1v>



Network Diagram



Ideas for Bringing the Toolkit to an International Audience

- How to scale the Toolkit for different size service areas?
- How to distribute information to international audiences?
- An updated Toolkit draft will be sent with your registration to the next presentation

How to Stay Connected



- Download and use the Toward Gigabit Libraries toolkit:
www.internet2.edu/tgl
- Email Stephanie at sstenberg@internet2.edu to provide feedback and/or join our email list to get updates about new toolkit features, presentations, and training sessions
- Follow the Community Anchor Program on Twitter for updates: [@Internet2CAP](https://twitter.com/Internet2CAP)

Questions or Comments?

Toolkit and Materials: internet2.edu/tgl

Feel free to reach out with any additional questions or ideas, we'd love to hear from you!

Stephanie Stenberg - sstenberg@internet2.edu (email to join our new mailing list)

Carson Block - librarylandtech@gmail.com