High-speed Broadband in California Public Libraries:
An Initiative of the California State Library

Needs Assessment & Spending Plan

Gerald Maginnity, Acting State Librarian of California

Jarrid Keller, Acting Deputy State Librarian of California

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The High-speed Broadband in California Public Libraries Project responds to a charge from the California State Legislature and Governor to the California State Librarian (2013/14 budget bill, Chapter 20, Statutes of 2013 (AB 110). The charge is as follows:

> *The State Librarian shall prepare a needs assessment and spending plan to connect local public libraries to a statewide high-speed Internet network. The needs assessment, at a minimum, shall (1) evaluate local public libraries' current Internet connectivity and expenditures; (2) identify the requirements of connecting all public libraries to the Internet using available options, including the Corporation for Education Network Initiative in California (CENIC); and (3) estimate the costs of the identified connectivity options. The spending plan, at a minimum, shall identify total project costs, broken down by onetime and ongoing costs, and identify available funding sources, including non-General Fund sources. The needs assessment and spending plan shall be submitted to the Department of Finance, the Legislative Analyst's Office, and the chairs and vice chairs of the budget subcommittees on education by February 1, 2014.*[1]

[1] The original text stated a due date of December 1, 2014, which was identified as a typographic error, with February 1, 2014, as the actual due date.

Table of Contents

Executive Summary 1

Introduction 2

Project Purpose 3

California Public Libraries and Why This Matters 3

Methodology 4

Need: Current state of broadband network access in California public libraries 5

Current Expenditures for Internet Services 7

Analysis of All Feasible Alternatives 8

Alternative 1-Status Quo 8

Alternative 2-Cooperative Library System Consortium 8

Alternative 3-Statewide Consortium 8

Recommended Alternative: Statewide Consortium-The Opportunity to Connect Public Libraries to California's High-speed Research and Education Network 9

Background 11

Introduction 12

Importance of High-speed Broadband to Public Libraries 13

The Challenge: Connectivity is Limited in California Public Libraries 16

The Potential Impact: Future use of the Internet in California Public Libraries 17

Case Study: Early Pilots 21

Methodology 23

Project Definition 24

Collaborating Organizations and Project Team 24

Survey Design 26

Survey Administration and Response 27

Survey Analysis 28

Current Internet Connectivity in California Public Libraries 31
Current Internet Speed in California Public Libraries 32
Facilities and Equipment Supporting Internet Service 43
Staff Support for Internet Service and Use of E-rate and CTF Funds 47
Planned Use of High-speed Broadband to Support Patrons 49

Current Expenditures for Internet Services in California Public Libraries 57
Introduction 58
Projections 60

Analysis of All Feasible Alternatives 61
Alternative 1-Status Quo 62
Alternative 2-Cooperative Library System Consortium 64
Alternative 3-Statewide Consortium 66
Recommendation 70

Recommended Alternative: Statewide Consortium 71
The Opportunity: Connect Public Libraries to California's High-speed Research and Education Network 72
The CalREN Network 72
Connectivity for California's Public Libraries via the CalREN Network 76
Costs 78

Conclusions 81

References Cited in this Report 85

Appendices 87

Index of Tables and Graphs

Table 1: Current Reported Network Speeds....33
Table 2: Consumer Limitations on Library Internet Speed....36
Table 3: Current Internet Connection....36
Table 4: Current Network Speed by Network Type....37
Table 5: Current Network Utilization Levels....38
Table 6: Telecommunications Carriers and Network Connections....40
Table 7: Current Internet Contract Terms....41
Table 8: Server Room Operations....45
Table 9: Server Room HVAC Features....46
Table 10: Network Staff Availability....48
Graph 1: Planned Use of Digital Content....50
Graph 2: Expanded Instructional Opportunities....52
Graph 3: Planned Changes in Library Administration....54
Table 11: Current Network Speeds and Costs....58
Table 12: Low to High Estimates of Library Spending on Internet Connectivity....60

Executive Summary

Introduction

This report addresses fundamental questions regarding bringing high-speed broadband to all California public libraries.

- Why is broadband in public libraries essential to guarantee access to information for all California residents?
- What is the current state of broadband network access in California public libraries?
- What are the steps necessary to ensure every resident of California has access to high-speed broadband networks in his or her public library?
- What are the costs associated with bringing broadband into all public libraries?
- How can these costs be met?

Over the past three decades, the revolution in computers and telecommunications networks has created unprecedented changes in business, commerce, government, science, healthcare, and education. Yet, the fruits of this information age are still unevenly distributed. For some individuals, technology brings the promise of inclusion, education, opportunity, wealth, and better health; for others, who lack access to technology, it brings continuing poverty and even greater isolation. Many look to public libraries to bridge this gap, as public libraries remain both the core safety net, as well as the high-touch access points, for many residents, particularly in low-income or economically distressed areas.

> The Library is a community commons, a community cooperative, and a life-long learning center. Libraries are founded on the democratic principle of providing free and equal access to knowledge, information and ideas. Expanded broadband would make it possible for libraries to continue to fulfill this role and equalize access to information and ideas for people of all income levels and all ages.
>
> Deborah Mazzolini,
> Belvedere-Tiburon Library

The federal government issued the National Broadband Plan to address how this equity of access to technology could be achieved. The Plan calls for all anchor institutions such as schools, public libraries, colleges and universities, hospitals and health facilities, local government offices, and public safety agencies to have at least 1 gigabit per second (1Gbps) broadband access by 2020. Also, in the summer of 2013, President Obama announced his ConnectED Initiative, which calls on the

Federal Communications Commission to take the steps necessary to build high-speed digital connections to America's schools and libraries, ensuring that 99 percent of American students can benefit from these advances in teaching and learning. Ensuring that California's libraries have access to high-speed broadband is critical to meet the demands of a robust 21st Century economy.

Project Purpose

The High-speed Broadband in California Public Libraries Project responds to a charge from the California State Legislature and Governor to the California State Librarian (2013/14 budget bill, Chapter 20, Statutes of 2013 AB 110). The charge is as follows:

> *The State Librarian shall prepare a needs assessment and spending plan to connect local public libraries to a statewide high-speed Internet network. The needs assessment, at a minimum, shall (1) evaluate local public libraries' current Internet connectivity and expenditures; (2) identify the requirements of connecting all public libraries to the Internet using available options, including the Corporation for Education Network Initiative in California (CENIC); and (3) estimate the costs of the identified connectivity options. The spending plan, at a minimum, shall identify total project costs, broken down by onetime and ongoing costs, and identify available funding sources, including non-General Fund sources.*

California Public Libraries And Why This Matters

The State of California has long had a commitment to public libraries in order to ensure that all Californians have access to the information resources they need to be successful through their local library, no matter where they live. Starting with the passage of the California Public Library Services Act (PLSA) in 1957 and subsequently the California Library Services Act (CLSA) in 1977, public libraries and cooperative public library systems have provided the mechanisms for sharing resources, helped coordinate information services, and facilitated communication and delivery among libraries.

During the 1990's most public libraries were in the midst of adapting and improving their services via the Internet. This also marked the expansion of California's economy based on the "dot.com" phenomenon. Since then, libraries have wanted to expand Internet-based services to better serve their patrons.

The California Public Library statistics for 2011-2012 reveal the following:

- 183 public library jurisdictions and 1115 library outlets
- Physical visits – 160,613,142
- Virtual visits – 757,395,614
- Library cards – 21,955,842
- Internet terminals – 20,392
- E-books – 1,355,018

Currently people use public library computers to access government, find and apply for jobs, conduct research for school or work, connect to the world, find information to help them to be healthy, communicate with family and friends and participate fully in the social, economic, and civic fabric of their communities. While connectivity is important, the speed of the network is even more crucial. The speed of the network determines the number of PCs, tablets, smartphones or laptops that can be connected, the ease of access to media rich resources, and the ability of a person to use a public computer to fill out online government or job forms completely within the time limits of the library. The need for speed will continue to increase as people will need to access media rich information like medical records, and as technology changes.

During the recent era of budget challenges, new efficiencies were developed that improved library services. Over the past several years the State Library has engaged the public library community in a series of discussions about changes they would like to see at the state level. In 2011 a taskforce was formed to review CLSA and make recommendations. Their work resulted in proposals to amend CLSA to increase efficiency and give high priority to the pursuit of broadband connectivity for all public libraries. The former, was accomplished by the passage of SB1044 in 2012 and the latter is being addressed by this report and assessment.

Methodology

California public libraries are organized into jurisdictions. There are 183 jurisdictions and 1115 branches. The survey needed to gather general information about the jurisdiction and specific technical information about each branch. In order to get a picture of current and desired broadband capacity and use, a two-part survey was administered. 178 jurisdictions out of a total of 183 responded to the survey, a 97 percent return rate. 883 branches out of a total of 1115 responded to the survey, a return rate of 79 percent. (Although there were 883 responses, not every branch responded to each question. Therefore individual data points generally reflect

We live in an increasingly inter-connected world. To fully participate in this world - whether students learning at a distance, job-seekers remotely interviewing with a potential employer via video conferencing, or a group of teens uploading the film they've created to YouTube - requires ever increasing bandwidth. The digital divide has decreased, but it has not disappeared, and libraries - open to all - are key to providing this kind of access to all in our communities.

Sara Jones,
Marin County Free Library

lower numbers.) This high rate of return attests to an extraordinary commitment on the part of California public libraries to this project.

Need: Current state of broadband network access in California public libraries

The survey results establish a strong need for faster Internet connectivity and all of the programs and services this would make possible; a readiness to implement infrastructure changes within public libraries to support connectivity; and an eagerness to use enhanced connectivity to serve patrons.

Speed of Internet connection

- More than 25 percent of responding California public libraries (227) make do with a "Very Slow" connection to the Internet which is 1.5 Million bits per second (Mbps) or slower.
- 52 percent of responding California public libraries (431) report connecting at 10 Mbps or slower.
- 71 percent of responding California public libraries (589) report connecting at speeds at or below 20 Mbps.
- In total, fewer than 5 percent (34) of responding California public libraries report operating at speeds of 500 Mbps or above.

It is worth noting that in areas of California where there is plentiful access to broadband, an average home may have access to 50-100 Mbps, where many libraries have 1.5 percent of this (1.5 Mbps) and serve 100 or 1000 times as many patrons as there are individuals in the average family home.

California public library networks are undersized in capacity and over-subscribed in their utilization levels. Nearly one-half of the respondents say that their network is operating at 75 to 100 percent of capacity, which makes the user experience extremely frustrating and renders the network unusable for many applications. The result for public libraries and their patrons is slow response times, a limited number of computing and communicating devices (smartphones, tablets, notebook computers) that can be attached to the network, and frustrating delays as networks struggle to handle demand.

Readiness to support high-speed broadband

In addition to seeking information about the speed of their Internet connection, the survey sought information to gauge the readiness of libraries to upgrade to broadband in the following areas:

- Space and equipment;
- Library networking equipment;
- Security, access control, and fire detection and suppression;
- Power, environment, heating, ventilation, and air conditioning;
- Location permanency; and,
- Staff support

The wealth of data provided by librarians and presented in this report show that many public libraries have the necessary infrastructure to support a high-speed broadband connection. Most jurisdictions have their own staff (55 percent) or access to staff in other agencies (42 percent) to provide technical support as needed.

> Expanded broadband is not only critical to the future growth of electronic services to the El Segundo community, but for our immediate needs today. Our system network is already maximized to the point of being slow or with blackout periods where there is no internet service for patrons or staff. The expectation of expanded internet, wireless, e-books, and database services will only continue to grow -- broadband is the solution which needs to be addressed and implemented as soon as it is feasible.
>
> Debra Brighton,
> El Segundo Public Library

Desire for and plans to use high-speed broadband

Librarians were asked to respond to a series of questions in the survey about how they might use high-speed broadband to better serve their patrons. They were asked to consider potential uses in three categories: digital content, instruction, and library administration.

Librarians are aware of the cost savings, educational opportunities, and digital collection development that high-speed broadband would make possible and they are eager to embrace these opportunities. All 18 categories of use listed in the survey were of interest to librarians. 13 of the 18 possible use categories were selected by 70 percent of librarians, including online learning, computer classes, community research and distribution of e-books and other electronic resources. All use categories were selected by least 40 percent of librarians. Librarians were also asked to comment upon the value of high-speed broadband and did so eloquently. Quotes from their comments are featured throughout this report.

Current Expenditures for Internet Services

The 731 public libraries that reported their costs (Table 11) are spending about $9.5 million dollars annually on Internet connectivity.

- 27 percent of the library facilities operate at consumer-level speeds of 1.5 Mbps or slower, and spend over $1.1 million per year.
- 14 percent spend $475,000 per year for 5 Mbps service.
- 44 percent of the library facilities spend over $5.5 million per year for Internet connectivity that is 50 Mbps or less.
- 13 percent of public libraries report spending $2.1 million per year for 100 Mbps through 500 Mbps of connectivity.
- Fewer than 2 percent report use of Gigabit (1000 Mbps) network connections, paying over $120,000 per year for Internet connectivity.

If the 384 non-responding public libraries' costs are similar, public libraries in the state are spending about $14.5 million annually on Internet services.

Analysis of All Feasible Alternatives

As part of an effort to identify costs and related requirements for implementing high-speed broadband networks for California public libraries, the California State Library (CSL) examined the following alternatives.

Alternative 1-Status Quo

183 separate public library jurisdictions continue to negotiate their own connections. High speed broadband services with capacity up to 1Gbps will only be implemented in library jurisdictions with the funding, skills, leadership, and determination required getting a complex technology project off the ground and keeping it moving.

Alternative 2-Cooperative Library System Consortium

The CSL would create a broadband consortium consisting of the nine statewide library cooperative systems with the CSL serving as oversight for the consortium. Cooperative systems would be responsible for managing consortium effort to obtain best price for circuits and services for their members with requirements to develop specifications, solicit bids from commercial carriers, and each undertake their own broadband plan, according to local policy and procedure. This will be accomplished through funding of the California Library Services Act (CLSA), which provides for the establishment and maintenance of a communications and delivery network between and among cooperative system members. CSL would continue its oversight of the CLSA. Requests for funding would be submitted to the CSL, where eligibility and amounts to be allocated to cooperative systems would be determined in accordance with cooperative system plans of service.

Alternative 3-Statewide Consortium

The CSL would partner with one entity that would create a statewide broadband consortium responsible for obtaining best prices for broadband connectivity, creating a statewide E-rate consortium, and providing connectivity to a high speed Gigabit backbone. Consistent with its current statewide roles and responsibilities, the CSL would provide oversight for the consortium effort.

Recommended Alternative: Statewide Consortium-The Opportunity to Connect Public Libraries to California's High-speed Research and Education Network

California's education and research communities currently leverage their networking resources under CENIC, the Corporation for Education Network Initiatives in California, a non-profit corporation created by the California research and education communities in 1997 in order to obtain cost-effective, high-bandwidth networking to support their missions and respond to the needs of their faculty, staff, and students. The segments that formed and govern CENIC include: the University of California, the California State University, the California Community Colleges, K-12 schools, and Stanford, Caltech, and the University of Southern California. CENIC designs, implements, and operates CalREN, the California Research & Education Network, a high-bandwidth, high-capacity Internet network specially designed to meet the unique requirements of these communities, and to which the vast majority of the state's K-20 educational institutions are connected. CalREN consists of a 3,800-mile CENIC-operated backbone, to which nearly 10,000 schools, colleges, universities and other institutions in all 58 of California's counties connect via fiber-optic cable or leased circuits obtained from telecom carriers. Over ten million Californians use CalREN every day.

To provide the needed bandwidth detailed in this report, California public libraries could join CENIC as a sixth segment. In so doing, public libraries would become a part of a larger "education ecology." California's research and education community has cooperatively created a common infrastructure and support structure (CENIC) to serve their missions. Public libraries are missing from this infrastructure and support system.

Costs to cover the annual CalREN backbone and support fees are $4.5 million. It is estimated an additional one-time $2 million will be required to procure network equipment such as routers, switches, etc. for connectivity to CalREN. Once connected, California public libraries will be among those states leading the nation in providing Internet access to their patrons. Detailed information regarding this option can be found in Recommended Alternative: Statewide Consortium.

Background

Introduction

Importance of High-speed Broadband to Public Libraries

The Challenge:
Connectivity is Limited in California Libraries

The Potential Impact:
Future Use of the Internet in California Public Libraries

Case Study: Early Pilots

Introduction

This report addresses fundamental questions regarding bringing high-speed broadband to all California public libraries.

- Why is broadband in public libraries essential to guarantee access to information for all California residents?
- What is the current state of broadband network access in California public libraries?
- What are the steps necessary to ensure all residents of California have access to high-speed broadband networks in their public library?
- What are the costs associated with bringing high-speed broadband into all libraries?
- How can these costs be met?

Over the past three decades, the revolution in computers and telecommunications networks has created unprecedented changes in business, commerce, government, science, healthcare, and education. New jobs, new industries, an explosion in entrepreneurship, new modes of community building, increased learning opportunities, ease of access to timely information and global markets, and the ability of an extended community to interact closely across space and time: all are dividends of this revolution in network and information technology.

> We are already losing customers because we cannot keep up with the increasing bandwidth demand. Customers are losing their ability to conduct important business, health, life, and education transactions because they cannot do what they need to do in their community libraries and they often have no other place to go. It hurts the social and economic fabric of our communities. It leaves people feeling helpless, hopeless and downtrodden. If the library won't help them anymore, who will?
>
> Jayanti Addleman,
> Monterey County Free Libraries

Yet the fruits of this information age are still unevenly distributed. This gap threatens to continue to cut off some populations in California from new opportunities. Access to new forms of education, good jobs, medical and health information, communication, and the chance to participate in the affairs of the broader society may be denied to them. As many forms of vital information such as medical

insurance, health records and tax forms transition to online-only, it is becoming increasingly impossible to participate in public life without access to the Internet. Thus for some individuals, technology brings the promise of inclusion, education, opportunity, wealth, and better health; for others without access to technology, it brings continuing poverty and even greater isolation. Many look to public libraries to bridge this gap, as public libraries remain both the core safety net, as well as the high-touch access points, for many citizens, particularly in low-income or economically distressed areas of California.

> The Richmond Community lags behind in the number of home computers, Internet connections, and more importantly digital literacy skills. The City must take responsibility to provide resources for our adults and our children to enable them to compete in the 21st century world.
>
> Katy Curl,
> Richmond Public Library

The federal government issued the National Broadband Plan to address how this equity of access to technology could be achieved. The Plan calls for all anchor institutions such as schools, libraries, colleges and universities, hospitals and health facilities, local government offices and public safety agencies to have at least 1Gbit/second broadband access by 2020. Also, in the summer of 2013, President Obama announced his ConnectED Initiative, which calls on the Federal Communications Commission to take the steps necessary to build high-speed digital connections to America's schools and libraries, ensuring that 99 percent of American students can benefit from these advances in teaching and learning. Ensuring that California's libraries have access to high-speed broadband is critical to meet the demands of a robust 21st Century economy.

Importance of High-speed Broadband to Public Libraries

Among the staunchest supporters of Internet access at public libraries is the Bill & Melinda Gates Foundation. In 2008, the Foundation began a $6.9-million pilot grant program to improve Internet connectivity at public libraries in seven states; in 2009, this program committed to an additional $3.4 million to fund state-level efforts to improve library connectivity, as well as additional aid to public libraries competing for federal stimulus through the American Recovery and Reinvestment Act of 2009 (ARRA) funding.

The Gates Foundation is deeply invested in this effort. "Federal, state, and local government investments in connecting public libraries to broadband are important steps toward realizing the vision of universal broadband access," said Jill Nishi, deputy director of the Bill & Melinda Gates Foundation's U.S. Public libraries program. "When public libraries have access to broadband, they can effectively deliver critical educational, employment, and government services for residents that lack Internet access elsewhere. As community anchor institutions, public libraries can also help drive local broadband adoption."

In 2010, the Gates Foundation commissioned a report on the use of technology in public libraries: *Opportunity for All: How the American Public Benefits from Internet Access at U. S. Public Libraries.* Of the 32 percent of adolescents and adults in the US who have used a public library computer/wireless network to access the Internet:

- 42 percent of them have done so for educational purposes, primarily the younger users.
  - 37 percent did homework.
  - 24 percent took online classes.
  - 37 percent researched college/voc-tech programs.
- 40 percent of them have completed employment/career-related tasks.
  - 75 percent have looked for jobs.
  - 46 percent created resumes.
  - 23 percent utilized job/career training.
  - Over 10 percent were successfully hired as a result of these efforts.
- 37 percent of them carried out healthcare-related tasks.
  - 80 percent researched specific illnesses/conditions.
  - 60 percent researched diet and nutrition.
  - 48 percent researched exercise activities.
  - 80 percent of the latter two made positive changes in their lives as a result of their research.
- Others have started or managed businesses, socialized, taken advantage of government/legal services, managed their finances, or taken part in community building activities.

The Pew Research Center's Internet & American Life Project has also examined the need for technology in public libraries. In their 2013 report, Library Services in the Digital Age, they report that "three-quarters (77 percent) of Americans think it is 'very important' for public libraries to provide free access to computers and the Internet to the community. Another 18 percent consider free computer and Internet

access 'somewhat important,' while 2 percent say this is 'not too important' and 2 percent say it is 'not at all important.'" Librarians they interviewed stressed that the library is a place to enable access to information, regardless of the format. One librarian is quoted in the report as stating "I believe public libraries should move away from being 'houses of knowledge' and move more towards being 'houses of access.'" (p. 43-44)

In 2011-12, the key findings from the American Library Association annual Public Library Funding and Technology Access Study include:

- Public computer and Wi-Fi use increased last year at more than 60 percent of public libraries.
- More than 90 percent of public libraries now offer formal or informal technology training.

> This library's future relevance is closely tied to our capacity to provide fast, dependable technological access. Presenting data via DSL, dial-up, T1, or even higher capacity lines fails to give us any space to grow and always frustrates those users who depend on us for their total access. Libraries MUST step up to be the gateway for electronic resources and information, just as we have historically assumed that role for hard copy formats. The more agencies that become "online only," the more we are compelled to provide that gateway. Otherwise, we become only a "nice building that no one enters."
>
> Jan Sanders,
> Pasadena Public Library

- Over three-quarters of public libraries (76.3 percent) offer access to e-books, a significant increase (9.1 percent) from the previous year. Additionally, e-book readers are available for checkout at 39.1 percent of libraries.
- Over 70 percent of public libraries use social networking tools to connect with library users.
- Over 44 percent of US public libraries support digital literacy through a wide range of formal classes.
- Over 65 percent of public libraries report an insufficient number of public computers to meet demand some or all of the time.
- Overall, 41.4 percent of public libraries report that their Internet connection speeds are insufficient some or all of the time.

As technology becomes an ever more critical aspect of public libraries, there is a need to establish agreed-upon standards of service. *The Edge Initiative* was established to "help public libraries continually evolve to meet the digital needs of

their communities and connect their services to community priorities." By establishing a set of "best practice benchmarks and providing toolkits to member public libraries, Edge is working to set the standard for technology services at public libraries." Thirty-two California public libraries are a part of the Edge Initiative in California, led by Jarrid Keller at the California State Library. Despite limited connectivity in their public libraries, these librarians recognize the importance of state-of-the-art technology access and service and are working with this national coalition to improve their practices.

The Challenge: Connectivity is Limited in California Public Libraries

In today's economic times, public libraries can be thought of as "economic first responders" for those who lack access to information technologies. As such, they require highly robust, high-speed connectivity. Today, many public libraries do not have the connectivity required to serve their communities. In fact, as detailed later in this report, many California public libraries have connection speeds of between 1.5 and 20 Mbps, far less than what many Americans have in their homes. Public libraries, particularly those in un- and under-served areas, often find themselves challenged to provide these vital capabilities to their communities.

According to the California Public Utilities Commission, an area is considered un-served if it offers no form of facilities-based broadband, such that Internet connectivity is available only through dial-up service or satellite. An area is considered "under-served" where broadband is available, but no facilities-based provider offers service meeting the benchmark speeds of at least six Mbps download and at least one Mbps upload.

Libraries face constraints including

- Funding: Insufficient funding specifically allocated for Internet access and its use and effects. Even public libraries that have received funding (from the Gates Foundation, for example) had trouble sustaining their programs with stagnant, unreactive, or excessively volatile technology budgets.
- Bandwidth: A critical limiting factor, particularly in un- or under-served areas where market forces have not provided adequate or equitable broadband penetration.
- Physical Infrastructure: Not only related to the bandwidth/fiber surrounding the library and its community, but also the library space itself, which often is not adequate to house enough computer workstations to meet community demand.

- Library Staff: Staff must be sufficiently trained, and that training must be kept up as technology advances. The existence of trained staff is a major distinguisher of public libraries as opposed to other providers of connectivity, such as Internet cafes, employment centers, or municipal wireless hotspots.
- Patron Demand: Great demand without sufficient supply can cause prohibitive congestion at a library's computer workstations. California librarians interviewed by California Opportunity Online echo these concerns, enumerated in the previously mentioned study, a broadband program sponsored by the Bill & Melinda Gates Foundation to bring together public libraries, community supporters, and state leaders to improve Internet connectivity for all California public libraries.

With such constraints at work, rural or remote public libraries – even the relatively few with funded technology budgets – cannot implement the tools that would help them serve their communities or provide their own staff with adequate administrative systems and improved professional development opportunities. Even urban public libraries have difficulty in meeting their patrons' needs in the current climate of austerity.

The Potential Impact: Future use of the Internet in California Public Libraries

Despite the recognized benefits of and increasing patron demand for technology access and training, limited connectivity prevents librarians from offering programs and services they perceive would be of value to their patrons. Videoconferencing, streaming media, content creation, specialized software, and longer sessions on public computer workstations and ability to add and support additional workstations, and unlimited wireless access are badly needed by many of California's public libraries, but insufficient bandwidth thwarts these libraries' efforts to fulfill their vital role in community research and education. In order to empower public libraries – particularly in challenged areas – to play this role, better connectivity is crucial. Without increased bandwidth, libraries are unable to support increases in users or utilize available content. Public libraries are eager to meet the needs of their communities in a rapidly changing world and recognize that to do so, they must employ the latest technology. (This need is highlighted in Appendix A where Librarians across California describe why high-speed broadband is critical to the future of their libraries and their communities.) Below are some of the current trends in library use that contribute to the need for high-speed broadband.

Expanding Use of Computer Workstations and Wireless Networks

Public libraries have expanded the number of PC workstations available to the public over the last five years. For example, the San Mateo City Library had 10 public-use PCs when it opened in 1996 and now has 100 PC workstations. Over the last few years, wireless connectivity has become more and more crucial. Increasingly, patrons are bringing their own devices into the library and connecting them to the library's wireless network.

Increasing Importance of Digital Collections

E-books, e-magazines, audiobooks and video-on-demand are an increasingly important part of library collections. For example, the San Bruno Public Library has had a 100 percent increase in the use of e-books and audiobooks just in the last year, from 2,000 downloads to 4,000 downloads.

The Changing Nature of Reference

Reference librarians answer questions primarily using Internet resources and many questions asked of these librarians relate to patron's computer use. For example, librarians in the Peninsula Library System estimate that about 40 percent of reference questions come from patrons at public computers or their own laptops, seeking assistance in searching the Internet and using software applications such as e-mail.

Experiments with Patron Content Creation and Maker Programs

Public libraries are becoming a place for community members to create their own content by scanning photos, creating videos and animations, and even doing 3-D printing.

Videoconferencing

Public libraries use videoconferencing for staff meetings and staff training sessions. Especially when branch public libraries are spread out over a large geographic area, videoconferencing can save hundreds of hours in staff travel time each year. In addition, experts from around the country can be utilized to offer their expertise to public libraries and their patrons through the use of videoconferencing.

> Our library has become an extension of government at all levels. We have people completing EDD applications because the closest office is more than 20 miles away. The Superior Court sends people to the library to look up trial information. Patrons use the library to apply for all kinds of social services. Even the local school district requires parents to complete information online and then print it.
>
> Julie Fredericksen,
> Corona Public Library

Technology Instruction Programs for Patrons

Increasingly, public libraries are offering formal and informal instruction for patrons on uses of technology. For example, the San Mateo County Public Libraries offer a wide range of classes on topics such as using EBay, blogging, using mail, computer/internet basics, setting up a Facebook account, using JobScout, and downloading e-books.

Tele-health Applications

Especially in rural communities, public libraries can employ state-of-the-art videoconferencing to allow patrons to connect with health care providers.

Streaming Media

From a jazz concert to the World Series, librarians can bring the world into the library.

Online and Mobile Applications (apps)

These services include online research services ("ask a librarian"), mobile apps to use/view library services, mobile apps that help locate material inside the library, and personalized accounts that provide book recommendations.

Technology Lending

Public libraries are experimenting with lending laptops and e-readers and creating programs in which patrons can try out new technology devices/apps.

Virtualizing the Desktop

Public libraries can store operating systems and software in the cloud and maintain them centrally, saving staff time and making software more reliable and cost

effective. And these cloud services can be licensed and shared across library jurisdictions, perhaps even state-wide, creating economies of scale, bringing costs down dramatically, creating robust, easily scalable services, and effective and cost-effective centrally supported services.

Library Administrative Systems

Technology is increasingly essential for a wide variety of administrative functions in public libraries including security, self check out, maintaining online catalogs, managing digitized content, and e-mail and online reference.

Technology-Supported Community Connections

Technology can enable public libraries to connect patrons with other community organizations. The Contra Costa Public Libraries offer Discover and Go passes to their patrons, enabling patrons to print museum passes themselves rather than using traditional physical passes that must be picked up and returned to the library. The Peninsula Public Libraries operate the Community Information Project, which works closely with county non-profit and government-based health and human service agencies, which provide direct services to the public, to collect and organize

In 2012 the County of Los Angeles Public Library provided its communities with over 2.7 million internet sessions on more than 1,500 public PCs across 80 libraries. Our communities use the internet for a variety of essential services like submitting job applications and applying for state and local assistance programs. Many families don't have broadband access at home and rely on us to complete homework assignments or stay connected to their friends and family via email. Also in 2012, the County Library provided 122,000 WiFi sessions, a 41% increase over the previous year. These sessions used 4.28 million minutes of internet access, which is a 30% increase over 2011. While some customers use the Library's WiFi as a convenience, many more that can afford a laptop or smart phone still rely on the Library as a primary source of internet access. During the fiscal year 2012, the use of the Library's downloadable e-Book collection has grown 112%. While many customers download from home, work, or school, a sizable portion rely on the Library's internet access to download our digital content. As we begin to offer downloadable video, the demands for internet bandwidth will continue to grow.

Margaret Donnellan Todd,
Los Angeles County Library

information about these agencies.

Library Use of Social Media

Public libraries are increasingly using social media including Facebook, Flickr, YouTube, Twitter, and Pinterest to promote and document their programs and communicate with their patrons.

Connection to high-speed broadband networks would enable librarians to realize administrative efficiencies, provide expanded digital content, and broaden education opportunity for their patrons, using the strategies outlined above and creating new strategies based on the needs of their communities.

Case Study: Early Pilots

To understand the requirements and benefits of connecting public libraries to a high speed broadband network, four groups of libraries are currently being connected to the CalREN network as a part of a pilot project.

- The Peninsula Library System, a consortia of 35 public and community college public libraries, is already connected to CalREN with a 10 Gbps link. The next phase will be to upgrade the bandwidth at every branch to 1 Gbps, to be completed during the summer of 2014.
- The San Francisco Public Library and branches will be connected to CalREN by the end of 2013.
- The San Joaquin Valley Library System and a group of nine county public libraries in the northern central valley of California will be connected early in 2014 with funding from the federal American Recovery and Reinvestment Act.

During the spring and summer of 2013, CENIC conducted interviews with librarians in many of these libraries, asking them to describe current uses of technology in their main and branch public libraries, identify the obstacles they face as a result of limited bandwidth, and share ideas they have for using expanded broadband capacity to serve their patrons. The results of these interviews have been compiled in a series of reports available on the CENIC website at: http://www.cenic.org/publiclibraries/

These interviews and reports are part of a larger effort to document the ways in which public libraries use high-speed broadband to better serve their communities. Programmatic efforts and administrative efficiencies relying on high-speed broadband will be documented once full connectivity is in place.

Methodology

Project Definition

Collaborating Organizations and Project Team

Survey Design

Survey Administration and Response

Survey Analysis

Project Definition

The High-speed Broadband in California Public Libraries Project responds to a charge from the California State Legislature and Governor to the California State Librarian. (2013/14 budget bill, Chapter 20, Statutes of 2013 (AB 110). The charge is as follows:

> *The State Librarian shall prepare a needs assessment and spending plan to connect local public libraries to a statewide high-speed Internet network. The needs assessment, at a minimum, shall (1) evaluate local public libraries' current Internet connectivity and expenditures; (2) identify the requirements of connecting all public libraries to the Internet using available options, including the Corporation for Education Network Initiative in California (CENIC); and (3) estimate the costs of the identified connectivity options. The spending plan, at a minimum, shall identify total project costs, broken down by onetime and ongoing costs, and identify available funding sources, including non-General Fund sources. The needs assessment and spending plan shall be submitted to the Department of Finance, the Legislative Analyst's Office, and the chairs and vice chairs of the budget subcommittees on education by February 1, 2014.*[2]

Collaborating Organizations and Project Team

In order to respond to this charge, four organizations came together to form a project team.

The California State Library serves as the central reference and research library for the state government; preserves and disseminates information and provides technical assistance to California's public libraries. The CSL set the direction for this project, convened meetings of the project team, provided oversight and managed the day-to-day operations. Leading the project team on behalf of the CSL was:

- Gerald Maginnity, California State Library, Acting State Librarian
- Jarrid Keller, California State Library, Acting Deputy State Librarian

[2] The original text stated a due date of December 1, 2014, which was identified as a typographic error, with February 1, 2014, as the actual due date.

The CSL also retained project consultants who participated in the creation of the survey, followed up with libraries to ensure timely and complete responses, conducted data compilation and analysis and produced a draft report for review.

- Joe Ford, President, Joseph Ford and Associates
- Christine Goodheart, Consultant
- Mary Wilkinson, Vice President, Joseph Ford and Associates

The California Library Association is a resource for all public libraries in California and provides leadership for the development, promotion, and improvement of library services and librarianship. The organization served as an advisor to the project and actively worked to shape the project purpose. Representing the California Library Association on the project team:

- Rosario Garza, Executive Director

The Califa Group is a non-profit library consortium of over two hundred public libraries in California. They pioneer technology projects and negotiate discount rates for technology purchases on behalf of member public libraries. The Califa Group advised on overall project strategy, set up the project help desk, produced the project webinars and served as the contracting agent for the project consultants.

- Linda Crowe, Executive Director
- Wayne Walker, Operations Manager

CENIC, the Corporation for Education Network Initiatives in California, designs, implements, and operates CalREN, the California Research and Education Network, a high-bandwidth, high-capacity Internet network specially designed to meet the unique requirements of its members which include all higher education institutions and K-12 schools in the state. In response to the legislative charge, CENIC was consulted on technical data and costs needed for connectivity to a high speed network. The following CENIC staff were made available:

- Louis Fox, President/Chief Executive Officer
- Janis Cortese, Manager of Publicity & Communication
- Brian Court, Director of Network Engineering & Design
- Cliff Frost, Senior Advisor Cloud Services
- Rich Hintz, Senior Advisor Infrastructure Engineering
- Ed Smith, Project Manager

Survey Design

The project team needed a survey tool that was reliable and could be developed and deployed quickly. In addition, the survey needed to be easy to use and in a format familiar to librarians. The team elected to use SurveyMonkey, a commercial survey development and administration tool.

The purpose of the survey was to determine the current state of broadband access in California public libraries. Specifically, survey questions were developed to ascertain:

- Current internet speed in California public libraries;
- Facilities and equipment supporting Internet service;
- Staff supporting Internet service;
- Planned use of advanced high-speed broadband to serve patrons; and
- Current expenditures on Internet service in California public libraries.

California public libraries are organized into jurisdictions. A jurisdiction serves a specific geographic area and contains one or more branches, sometimes as many as ninety branches. The survey needed to gather information about the jurisdiction and specific technical information about each branch. Therefore, it was determined that a two-part survey should be used.

- The Jurisdictional Information Survey was designed to be completed by the library director. This survey collected information on staffing, administration and planned use of high-speed broadband. One response was required per library jurisdiction.
- The Library Branch Needs Assessment Survey was designed to be completed by library technical staff with knowledge of each branch library in a jurisdiction, working in consultation with the library director. This instrument sought information about current equipment, facilities, staff and costs. One response was required for each library branch.

The surveys went through multiple revisions with input from the entire project team. Some of the information sought was complex, therefore, the team tried to make the surveys as simple to complete as possible. Most questions could be answered using a drop down menu or choice fields. The team discussed the possibility of pre-testing the survey with a small group of potential respondents; however, the total time available for the project (10 weeks) made this impossible. Copies of these surveys are available in Appendix B.

Survey Administration and Response

The California State Library, the Califa Group, and the California Library Association mounted an information and outreach campaign to inform librarians about the survey purpose and timeline.

The link to the surveys was sent out to California Library Directors on August 5, 2013, and they were asked to complete the surveys on SurveyMonkey by September 2. The closing date was subsequently extended until September 13, to permit updates of existing data entries and new inputs.

To assist librarians and their technical staff in completing the surveys, the project team set up and staffed an online help desk. Librarians submitted questions and were contacted via email or phone to answer their questions. About 45 such requests came in during the project, and the personnel who operated the desk responded to 90 percent of questions within 24 hours.

On the original due date of September 2, 150 of 183 Jurisdictional Surveys (83 percent) had been returned and 512 of 1115 Branch Surveys (46 percent) had been returned. To improve this return rate, the project team organized a follow-up process. All librarians who completed the survey were contacted by phone. The receipt of their surveys were confirmed and they were thanked for their participation. All public libraries who did not complete surveys were contacted by phone and asked to complete them by the new due date of September 13. In a number of cases surveys were only partially complete. In these cases librarians received an email detailing the surveys that were complete and asking for the remainder to be completed. During this process, it was discovered that some public libraries, while in the process of completing multiple library branch surveys, overwrote their information due to a bug in SurveyMonkey. In many cases, librarians re-entered this lost data, however, it appears that at least 50 library branch needs

> The public library is vital to our communities to provide not only access to information, but online access to resources. Today we are faced with helping people apply for jobs online, apply for school and financial aid online, apply for federal and state benefits online, and soon, apply for medical insurance programs. We still have many patrons who are not computer literate and have no access in their homes to online resources. The library is the one place they can come for free access and help for all these needs.
>
> Paymaneh Maghsoudi,
> Whittier Public Library

assessments had been lost and the information needed to be recovered.

As a result of this follow-up process, an additional 28 jurisdictional surveys were received for a total of 178 responses, a 97 percent return rate. An additional 371 library branch surveys were received for a total of 883, a return rate of 79 percent.

This rate of return is high for a survey of this type and represents an extraordinary commitment on the part of California public libraries to this project.

Survey Analysis

Data Analysis

After the survey closed on September 13, 2013, the team compiled the data and prepared it for analysis. Because multiple tools were used for conducting the analysis (SurveyMonkey, Excel, Batchgeo, Google Maps, ESRI ArcView), it was important to ensure that all team members used a consistent set of data.

Data was exported into Excel from SurveyMonkey and duplicate entries, inconsistent formatting and spelling mistakes were identified and corrected in both data sets.

In most cases the key information required was contained in a single question, and simple counts of the responses were done and presented in table or chart form with written descriptions. (Data normalization rationale can be found in Appendix C.) Both SurveyMonkey and Excel tools were used for this purpose. In a few cases it was useful to compare multiple responses, and the PivotTable function in Excel was used for this.

> The demand for speed increases while what we can offer stays the same. This means the high quality service we offered a few years ago has diminished. Many people walk through the door with devices which immediately pull from our existing WiFi. The more devices the slower the service. People expect to be able to connect, especially in the library. People with Laptops, tablets and other devices will continue to expect that information will be available through the library. And, more and more, much of that information will be accessed through the Internet. Slow Internet is frustrating to patrons and for many is equivalent to no Internet.
>
> James Ochsner,
> Sutter County Library

For making maps, the Batchgeo.com cloud service was used to produce Google maps. These maps, displaying broadband speed in public libraries by region, can be found in Appendix D.

Current Internet Connectivity in California Public Libraries

Current Internet Speed in California Public Libraries

Facilities and Equipment Supporting Internet Service

Staff Support for Internet Service and Use of E-rate and CTF Funds

Planned Use of High-speed Broadband to Support Patrons

Current Internet Speed in California Public Libraries

This section of the report analyzes survey responses from a number of questions related to public libraries' current Internet-connected networks and network speed. The questions focus on these topics:

1. Network speeds.
2. Upload and download speeds.
3. Form of network.
4. Bandwidth utilization.
5. Internet network suppliers.
6. Length of contract terms for network contracts.

The findings for this section of the report are clear, unambiguous, and sobering. They paint a picture of libraries across California laboring to provide reliable Internet connectivity, at very low speeds.

For purposes of this report, as reflected in Tables 1 and 2 network speeds have been classified as follows:

- Speeds of <10 Mbps are classified as Very Slow.
- Speeds <100 Mbps are Slow.
- Speeds <1000 Mbps are Medium.
- Speeds at 1,000 Mbps (1 Gbps) are Gigabit.

Network speeds in the "Very Slow" and "Slow" categories (less than 100 Mbps) are consumer speeds. That is, these speeds are available as adjuncts to other services – DSL on voice lines, and cable modems that allow data to be run as an adjunct to cable television. These are typically speeds that are available for home subscription.

Network speeds in the "Medium" and "Gigabit" categories (100 Mbps or greater) are enterprise speeds, typically required and used in business, health care, and higher education.

Network Speeds

Survey responses for the 828 public libraries reporting current network speeds are organized in the following table.

Table 1: Current Reported Network Speeds

Speed Category	Reported Network Speed, Mbps	Number of Responses	Percent of All Responses	Percent of all responses by Category	Percent of total Library Branches
Very Slow <10Mbps	Up to 1.5	227	27.42%	40%	30%
	5	107	12.92%		
Slow <100Mbps	10	97	11.71%	44%	32%
	20	158	19.08%		
	25	1	0.12%		
	30	49	5.92%		
	45	17	2.05%		
	50	40	4.83%		
Medium <1000Mbps	100	79	9.54%	14%	11%
	155	2	0.24%		
	250	16	1.93%		
	300	1	0.12%		
	500	18	2.17%		
Gigabit	1000	16	1.93%	2%	1%
Total Responses		828	100.00%	100%	
Total Branch Libraries		1115			74%

Table 1 reveals many interesting facts about network speeds in California library facilities. Perhaps most stunning is that a minimum of 62 percent (almost two thirds) of all California Library branches are connected to the Internet at "Slow" or "Very Slow" data rates. If the 74 % of library branches that responded are representative of all branches, then 84 percent of all branch public libraries in California are in this condition.

Also of interest:

- More than 25 percent of responding California public libraries (227) make do with a "Very Slow" connection to the Internet which is 1.5 Mbps or slower.
- 52 percent of responding California public libraries (409) connect at 10 Mbps or slower.
- 71 percent of responding California libraries (589) report connecting at speeds at or below 20 Mbps.
- In total, fewer than 5 percent, (34) of responding California public libraries report operating at speeds of 500 Mbps or above.

Some comparative statistics may be useful in describing the deployment of broadband networks in California.

- There are fourteen times more responding public libraries operating at 1.5 Mbps than at 1 Gbps.
- For every responding library operating at 500 Mbps and above, there are 20 operating at 50 Mbps or below.
- For every responding library operating at enterprise rates of 100 Mbps and above, there are more than 4 operating at consumer service rates of 50 Mbps or below.
- About 70 percent of responding California public libraries attempt to provide public services through low-speed network connections of 20 Mbps or less.

Upload and Download Speeds

The survey also asked about upload and download speeds to learn more about the quality of service provided to public libraries and their patrons.

Carriers often configure consumer Internet services with one speed to the home (the download speed) and a much slower speed from the home into the Internet (the upload speed). This is called an *asymmetric* or *uneven service*, and is done in order to reduce costs as much as possible. The home-based consumer is assumed to be a passive participant on the network, not sending very much data to the Internet but receiving a great deal through activities like watching movies.

This consumer assumption is not a good one to make for library branches, as it severely limits the kinds of activities a library can participate in. Worse, slow upload speeds actually enforce this kind of passive use because they inhibit other possibilities.

Enterprise Internet services are typically configured with the same upload and download speeds (called *symmetric* or *normal service*). This allows for a more complete range of activities on the network. Virtually all educational institutions in the state use Internet connections that provide the same upload and download speeds.

A classic example of an activity that benefits from high-speeds in both directions is holding online meetings, such as Town Hall type gatherings. If only some people can actively participate in the meeting it becomes much more of a lecture and less of an interactive experience.

Similarly, public libraries and library patrons who want to be able to share projects and information with others will benefit from high speeds in both directions. Having consumer service limitations placed on a public library will seriously impede that community's ability to fully benefit from the Internet.

Since the early days of the Internet, colleges and universities have had high-speed connections, for both uploading and downloading. This has led to the creation of numerous new businesses and new ways of doing research, learning, and recreation.

This environment, where students and faculty "live in the future" has been a significant factor in creating the Internet economy. Many of its leading entrepreneurs have come directly from this university technology environment, the same kind of environment that has been created in K-12 and community college environments, and which the CSL and its partners seek to create in all of California's public libraries.

Public libraries serve unique communities with different needs, and like universities, they have a similar potential to create new businesses, knowledge, and digital content. So the ability for public libraries to participate in online activities with other public libraries and educational institutions will be essential in the future. Thus, having the same upload and download speeds will be imperative to serve the future needs of their communities. And with enterprise Internet service, everyone will benefit from more interaction between public libraries, K-12 schools, community colleges, and universities.

The survey results show that uneven connections at "Very Slow" and "Slow" data rates account for 152 of the 176 reports (86 percent) where it makes an already poor service much worse. The single library reporting a Gigabit connection with uneven rates is 1 Gbps in one direction and 500 Mbps in the other. This is less than ideal but far better at this speed than uneven rates in the "Slow" category.

Table 2: Consumer Limitations on Library Internet Speed

Speed Category	Reported Upload and Download Speeds	Uneven Upload and Download Speeds	Same Upload and Download Speeds	Percent with Uneven Service
Very Slow <10	312	52	260	17%
Slow <100Mbps	326	100	226	31%
Medium <1000Mbps	103	23	80	22%
Gigabit	10	1	9	10%
Grand Total	751	176	575	23%

Form of Network

The Library Branch Needs Assessment Survey sought responses from public libraries regarding the type of network each library uses to connect to the Internet.

Table 3: Current Internet Connection

Network Type	Number Reporting	Percent
ATM circuit	118	15.73%
Cable modem	82	10.93%
DSL (Digital Subscriber Line)	71	9.46%
Metro Ethernet	175	23.33%
Point-to-point circuit	242	32.27%
Other	62	8.27%
Total	750	

As the data show, no single network type dominates among current Internet connections, although *Point-to-Point circuits* and *Metro Ethernet* represent more than 50 percent of respondents between them, or nearly 425 public libraries.

A surprisingly high number of public libraries rely on DSL and Cable modem, both of which are consumer-based services, to get Internet connections. Between them, 20 percent or 150 public libraries responded that they used these low-speed technologies.

In the "Other" category, fiber optic networks and wireless accounted for 60 respondents, approximately 50 percent each, or about 30 respondents each for Fiber and Wireless. A few respondents use Managed AVPN, Channelized DS3, and Frame relay. The table below shows network speeds by network type.

Table 4: Current Network Speed by Network Type

Network Speed, Mbps	Number Reporting	Type: ATM	Type: Cable	Type: DSL	Type: Met Eth	Type: P-to-P	Type: Other
1.5	222	105	16	20	6	48	1
5	97	0	15	38	7	26	2
10	90	0	21	5	41	20	2
20	155	0	7	2	16	107	2
30	42	1	0	0	0	10	2
45	13	2	6	3	5	3	0
50	43	0	2	0	17	13	6
100	74	1	0	0	15	8	39
155	2	0	0	0	0	0	0
250	15	9	0	0	6	0	0
300	1	0	0	0	1	0	0
500	19	0	0	0	17	2	0
1000	55	0	0	0	44	5	8
Total	828	118	67	68	175	242	62

NOTE: The totals for the various rows and columns do not cross total, because some public libraries reported speeds and not types, and some reported types and not speeds.

Despite the issues related to variable reporting, Cable modem and DSL are distinguished by their overall low speeds, consonant with their technology bases in home services. It is also clear that Metro Ethernet has the ability to deliver service at any bandwidth, and is used in California public libraries at all speeds from 1.5 Mbps to 1 Gbps.

It may be surprising to see "ATM circuit" entries listed at 1.5 Mbps. This refers to a service (no longer available, but grandfathered) called "ATM Circuit Emulation Service." This does not provide ATM service to the library branch office – the library

has a T1 (or faster) circuit to the provider. The provider then tunnels this circuit over the provider's ATM infrastructure. A better technical description of these connections would probably have been Point-to-Point Circuit.

Bandwidth Utilization

The final element in the network capacities section of the survey considers the amount of the network that is currently in regular use.

Networks without some headroom (or excess capacity) can be overwhelmed when heavily used. Most network planners prefer to have networks operating on a regular basis at or below the 50 percent measured level. (The reason for this is that measurements of utilization are averages over time, so when the average goes over 50 percent it is very likely that there are peaks of usage over 100 percent within that time period. Obviously there are exceptions to this, but it is extremely rare for a network operating at over 75 percent of measured utilization to be performing satisfactorily.)

A network that regularly runs over 50 percent utilization for any length of time is very likely to have frequent peaks of demand that exceeds capacity, which leads to delayed and dropped packets. People using a network in this condition will experience delays, unpredictable responses, and even complete failure to be able to accomplish tasks that rely on the network.

At regular utilization over 75 percent, serious problems are to be expected frequently, with network-intensive tasks like video- or voice-conferencing rendered impossible to carry out.

Survey responses for the 817 public libraries reporting utilization of current bandwidth are organized in the following table.

Table 5: Current Network Utilization Levels

Utilization Ranges	Current Utilization Levels	Number Reporting	Percent
Fine	Up to 25%	30	3.67%
OK	25 to 50%	70	8.57%
Full	50 to 75%	115	14.08%
Dire	75 to 100%	376	46.02%
	Unknown	226	27.66%
	Total	817	

Perhaps the most striking feature of the responses is that nearly one-half of the respondents say that their network is operating at 75 to 100 percent of capacity, which makes the user experience extremely frustrating and renders the network unusable for many applications.

60 percent of respondents (nearly 500 public libraries) are operating at "Full" or "Dire" levels.

Approximately 25 percent of respondents do not know their utilization rates, and if the distribution of the non-respondents on this question is similar to the distribution of the respondents, then the picture is even worse.

Relationship Between Bandwidth & Utilization

584 library branches reported both network speeds and utilization. 407 (70 percent) report both Consumer speeds and "Full" or "Dire" rates of utilization. 314 (54 percent) of these report both Consumer network speed levels ("Very Slow" or "Slow') and "Dire" rates of utilization.

Clearly, and not surprisingly, low data rates and network congestion together inflict serious problems on many California branch public libraries.

These high utilization rates paint a picture of seriously inadequate networks.

Internet Network Suppliers

The Library Branch Needs Assessment Survey sought responses identifying the supplier of Internet connections to the respondent public libraries. Public libraries name 20 providers of Internet connections. The following table shows their distribution.

Table 6: Telecommunications Carriers and Network Connections

No.	Telecomm Carrier[3]	Number Library Customers	Percentage
1.	Allegiance Telecom	1	0.14%
2.	AT&T	348	50.29%
3.	Cal-Ore	2	0.29%
4.	Charter	66	9.54%
5.	Cogent	3	0.43%
6.	Comcast	37	5.35%
7.	Cox	13	1.88%
8.	Cruzio	11	1.59%
9.	Frontier/Citizen	23	3.32%
10.	Level3 Communications	3	0.43%
11.	Ponderosa	3	0.43%
12.	Reliance	1	0.14%
13.	Sebastian	1	0.14%
14.	Siskiyou	3	0.43%
15.	SureWest	4	0.58%
16.	Telepacific	2	0.29%
17.	Time Warner Cable	120	17.34%
18.	TW Telecom	13	1.88%
19.	Verizon	36	5.20%
20.	Volcano	2	0.29%
	Total	692	

- [3] Six carriers were offered as potential choices for this survey question, but were not selected by any survey respondent. Those six carriers are Calaveras, Cricket, Ducor, Plumas Sierra, Sierra Telephone, and Vast Networks.

Five carriers dominate Internet connectivity in California public libraries:

- AT&T is reported as the Internet carrier of 348 responding public libraries (50 percent).
- Time Warner Cable was the second most-named provider, at 120 respondents (17 percent of responses).
- Charter at 66 respondents (about 10 percent of responses).
- Comcast at 37 (5 percent of responses).
- Verizon with 36 (5 percent of responses).

Contract Terms

Respondents were asked to identify current contract terms. As the table below shows:

- 39 percent of the respondents, or about 285 of the 735 respondents, show a contract term that has no time commitment
- 2 percent (13 respondents) show contract terms of six months or less
- 63 percent have contract terms of 12 months or less.
- Approximately 25 percent (about 190 respondents) are locked into contract terms greater than 24 months

Table 7: Current Internet Contract Terms

Contract Term in Months	Number Reporting	Percent
Month-to-month basis	284	38.64%
0 to 6 months	13	1.77%
6 to 12 months	167	22.72%
12 to 18 months	42	5.71%
18 to 24 months	37	5.03%
24 to 36 months	61	8.30%
36 to 48 months	131	17.82%
Total	735	

This is important information for planning the deployment of new network infrastructure. There may be cases in which it makes sense to terminate a contract early, but, in general, network planners will focus first on the contracts without long terms remaining.

Summary Findings for this Section

The data provided by the four questions regarding network speed, download speed, upload speed, and network utilization level make clear how deeply impacted California public libraries are by their limited network capacities. Here are some findings:

1. For network speeds, the have-not public libraries (those operating at consumer speeds of 50 Mbps or lower) outweigh the have public libraries by 4 to 1. There are fourteen times as many public libraries operating at 1.5 Mbps as compared to 1 Gbps.
2. The data show that a significant number of public libraries (176, 23 percent of those responding to the relevant questions) are running on asymmetric network connections, which even further limits their ability to participate fully on the Internet.
3. Network utilization completes the picture: California public library networks are undersized in capacity and over-subscribed in their utilization levels. These are networks running on their knees, with coincident implications for library patrons who are impeded in getting work done; librarians and library administrators who are limited in the kinds of services they can provide; and the community the library serves which is missing the opportunity to participate in emerging economic trends.
4. The result for public libraries and their patrons is slow response time, a limited number of computing and communicating devices (smartphones, tablets, notebook computers) that can be attached to the network, and frustrating delays as networks struggle to handle demand.
5. The data also show a market dominated by one carrier, with AT&T reported as carrier by 50 percent of the public libraries reporting; four other carriers account for another 35 percent of the responses.

Service Implications of Network Speeds

In an Internet-connected world, where patrons and staff both make use of public libraries to connect to the Internet and access digital resources, most California public libraries operate at consumer speeds. That is, many private homes have access through Digital Subscriber Line (DSL) or cable modem to speeds equivalent

to or greater than the capacities in use in about 70 percent of California public libraries.

Low network capacity results in these significant service limitations:

1. Insufficient capacity to add or increase wireless service, since the Internet connection will remain the barrier in the network.
2. Insufficient network capacity to provide graphical content associated with a library's collections, its community, or even with the library's own online library management system.
3. Insufficient capacity to link to and download or receive video programs of interest to patrons and staff.
4. Insufficient capacity for the library to provide Internet access for job-hunting patrons, the capability to register for classes, or to interact with government or healthcare agencies that have migrated registration and processes to the Internet.
5. Inability to source and/or effectively participate in live interactive meetings, discussions, performances, "Town Halls", debates and other forums that are increasingly available.
6. Inability to be a source of new innovations built on the unique talents of members of each library's community.

Facilities and Equipment Supporting Internet Service

This section of the report analyzes responses from a number of questions related to current status and readiness for broadband services. The questions are primarily technical in nature, and focus on these topics:

1. Space and equipment, including dimensions and availability of spaces.
2. Library networking equipment.
3. Security, access control, and fire detection and suppression.
4. Power and environment.
5. Heating, Ventilation, and Air Conditioning (HVAC).
6. Location permanency.

These questions, and the survey responses to them, focus on basic infrastructure requirements to upgrade to high-speed broadband based on industry best

practices. The questions posed in the survey relate to the suitability of libraries to house broadband service.

This section of the report presents analysis primarily in narrative form. For security reasons the details of the design of network facilities are not included in this report.

Space and equipment, including dimensions and availability of spaces

In this section of the survey, respondents were asked about network facilities and the availability of space resources for housing broadband equipment. About 600 public libraries responded to these questions, and provided a wealth of details regarding their server rooms, network entry points, and dimensions and construction of network facilities. The details are of great value in network planning.

The data show that hundreds of California public libraries have the necessary capability to house and operate high-speed broadband.

Library networking equipment

This section focused on the availability of existing network equipment and on the potential for connecting that equipment to a fiber broadband service. More than 725 public libraries responded to these questions, with 96 percent reporting having a router, and 86 percent reporting the equipment manufacturer as Cisco.

The responses reveal that more than half the respondents (377, or 53 percent) were already operating some form of fiber optic products and services. Of the 271 respondents who have network equipment with fiber optic connection features (40 percent), 105 have installed a GBIC (Gigabit Interface Converter) interface and 60 have installed a SFP (Small Form-factor Pluggable) interface. GBIC and SFP interfaces allow easy connection to 1 Gbps services, so this is good news.

The details are of great value in network planning.

Security, access control, and fire detection and suppression

This section of the survey received more than 700 responses, with a wealth of detail related to facility security, access controls, and the availability of fire detection and suppression.

The data show that several hundred California public libraries already operate services that would support a secure and managed connection to broadband.

Power and environment

This section of the survey received more than 700 responses, and these responses provide a wealth of detail related to power availability, backup power via UPS (Uninterruptible Power Supply) and generator, and minutes of standby power. Several hundred California public libraries currently operate services with appropriate electrical power.

Table 8: Server Room Operations

Question	Number Responding	Percents
Backup network power?		
Yes	397	55.99%
No	312	44.01%
Total	709	
If so, for how long?		
Less than 15 min	92	22.38%
15 to 30 min	215	52.31%
Over 30 min	104	25.30%
Total	411	
Server room on backup?		
Yes	238	59.80%
No	160	40.20%
Total	398	
If so, for how long?		
Less than 15 min	41	16.87%
15 to 30 min	121	49.79%
Over 30 min	81	33.33%
Total	243	
Library on generator?		
Yes	45	6.40%
No	658	93.60%
Total	703	
If so, for how long?		
0 to 30 min	11	57.89%

Question	Number Responding	Percents
30 to 60 min	3	15.79%
1 hour to 2 hours	4	21.05%
Over 2 hours	1	5.26%
Total	19	

Heating, Ventilation, and Air Conditioning (HVAC)

This section focused on the availability of heating, ventilation, and air conditioning, or HVAC. More than 700 respondents provided one or more responses to this section. The data show that about 60 percent of the public libraries operate 24-hour HVAC services, and that only about 6 percent have HVAC on backup power.

This is another technical section filled with valuable detail for network planning.

Table 9: Server Room HVAC Features

Question	Number Responding	Percents
24-hour HVAC?		
Yes	441	61.68%
No	274	38.32%
Total	715	
HVAC on backup power?		
Yes	39	5.90%
No	622	94.1%
Total	661	
If on backup, how long?		
0 to 30 min	15	30.61%
30 to 60 min	6	12.24%
1 hour to 2 hours	7	14.29%
Over 2 hours	21	42.86%
Total	49	
Characterize airflow?		

Question	Number Responding	Percents
None	83	13.47%
HVAC, same as library	366	59.42%
Separate HVAC	118	19.16%
Passive ventilation (airflow to outside)	49	7.95%
Total	616	

Location Permanency

Librarians were asked about plans to relocate their library or network facility within the next 5 years.

- About 96 percent of 800 responding public libraries report no planned change of location during the specified time period.
- About 4 percent of public libraries reporting do have plans for changing library or network facility locations.

Clearly, there is sufficient permanency of location to aid network planners in identifying which public libraries are likely to remain in the same location during upgrade to fiber-optic broadband service.

Staff Support for Internet Service and Use of E-rate and CTF Funds

This section of the report is based on the Jurisdictional Information Survey, which had a response rate of better than 95 percent, from 178 library jurisdictions.

Staff support for Internet service

It is clear from the data that most jurisdictions have their own staff (55 percent) or access to staff in other agencies (42 percent) to provide technical support. So 96 percent of all library jurisdictions have access to some kind of technical support.

Table 10: Network Staff Availability

Two Questions	Yes, Yes	Yes, No Response	Yes, No	No, Yes	No, No	No Response, No Response	Total
Do you have IT or networking staff on site, either part-time or full-time? If not, do you have access to networking staff from your county, city, or other agency/department?	30	63	4	74	5	2	178
Access to support:	171						96%
No Support					5		3%
Unknown						2	1%

The picture that emerges from the data on availability of "emergency hands" help, as in out-of-hours service requirements, is less encouraging. About half the reporting library jurisdictions could not provide out-of-hours hands to help in an emergency.

Despite the lack of in-house staffing and 24-hour availability of help, it is clear that hundreds of California public libraries are positioned well to support broadband services with technical staff. It is also likely that the broadband equipment anticipated to provide up to 1 Gbps will be as reliable as or more reliable than the equipment public libraries are currently using. So, from a network staffing point of view, the move to upgrade the network capabilities should not be a major barrier.

Use of E-rate and CTF Opportunities

The survey asked jurisdictions if they currently take advantage of federal E-rate discounts for circuit or equipment costs. Possible responses were "Yes for both," "Only for the circuit," and "Only for internal connection."

The California Teleconnect Fund (CTF) also supports discounts of the monthly reccurring telecommunications services under this universal service program, and jurisdictions were asked if they take advantage of these ("Yes for both," "Only for the circuit," "Only for equipment," "No" or response left blank).

Here is a summary of the responses:

- 96 Jurisdictions (54 percent) are using some form of E-rate and/or CTF opportunities.
  - 42 (24 percent) use E-rate for their circuit only, and also use CTF.
  - 20 (11 percent) use E-rate for both circuit and equipment, and also use CTF.
  - 20 (11 percent) use CTF only.
  - 14 (8 percent) make use of only one of the E-rate opportunities.
- 78 Jurisdictions (44 percent) are not taking advantage of either.
- 4 Jurisdictions (2 percent) did not respond to these questions.

Clearly there is ample opportunity to make better use of these existing universal service programs. A very good way to do this is to form an E-rate consortium, similar to the one established for California's K-12 school system. If 100 percent of California public libraries were to participate in the existing E-rate and the California Teleconnect Fund, significant service improvements could be realized for each dollar spent in those jurisdictions that are not now using these subsidies.

Planned Use of High-speed Broadband to Support Patrons

Librarians were asked to respond to a series of questions about how they might use high-speed broadband to better serve their patrons. They were asked to consider potential uses in three categories: digital content, instruction and library administration.

Digital Content

Library collections are changing. More and more library materials come in a digital format such as e-books, e-magazines, audiobooks and video materials. In addition, public libraries are increasingly supporting patrons to create their own digital content, by developing community e-books or helping them digitize historical materials, for example.

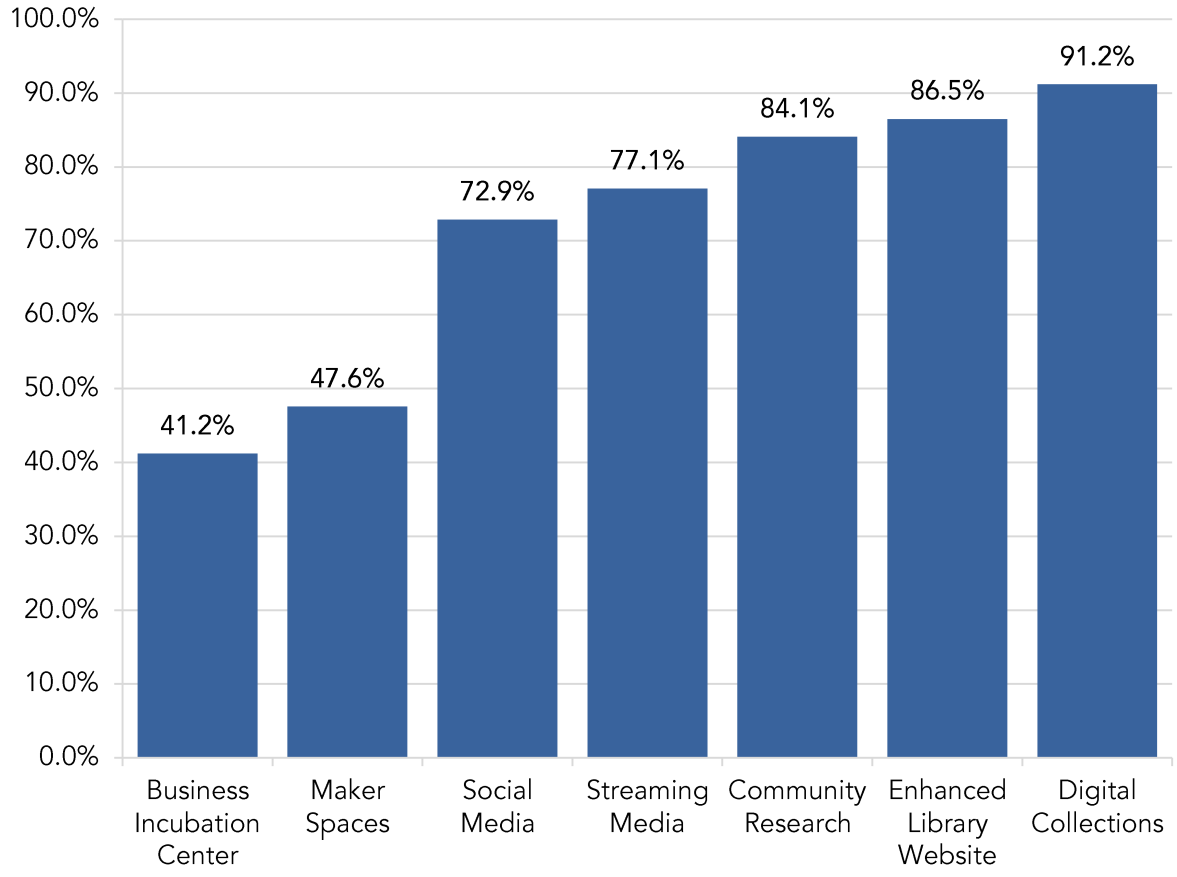
The survey asked librarians to review a list of possible uses of digital content and to check those services they would offer patrons if the obstacle of low bandwidth were removed. The activities were:

- Develop and support a small business incubation center;
- Create a "maker space" where patrons can create content (for example, use video equipment and 3-D printers);

- Provide and support use of social media by patrons;
- Stream live events from around the country into the library;
- Expand community research options (for example, digitizing family and community history materials);
- Enrich website with video content (for example, taped story times, speakers, etc.); and
- Distribute e-books and/or video on demand services.

The chart below shows the percentage of respondents who chose each service (respondents could choose more than one).

Graph 1: Planned Use of Digital Content



During the library connectivity pilot projects, Librarians were asked to describe in more detail what they would do if bandwidth were no longer an obstacle. A number of librarians spoke about the transformation of their collection and their desire to develop digital content with patrons.

For example, the *Stanislaus County Library* began loaning e-Books less than a year ago and cannot keep up with the demand for them. Their collection is growing and is now at 8000 titles with 70 percent of e-books checked out at any given time. Librarians note that if 30 percent of their hard copy collection is checked out, they feel they are doing well.

The *Madera County Library* has developed a project with three Tribes in their jurisdiction to create rich digital content. They intend to expand the work of their genealogy room by digitizing historical documents, photographs, recordings, and other materials provided by tribal members. These materials will be available to the public at the County Library, at a community kiosk and in the Tribal Public Libraries. Expanded broadband is essential for the success of this project.

The *Kern County Main Library* has an active teen program and these teens have begun generating digital content as well. Teen supporters of the library created videos to promote library use among their peers and other citizens. However, due to limited bandwidth, these videos could not be posted on the library website. Teens are anxious to expand their video production and to share their work with the community.

Instruction

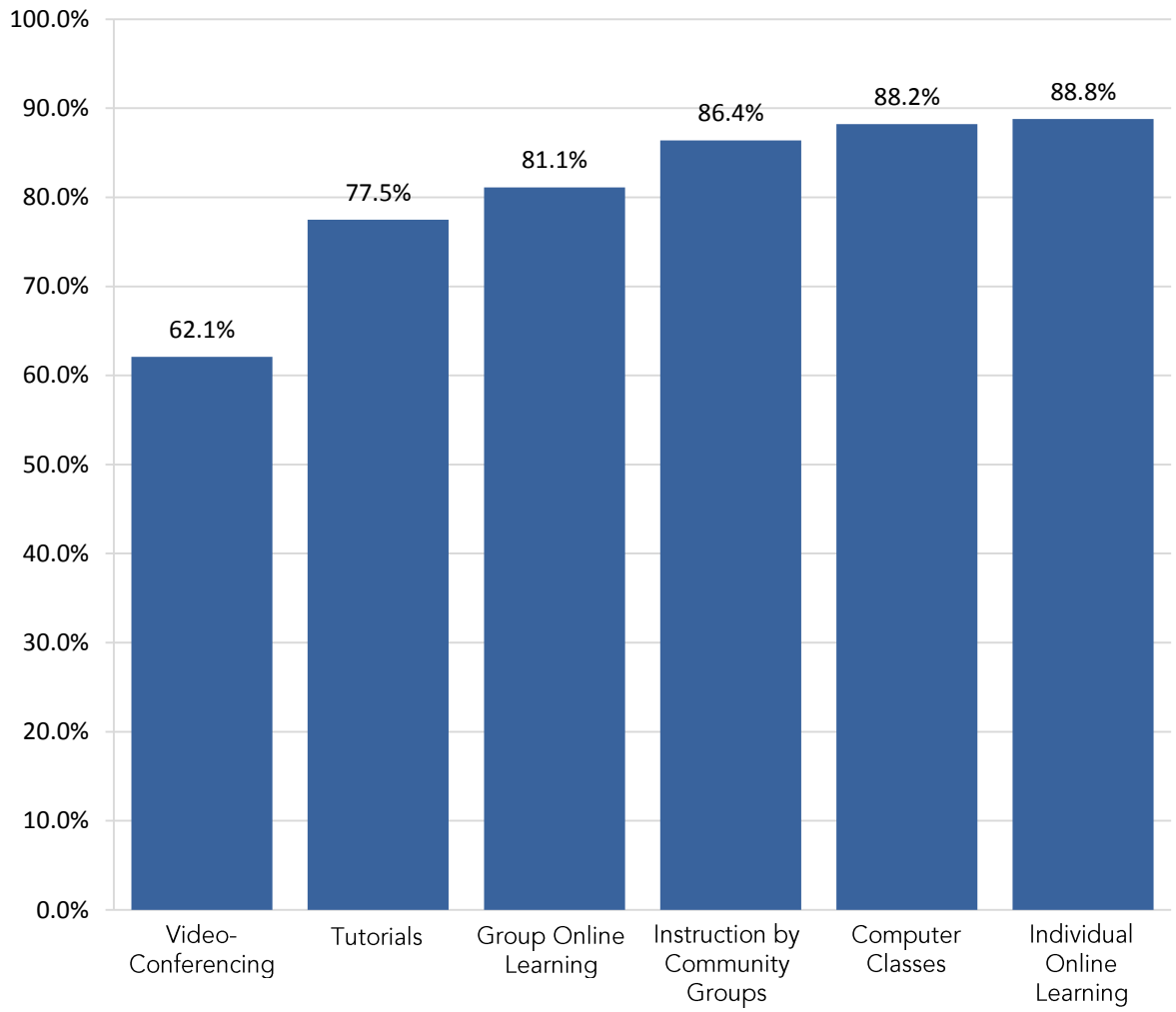
Public libraries are centers for both formal and informal learning in their communities. From one-on-one assistance with technology use to support for groups engaged in online learning to small business incubation centers, public libraries help their patrons learn critical skills every day.

The survey asked librarians to review a list of possible instructional activities that would be supported by high-speed broadband and to check those activities that they would offer patrons if the obstacle of low bandwidth was removed.

- Videoconferencing with experts (for example, health professionals, legal aid);
- One-on-one tutorials;
- Support for group online learning;
- Partnerships with community organizations offering instruction (for example literacy, health, veterans benefits);
- Computer classes; and
- Support for individual online learning.

The chart below shows the percentage of respondents who chose each kind of instructional activity.

Graph 2: Expanded Instructional Opportunities



When interviewed during the pilot project, librarians had a host of ideas for improving and expanding instruction in their public libraries.

Once bandwidth is no longer an obstacle, the Fresno County Library plans to create a "Discovery Center." Aimed primarily at teens, it would contain a video and sound recording studio, performing studio, and an artist studio. Related to this, they would also like to build a "Digibus," a roving teen services vehicle with similar equipment but able to travel around the community.

Public libraries are inherently educational institutions and can be centers for hands-on learning in their communities. Right now Maker Mondays are being offered in several *San Mateo County Public Libraries*. Teen film contests and photography workshops are just two examples. Creating more spaces for hands-on learning is a top priority, both digital and physical. There are some opportunities for public

libraries undergoing renovation to put maker spaces in the public libraries and librarians have been developing the concept of an in-house "Tech Shop," including equipment such as 3D printers and replicators available to the public.

Intergenerational learning is a top priority at the *Merced County Library*, and currently librarians are teaching parents and caregivers how to engage children through literacy activities. To expand this work, they would like to videotape story times and put the videos on their website so parents and caregivers can access these stories anytime. Coupled with training sessions in the community, this repository of stories can become a tool for modeling caregiver-child interaction through literature.

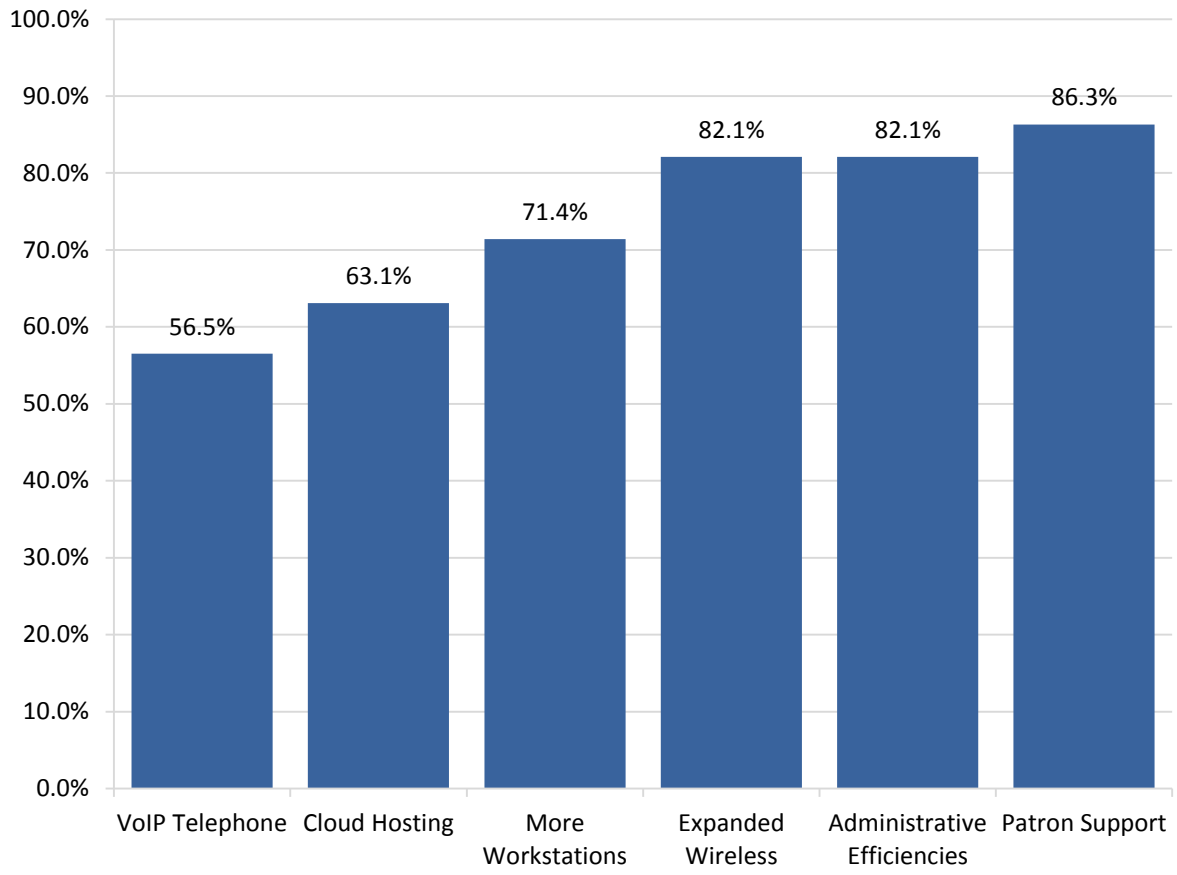
Library Administration

California public libraries operate on extraordinarily tight budgets. Librarians continually look for administrative efficiencies, as any money saved in library administration can be redirected to enrich patron services. High-speed broadband can make possible a whole range of cost saving measures, such as the ones detailed below. In the survey, librarians were asked to identify the ways they would use high-speed broadband in library administration.

- Voice over Internet Protocol telephone (VoIP);
- Cloud hosting of applications or services;
- Expand existing computer work stations;
- Install or expand their current wireless network;
- Administrative efficiencies (for example, videoconferencing meetings, self-check-out); and
- Patron support (for example, online tutorials for frequently asked questions and librarians on the floor answering reference questions using mobile devices).

The chart below shows the percentage of respondents who chose each administrative use.

Graph 3: Planned Changes in Library Administration



Librarians interviewed during the pilot connectivity projects frequently mentioned ways high-speed broadband would allow them to streamline library administration, resulting in better patron service and cost savings.

Redwood City librarians would like to radically change or eliminate the traditional service desk. They envision librarians equipped with iPads or notebook computers serving people on the floor and at kiosks similar to those in Apple stores. Librarians would function more like service representatives, no longer sitting and waiting for patrons to approach them.

Librarians at the *San Mateo City Library* understand that higher bandwidth and increased use of technology provide the opportunity to reevaluate how collections are developed and space is used in the library. Emerging technologies help to define and shape the changing function of public libraries, as do flexibly designed library spaces. Certain collection formats may be replaced by downloading stations, comfortable seating for mobile device users or group study workspaces.

The community room in the *Nevada County Library* is used 15 times per week by a wide range of community organizations including the genealogy club, homeless advocacy group, book clubs, and business training programs. The Computer Club has met there for the last several years. As membership in this club grew and computer activities became more bandwidth intensive, the currently available connectivity became unreliable. Consequently, this club no longer meets at the library. Librarians know that without upgrading technology and connectivity they will no longer be able to serve community users.

To more effectively connect with patrons, *South San Francisco* librarians will make more use of social media like Facebook, Pintrest and Flicker, changing the model they use for program promotion. They also plan to document and share past programs, for example, making videos of story times and other public programs and putting them on the library website.

Findings:

Librarians are aware of the cost savings, educational opportunities and digital collection development that high-speed broadband would make possible, and they are eager to embrace these opportunities.

All 18 categories of use listed in the survey were of interest to librarians. 13 of the 18 possible use categories were selected by 70 percent of librarians. All use categories were selected by least 40 percent of librarians. The most popular broadband enabled activities were in the areas of patron support, online learning, computer classes, community research and distribution of e-books and other electronic resources.

Current Expenditures for Internet Services in California Public Libraries

Introduction

Projections

Introduction

This section of the report shows what public libraries are paying for Internet connectivity displayed by network speed as reported in Table 1[4]. Survey responses for the 731 public libraries that reported current network costs are organized in the following table.

Table 11: Current Network Speeds and Costs

Speed Category	Speed	Number Reporting	Percent of Total Reporting	Percentage by Category	Annual Cost	Annual Cost per Connection per Megabit
Very Slow	1.5	189	25.85%	40.08%	$1,165,416.00	$4,110.81
	5	104	14.23%		$475,560.00	$914.54
Slow	10	88	12.04%	44.46%	$1,060,800.00	$1,205.45
	20	144	19.70%		$3,255,612.00	$1,130.42
	25	1	0.14%		$4,800.00	$192.00
	30	45	6.16%		$520,680.00	$385.69
	45	17	2.33%		$310,956.00	$406.48
	50	30	4.10%		$405,900.00	$270.60
Medium	100	65	8.89%	13.82%	$1,376,424.00	$211.76
	155	0	0.00%		$-	
	250	16	2.19%		$384,000.00	$96.00
	300	0	0.00%		$-	
	500	20	2.74%		$348,000.00	$34.80
Gigabit	1000	12	1.64%	1.64%	$120,756.00	$10.06
	Totals	731			$9,428,904.00	

These speeds are self-reported and unaudited, but they provide a good basis for making estimates. It is likely that some costs, especially for 500 Mbps and Gigabit

[4] Although there were 883 responses, not every branch responded to each question. Therefore individual data points reflect lower numbers.

connections, are underestimates. This is because the survey asked respondents to choose cost ranges except at the high end where the choice was >$2,500/month. These estimates use the midpoint of the cost ranges, but use $2,500 at the high end, so high end costs are underestimated.

As the table shows, 40 percent of library facilities are operating at very low network speeds, are spending over $1.6 million per year for very limited Internet access, and are paying an enormous cost/megabit/second:

- 26 percent of the library facilities (189 responding) operate at consumer-level speeds of 1.5 Mbps or slower, and spend over $1.1 million dollars per year at over $4,000/Mbps.
- 44 percent of the library facilities (325 responding) spend over $5.5 million per year for Internet connectivity that is classified as slow (10 Mbps through 100 Mbps). The vast majority of these (31 percent) are spending in excess of $1,000/Mbps.
- 13 percent of public libraries (101 library facilities) report spending a total of $2.1 million per year for their medium speed Internet connections.
- Fewer than 2 percent (12 library facilities) report use of Gigabit network connections – 1000 Mbps (1 Gbps) – and pay over $120,000 per year.

The average cost per library at 1.5 Mbps is about $6,166 per year, while the average reported cost per library at 1 Gbps is at least $10,063 per year. This cost for Gbps service is heavily skewed to the low end because there are a small number of public libraries that are receiving great service for very little money – most likely because of being physically very close to a community college or university that assists them. Nonetheless, it's clear that the California public libraries are paying far too much money for each megabit/second of service they are using.

Five public libraries reporting cost figures but not reporting network speed data are not included in the table. Their aggregate costs are about $227 per month.

The maps in Appendix D display respondents by location on a map of California by network speeds.

These maps reveal:

- Public libraries in the Central Valley of California operate at Very Slow network speeds. The graphic display shows virtually no networks in the Central Valley that operate at speeds greater than 10 Mbps.
- Public libraries north of the San Francisco Bay Area are similarly network-challenged.

- There are a very small number (14 total) of public library branches in the state currently connected at 1 Gbps.
- The major urban population centers in the Bay Area, Los Angeles basin, San Diego, and Sacramento generally fare a bit better than their Central Valley and Northern colleagues, but only slightly better.
- 98 percent of responding California public libraries operate at "Very Slow" to "Medium" speeds.
- Public libraries in the "Very Slow" to "Medium" categories are spending at least $9.3 million per year for Internet connections.

As the data illustrates, California public libraries pay dearly on a cost-per-megabit basis for their network services. The relatively small sample sizes at the upper end of the bandwidth probably contribute to variability in the costs.

Projections

The number of public libraries reporting the costs detailed in the preceding section is 731. Given that about 384 additional public libraries exist for which no response is available, we have to extrapolate from the data we have.

If the non-responding public libraries' expenses are similar to those reported, public libraries in the state are spending about $14.5 million dollars annually on Internet connectivity.

Since we asked Public libraries to provide costs in ranges, we can also provide estimates for the lowest possible annual expenditure and the highest:

Table 12: Low to High Estimates of Library Spending on Internet Connectivity

	Estimate of Actual	Projection to All
Low Annual	$8,486,580.00	$12,944,646.65
Estimate	$9,428,904.00	$14,381,980.79
High Annual	$12,362,880.00	$18,857,197.26

The estimated cost is not the exact midpoint of High and Low because for the most expensive category (>$2,500/month) the middle and low estimates use exactly $2,500. For the High estimate $3,000/month was used.

Analysis of All Feasible Alternatives

Alternative 1-Status Quo

Alternative 2-Cooperative Library System Consortium

Alternative 3-Statewide Consortium

Recommendation

Analysis of all Feasible Alternatives

As part of an effort to identify costs and related requirements for implementing high-speed broadband networks for California public libraries, the CSL examined the following alternatives.

Alternative 1-Status Quo

Under this alternative 183 separate public library jurisdictions continue to negotiate their own connections. High speed broadband services with capacity up to 1Gbps will only be implemented in library jurisdictions with the funding, skills, leadership, and determination required getting a complex technology project off the ground and keeping it moving.

Connectivity Model

Currently, twenty Internet service providers provide broadband connectivity to California Public Libraries. No single carrier provides service to all California public libraries, nor do they provide connectivity to a common statewide backbone that would facilitate sharing of data among all public libraries. These providers provide a myriad of services to connect Libraries to the Internet across the state. Of the twenty carriers listed in the assessment, the following five carriers provide 87% of the Internet connectivity for public libraries.

- AT&T with 50 percent.
- Time Warner Cable with 17 percent.
- Charter with 10 percent.
- Comcast with 5 percent.
- Verizon with 5 percent.

Costs

Under this alternative, public libraries will continue to spend about $14.5 million annually on Internet connectivity. The findings show that California public libraries do not have the broadband speed or capacity to continue to provide essential broadband driven services such as access to E-government, employment, education, health and other Internet-enabled services and resources.

To illustrate the costs associated with providing high-speed broadband connectivity to our libraries under the current model, the following example is provided. The findings of this report indicated 26 percent of the library facilities (189 responding) operate at consumer-level speeds of 1.5 Mbps or slower. In order to bring this 26

percent up to at least 20Mbps, it would cost approximately $4.5 million annually based on current carrier rates.

Continuing this model is not cost effective. In order for California public libraries to provide the services required of their communities, a different alternative for connectivity must be explored.

Pros

- Adhering to the status quo does not obligate the state to an ongoing financial commitment for library broadband connectivity.

Cons

- The results of the broadband needs assessment illustrate the deficiencies in the current alternative. The findings reveal that the current method for connecting libraries to broadband services are inadequate, costly, and do not scale to meet demand. Many public libraries in California have extremely limited broadband. In fact, this survey shows that approximately 70 percent of California public libraries have connectivity that is more limited than the typical American home.
- Even though a library may subscribe to the highest speed connection that is affordable, the user experience can still be one of slow connectivity and near dial-up speeds. In this scenario: a public library has 15 public access workstations in constant use; it offers Wi-Fi that supports another 10-15 simultaneous connections, typically in use; the library has a T1 connection; and the Wi-Fi and public access workstations share the same connection. With up to 30 devices sharing the same 1.5 Mbps connection, the connection speed at the device level is the equivalent of dial-up service, severely affecting the quality of the user experience. The result for public libraries and their patrons is slow response time, a limited number of computing and communicating devices (smartphones, tablets, notebook computers) that can be attached to the network, and frustrating delays as networks struggle to handle demand.
- Data from the needs assessment shows the following network speed and capacity findings.
    - 62 percent (almost two thirds) of all California Library branches are connected to the Internet at "Slow" or "Very Slow" data rates.
    - California public library networks are undersized in capacity and over-subscribed in their utilization levels. 60 percent (500) California Public Library Branch networks are beyond capacity at "Full" or "Dire" levels.

Alternative 2-Cooperative Library System Consortium

The CSL would create a broadband consortium consisting of the nine statewide library cooperative systems with the CSL serving as oversight for the consortium. Cooperative systems would be responsible for managing consortium effort to obtain best price for circuits and services for their members with requirements to develop specifications, solicit bids from commercial carriers, and each undertake their own broadband plan, according to local policy and procedure. This will be accomplished through funding of the California Library Services Act (CLSA), which provides for the establishment and maintenance of a communications and delivery network between and among cooperative system members. CSL would continue its oversight of the CLSA. Requests for funding would be submitted to the CSL, where eligibility and amounts to be allocated to cooperative systems would be determined in accordance with cooperative system plans of service.

Connectivity Model

California public libraries would engage in a consortium effort of the nine cooperative library systems to purchase services from the twenty broadband service providers that provide connectivity to the 183 California library jurisdictions. Each jurisdiction would need to provide its own personnel, facilities, specifications, plans, and interconnectivity methods.

Costs

This option could be funded through the California Library Services Act (CLSA), which provides for the establishment and maintenance of a communications and delivery network between and among cooperative system members. CSLA will incur current broadband costs for libraries in California, which are estimated at $14.5 million annually. (This does not factor in added staff at the CSL or Cooperative Library System to execute the provisions of this alternative.) This would allow jurisdictions to divert current broadband expenses towards "middle mile" (the segment of a telecommunications network linking a network operator's core network to the local network plant) and “last mile” (the final leg of the telecommunications networks delivering communications connectivity to customers). Through consortium effort, it is the expectation that volume purchasing may result in enhanced broadband speeds, lower costs for library connectivity, and may result in lower ongoing expenditures in future years.

Pros

- Provides for the support and maintenance of a communications and delivery network between and among members of cooperative library systems.

- Restores some funding for CLSA which is currently $28 million below what it was in FY 2010/2011, and will provide a mechanism for libraries to significantly improve broadband connectivity statewide.
- Leverages consortium efforts to lower broadband expenses and increase high speed broadband connectivity.
- Frees up local broadband expenses that can be diverted to equipment, middle and last mile infrastructure investments.
- Gives CSL role in broadband planning for 183 Library Jurisdictions.

Cons

- CSL will be required to build a program that would be responsible for the organization and central planning capable to deal with matters in 58 California counties, all of which will have different procedures, plans, and projects in each location. This build out will require five positions at a minimum, and may take up to one year to start.
- Annual costs to nine cooperative library systems unknown at this time. Shifts workload to Cooperative Library Systems, which may need to hire additional staff with proper expertise to execute new role.
- Broadband service provider willingness to negotiate with cooperative library systems and expand broadband capacity unknown at this time.
- Administrative and technical burden will be passed to the libraries, and the potential for delays, lack of coordination, connectivity problems, and incompatibility problems.
- Few libraries have the requisite staff capabilities to attempt such projects and succeed. Many currently under-serviced libraries would remain that way, because they don't have the personnel resources to improve their bandwidth access, even if they had the funds.
- Remote and rural areas of California may not be able to attract gigabit service via a commercial carrier accessible to libraries. Commercial carriers will not invest in fiber to areas where the population is too small to give them a return on their investment. These areas will continue to be left out of high speed Internet service.

Alternative 3-Statewide Consortium

The CSL would partner with an entity that would create a statewide broadband consortium responsible for obtaining best prices for broadband connectivity, creating a statewide E-rate consortium, and providing connectivity to a high speed Gigabit backbone. Consistent with its current statewide roles and responsibilities, the CSL would provide oversight for the consortium effort.

In determining potential organizations to provide statewide consortium partnership, the CSL looked at major statewide players who have a relationship with the California Public Library Community, or have the potential to fulfill this role.

Department of Technology Services-California Government Enterprise Network Service Offering (CGEN)

The State of California operates The California Government Enterprise Network (CGEN). CGEN services provide the California State Government Wide Area Network (WAN) connectivity through vendor owned and managed equipment. The vendor manages from the customer's local area network (LAN) to the vendor's routers in the Data Center Services (DCS) iHubs. Customers can access the Internet, DCS facilities, customer servers and applications hosted at DCS and other State departments. DCS is the owner of record and manages the provisioning of customer connectivity. Customers are still responsible for their own LAN.

CGEN is built on CALNET vendor managed service product offerings. The Rates Methodology for CGEN is based primarily on pass through of vendor charges to the customers. Fees for managing the vendor, assisting with provisioning (DCS Fee), and for providing and maintaining the iHubs and Internet access (iHub/Internet Fee) are added to the vendor pass through. Until the current network, CSGNET, is completely de-populated and retired, a CSGNET Retirement Fee is also added. This particular fee will be eliminated once CSGNET is fully decommissioned.

Costs

Based on the CGEN cost estimate tool (http://www.servicecatalog.dts.ca.gov/services/network/cgen/rates.html), one-time and ongoing cost estimates were projected to connect all 183 California public Library Jurisdictions. As with any estimate, actual costs may be lower or higher at time of implementation.

One-Time-Costs

It is estimated one-time costs to connect all 1115 public library branches to CGEN would be $4.46 million. This assumes all branches would be candidates for CGEN OPT-E-MAN services.

Service	Rate	Library Sites	Total
CGEN OPT-E-MAN build out, per install	$4,000	1115	$4,460,000.00

Ongoing Costs

It is estimated monthly costs to connect all 1115 public library branches to CGEN with speeds in excess of 100 Mbps would average $4 million to $5 million per month or approximately $60 million annually. This assumes all branches would be candidates for CGEN OPT-E-MAN services.

Pros

- A recognized statewide network service provider.
- Staff has extensive network expertise and knowledge.
- Would increase Internet speed at most libraries.

Cons

- With the exception of the California State Library, no other California public library in the State has connectivity to CGEN, nor do service agreements exist with any of the 183 California Library jurisdictions.
- CGEN's primary customers are state agencies, providing California state government WAN connectivity.
- The two CGEN service providers (AT&T and Verizon) do not currently provide connectivity solutions to all public libraries.
- Does not have presence in all 58 counties.
- Provides limited symmetric upload and download speeds required for libraries.
- Does not readily provide connectivity speeds over 500Mbps. Speeds above 500Mbps are dependent on capacity of Telco provider servicing geographic area.

CENIC

The Corporation for Education Network Initiatives in California (CENIC) is a nonprofit corporation that provides high-performance, high-bandwidth networking services to California universities and research institutions. Through this corporation, representatives from all of California's K-20 public education combine their networking resources toward the operation, deployment, and maintenance of the California Research and Education Network, or CalREN.

CENIC designs, implements, and operates CalREN, a high-bandwidth, high-capacity Internet network specially designed to meet the unique requirements of these communities, and to which the vast majority of the state's research and education institutions are connected. Charter institutions connected to the CalREN backbone include:

- All 10 campuses of the University of California system, all UC medical centers, and the UC Office of the President.
- All 23 campuses of the California State University system, offsite centers, and the CSU Chancellor's Office.
- All 112 campuses of the California Community College system and off-site centers.
- All County Offices of Education in California's K-12 system and via those offices, over 8,000 K-12 schools.
- Other universities including: the California Institute of Technology, Stanford University, and the University of Southern California.

CalREN consists of a CENIC-owned and operated backbone to which schools and other institutions in all 58 of California's counties connect via leased circuits, obtained from telecom carriers, or fiber-optic cable.

Costs

$4.5 million annually for California public libraries to connect to CalREN backbone with anticipated speeds of 1Gbps. These fees cover the network infrastructure, network services procured from external organizations, and support costs for staff providing 24x7x365 services to the institutions connected by CENIC's network.

Pros

- CENIC currently has a relationship with the public library community and is providing services to the Peninsula Library System, San Francisco Public Libraries and the San Joaquin Valley Library System.
- CENIC owns its own backbone and leases additional capacity from other carriers. It has the capability to establish and control costs for non-tariffed services such as broadband fiber. CENIC designs, implements, and deploys fiber networks as its sole business, and it has a record of accomplishment in administering network deployment. Planning, connectivity, and inter-operability would be enhanced in a single-carrier environment operated by a vendor of statewide services. CENIC regularly implements fiber-sharing projects and is in a very good position to help contain one-time and recurring costs for California public libraries, as well as to extend broadband deployment into under-served and rural areas.
- CENIC provides full E-Rate program management, extending the value of E-Rate to many public libraries that have not taken advantage of the discounts because of administrative burdens of the complex federal program. Combining the buying power of California's 1115 public libraries with that of K–20 institutions, may result in one-time and ongoing cost savings.
- Public libraries are a viable partner in the educational continuum, consistent with the other entities served by CENIC.
- Public libraries will be able to share a California-wide intranet, peering/exchange, and access to other world education networks.
- Public libraries can create a California-wide library high-speed intranet to support state-wide inter-library efforts such as buying content and services or a statewide library card.

Cons

- Ongoing financial commitment to fund membership in CENIC.
- Potentially all 1115 California Library outlets may request funds from the California Teleconnect Fund (CTF). As of FY 13/14, 315 California Public Library outlets are receiving $1.245 million in discounts from the CTF annually.
- Existing library Internet service provider contracts may delay library connectivity to CalREN.

Recommendation

As a result of the evaluation of all feasible options, the entity best suited to partner with the CSL in a consortium effort is CENIC. Partnering with CENIC will allow the California Library community to take advantage of high-speed broadband services not currently available to our libraries. Partnering with CENIC is consistent with the California Library Services Act which states:

"…. that it is in the interest of the people of the state to insure that all people have free and convenient access to all library resources and services that might enrich their lives, regardless of where they live or of the tax base of their local government."

The CENIC connectivity option is detailed in the following section: *Recommended Alternative:* Statewide Consortium-The Opportunity to Connect Public Libraries to California's High-speed Research and Education Network.

Recommended Alternative: Statewide Consortium

The Opportunity: Connect Public Libraries to California's High-speed Research and Education Network

The CalREN Network

Connectivity for California's Public Libraries via the CalREN Network

Costs

The Opportunity: Connect Public Libraries to California's High-speed Research and Education Network

California's education and research communities currently leverage their networking resources under CENIC, the Corporation for Education Network Initiatives in California. CENIC is a non-profit corporation created by the California research and education communities in 1997 in order to obtain cost-effective, high-bandwidth networking to support their missions and respond to the needs of their faculty, staff, and students. CENIC designs, implements, and operates CalREN, the California Research & Education Network, a high-bandwidth, high-capacity Internet network specially designed to meet the unique requirements of these communities, and to which the vast majority of the state's K-20 educational institutions are connected. CalREN consists of a 3,800-mile CENIC-operated backbone, to which nearly 10,000 schools and other institutions in all 58 of California's counties connect via fiber-optic cable or leased circuits obtained from telecom carriers. Over ten million Californians use CalREN every day.

There are currently five Charter Associates who comprise the board of directors of CENIC: the California K–12 system, California's Community Colleges, the California State University, the University of California, and private universities (Caltech, Stanford, and the University of Southern California). CENIC also serves non-Charter research and education institutions when this is in the interest of their Charter Associates. A full list of the CENIC Associates can be found at www.cenic.org. Each Charter Associate is represented by three board seats on the CENIC Board of Directors and help shape the direction and focus of the organization.

California's public libraries would be added to CENIC as a sixth Charter Associate. The CSL would act as the public libraries' interaction point with CENIC. As a result, public libraries would have the capability to collaborate more seamlessly with one another as well as draw on content, expertise, and opportunities from schools, colleges, and universities, extending these capabilities to individual public libraries and library patrons statewide and thereby enhancing access to information, research, and credit/non-credit distance learning.

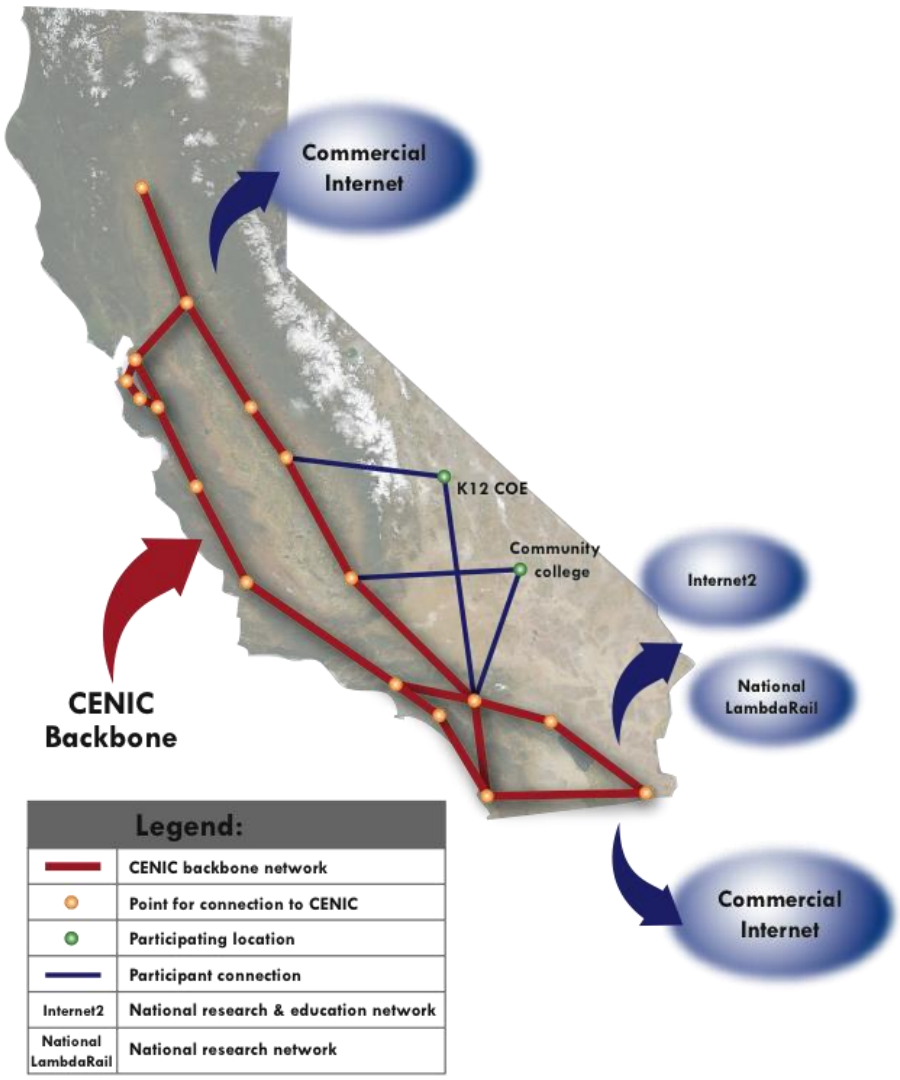
The CalREN Network

CENIC's California Research and Education Network (CalREN) is an advanced network-services fabric serving the vast majority of research and education institutions in the state.

The CalREN backbone consists of roughly 3,800 miles of CENIC-owned and managed fiber, as well as hundreds of optical components. Connection points,

shown as yellow dots in the picture below, allow sites to connect at the most cost-effective location.

Current Connectivity Model

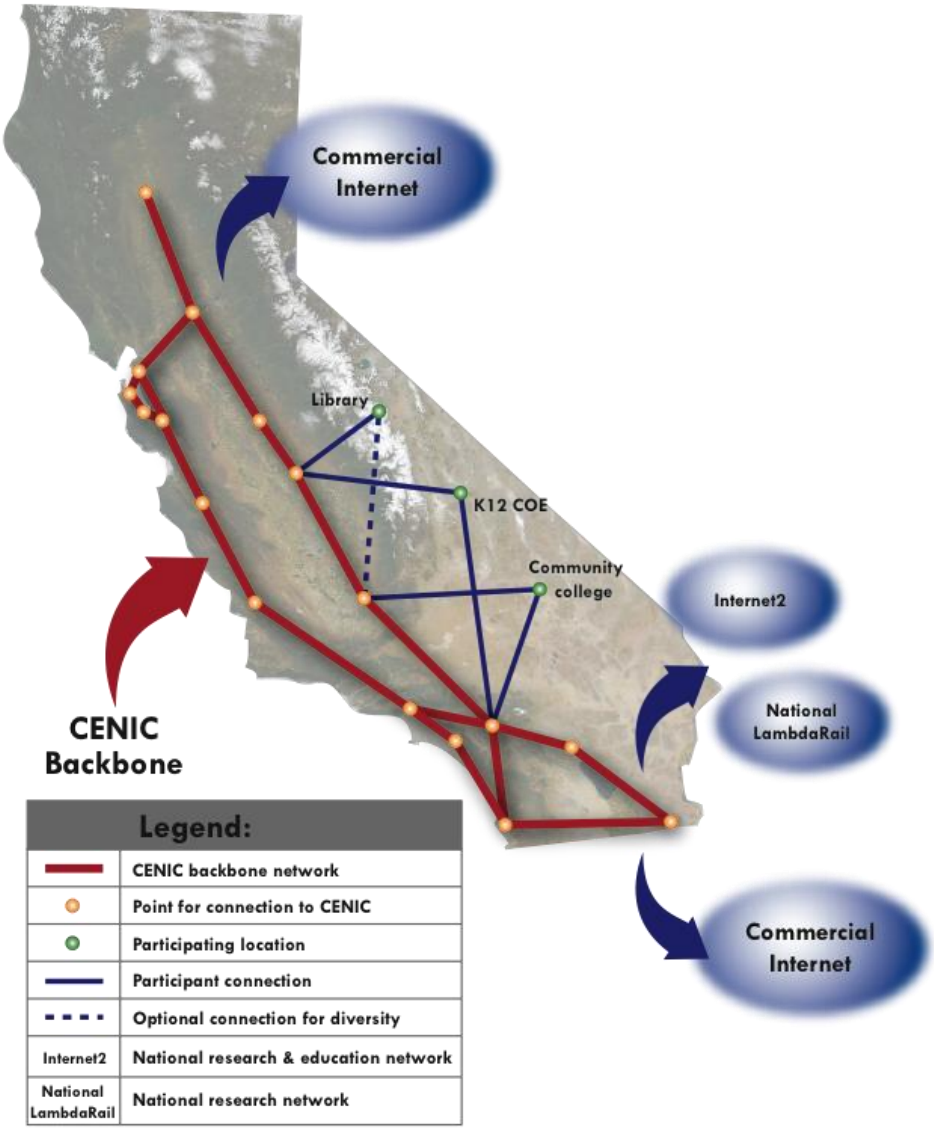


Connections to this backbone for educational institutions take two forms:

1. A direct connection, used for colleges and universities (Possible Connectivity Model #1)
2. An indirect connection, used for K-12 sites, in which multiple school districts connect to a single aggregation point, typically located at a county office of education (Possible Connectivity Model #2)

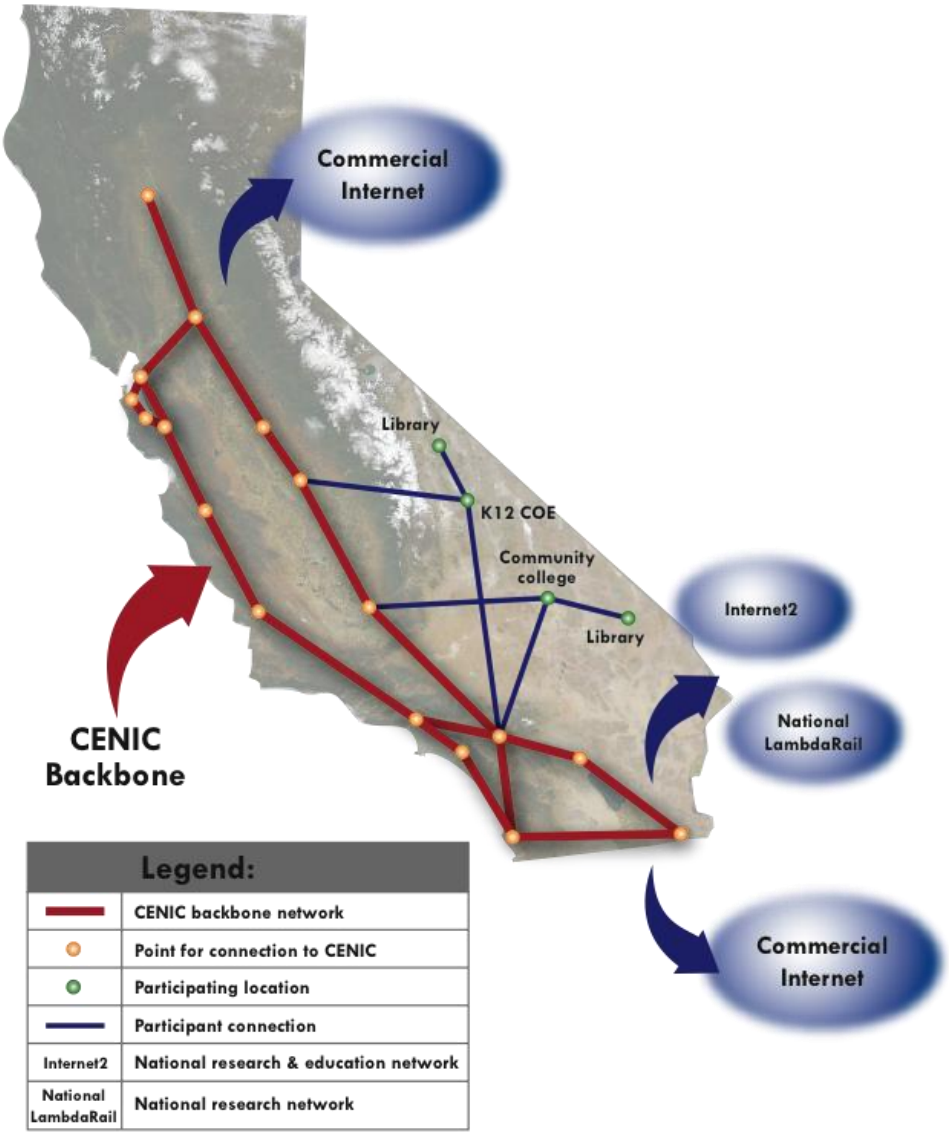
Possible Connectivity Model #1

A direct connection, used for colleges and universities.



Possible Connectivity Model #2

An indirect connection, used for K-12 sites, in which multiple school districts connect to a single aggregation point, typically located at a county office of education.



Connectivity for California's Public Libraries via the CalREN Network

CENIC will shortly begin to provide high-capacity connectivity for many of the public libraries in California's Central Valley via a project funded by the American Recovery and Reinvestment Act. In addition, as described earlier in this report, CENIC is currently carrying out pilot projects with the San Francisco Public Library System and the Peninsula Library System.

As this report elsewhere describes, many of the library jurisdictions have already joined together in consortia such as the Black Gold Cooperative Library System (www.blackgold.org), the Solano, Napa and Partners Library Consortium (www.snap.lib.ca.us), and the Peninsula Library System (www.plsinfo.org). Where these relationships are already in place, infrastructure will be augmented to expand the existing connectivity to meet the goal of providing 1Gbps connection for each library. CENIC will generally connect to a single "head end" site at each consortium or jurisdiction, reducing costs by allowing network infrastructure to be shared by multiple public libraries.

We anticipate connecting 40 percent of the public libraries in the first fiscal year of funding, with the bulk of the remainder following in the second year. CENIC has carried out projects of similar scale in the past, including connecting the 123 California Community Colleges and the 58 California K-12 node sites. Based on this experience, a proposed multi-phase planning and implementation process is outlined below.

Phase 1: Jurisdiction Exploratory Meetings

CENIC staff will meet with representatives of each of the library jurisdictions, either in person or via telephone or videoconference. The objectives of this meeting are as follows:

1. To confirm the information collected by the surveys carried out during this needs assessment.
2. To explore the special circumstances and needs of each jurisdiction. For example, many jurisdictions have strong relationships with local community colleges, K-12 districts, and city or county governments, and understanding these relationships will inform the network design.
3. To discover any obstacles to successful implementation.

Phase 2: Network Design

Connections to the CalREN network can take a variety of forms, and in this phase CENIC staff, in collaboration with jurisdiction representatives, the CSL and the Califa Group, will determine the most cost-effective means. These may include making use of CENIC managed fiber or leased circuits from telecommunications companies, connecting library systems directly to the CalREN backbone or to sites such as community colleges or K-12 County Offices of Education, and aggregating multiple jurisdictions into a single connection.

CENIC will also assist in coordinating new partnerships to facilitate connectivity. For example, in cases where a library system would be connected to a county office of education, a high level of service availability will be impossible unless the county offices of education staff are available to support the library connection. CENIC will assist with these new relationships and, where appropriate, facilitate MOUs or other service level agreements.

Phase 3: Implementation

The implementation phase includes a series of steps, customized for the particular circumstances surrounding each connection. These may include last-mile fiber procurement or construction, telecommunications circuit procurement, provisioning of building entrance fiber and intra-building cross-connections, space and power provisioning, and equipment procurement, testing, and staging. Expenses related to last-mile connections would be the responsibility of local libraries.

Phase 4: Migration and Operational Readiness

Following a successful implementation, CENIC staff will work with library staff to migrate network services. This will again be customized for each connector. For example, some library systems may have contractual term obligations requiring maintenance of legacy Internet Service Provider (ISP) connections, which requires a significantly different and more complex migration effort than a system that can move to CalREN immediately.

This phase will also include a meeting between each new connector and CENIC's Network Operations Center (NOC) manager to review support mechanisms and the process for dealing with problems that arise.

While these phases are presented sequentially, in practice they are likely to overlap; for example, some library systems may be in an implementation phase while others are in an exploratory phase.

Costs

The costs for meeting the ambitious goal of a 1Gbps connection for each California public library site can be broken down into several categories:

Ongoing Costs: CENIC Membership

As a not-for-profit, CENIC's backbone and technical support fees are set by its Board of Directors on a cost-recovery basis. These fees are currently set at $4.5 million annually for each of the multi-site segments (the University of California, the California State University, the California Community Colleges, other universities and the California K-12 system). These fees cover the network infrastructure, network services procured from external organizations, and support costs such as salary for CENIC's staff of 50 (most of whom are technical staff providing 24x7x365 services to the institutions connected to CENIC's network).

The benefits of membership in CENIC will afford libraries with many new opportunities. Libraries will have highly reliable, high-speed Internet connectivity through a network considered internationally to be among the most innovative and leading edge. Fixed cost for networking are limited only by speed of connection (circuit size) from member institution to the CalREN backbone network, while providing reliable access to other national networks such as Internet2, ESnet (Department of Energy) and National LambdaRail via CalREN's multiple connection points. Services such as consulting and project management for installing fiber to members' sites and support for statewide federal E-rate will be available to libraries. Lastly, and importantly, libraries would become part of a statewide high-bandwidth intranet, connecting libraries to educational partners, expanding and improving the services libraries can offer patrons.

CENIC's technical staff has performed an analysis of the traffic volumes projected for the approximately 1,100 library branches proposed to connect to the CENIC network. Based on this analysis, CENIC will be required to perform network upgrades totaling $18 million in order to support this additional traffic. This equipment is amortized over 4-6 years depending on specific equipment types.

In order to cover these costs, the $4.5 million annual fee will be extended to the California libraries by CENIC. This funding supports CENIC's cost for network upgrades, technical support center, services, and technology refresh cycles that will commence after the fifth year. This backbone and support fee has remained constant for the past eight years, while bandwidth has increased exponentially, as have services to CENIC's members. The CENIC Board, on which libraries would have three representatives (appointed by the California State Librarian) remains committed to this approach for the future.

The California Teleconnect Fund (CTF) could potentially fund up to half of the ongoing costs. The CTF provides a 50 percent discount on select communications services for eligible entities. California public libraries are eligible to receive discounts through the CTF. This is consistent with how the K-12 system funds annual costs for CENIC membership. Remaining ongoing costs would need to be funded with federal, state, local, or private funds. As of FY 13/14, 315 California Public Library outlets are receiving $1.245 million in discounts from the CTF annually.

One-Time Costs

In order to connect to a common statewide broadband infrastructure, library systems and branches will need certain equipment. It is estimated that $2 million is needed on a one-time basis to help libraries pay for this equipment, as these capital expenses my not be in their budgets. The funding would be provided to local libraries when they are in the implementation phase. The State Library is actively seeking funding for this purpose from private foundations and other entities.

Library Last-Mile Connections

It is anticipated that libraries' current Internet expenditures can be redirected to pay for the last-mile connections to the CalREN network. This will result in libraries paying the same amount as they do today, but they will be provided with a 1 Gigabit connection – about 1000 times the speed that the majority of libraries are getting today. In addition, aggregating the buying power of California's library, research, and education communities can substantially lower these costs.

Conclusions

Conclusions

1. **High-speed broadband is essential for public libraries to fulfill their mission.** Availability of broadband in public libraries promotes equity and provides patrons opportunity regardless of income.
2. **Many public libraries in California have extremely limited broadband.** Approximately 70 percent of California public libraries have connectivity that is more limited than the typical American home.
3. **Public libraries are paying a lot for this limited connectivity.** Estimates based on this survey run as high as $14 million dollars annually for very low connectivity speeds. These same dollars could be repurposed, as suggested herein, and buy significantly more bandwidth.
4. **Librarians across California know how they want to use high-speed broadband in their libraries.** Librarians will have a host of new opportunities to serve their patrons more effectively and to operate their public libraries more efficiently. Patrons, especially those who do not have Internet access in their homes, will have access to resources, information and educational opportunities that will improve their quality of life and economic prospects.
5. **There is a resource that exists in California that can solve this problem.** CENIC operates a high-speed fiber backbone, CalREN. This 3,800-mile backbone connects all research and education organizations in the state, and public libraries belong in this group of institutions.
6. **By linking to CalREN, public libraries would have an average of 100 times their current broadband capacity.** They would also be able to take advantage of:
    - participation in the governance of CENIC, including setting future direction;
    - access to a 24/7/365 network operations center;
    - access to money-saving opportunities including peering relationships;
    - participation in innovation in networking as well as current and future library functions enabled by emerging technologies.
7. **California libraries will have more reliable Internet service.** Upgrading the library branch Internet connectivity will increase the reliability of the facilities and bring in new expert-level network operations center staff to help with any problems. Modern equipment to provide an improved network experience to public libraries is at a minimum as reliable as, and probably more reliable than, the equipment in use today.

8. **Public libraries and their patrons will benefit by joining this consortium.** By joining CalREN, public libraries will be able to collaborate with a whole new community of experts from K-12 schools, community colleges, the California State University and University of California systems, several private universities, and various museums and other cultural institutions. This community has proven adept at providing help to each other and will welcome the library community with enthusiasm.

9. **This survey provides a clear picture of each library's current facilities, equipment and staff.** To connect public libraries to a high-speed broadband network we need detailed information about their current Internet connectivity. This survey gives us that information. Based on what we know about current conditions, it is possible to plan for connecting public libraries to CalREN and estimate the costs of doing so.

10. **Public libraries can reduce the disparities in access to the Internet across California.** These disparities are striking, and public libraries are eager to fulfill their mission by providing high-speed broadband so their patrons can access resources, information and educational opportunity. We must give them the tools to do so.

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Appendices

A. The Importance of this Project:
Librarians across California describe why high-speed broadband is critical to the future of their libraries and their communities

B. Survey Instrument

C. Data Normalization Rationale

D. Maps Showing Current Internet Speeds in Libraries Across California

Appendix A

California State Library
FOUNDED 1850
Preserving Our Heritage, Shaping Our Future

The Importance of this Project: Librarians across California describe why high-speed broadband is critical to the future of their libraries and their communities

In order to be competitive in today's – and more importantly in TOMORROW'S – world, patrons (especially in rural areas) need access to an ever increasing amount of digital information and resources. And as providers of free information access, Libraries need dependable, affordable, broadband access in order to help their communities prosper.

— Rita Lovell, Alpine County Library

We are the only place where people without computer access can come for free internet and free assistance with their computer needs. Broadband access is extremely important to our library especially since we are located in a rural area where many people still do not have computer access because of their remote locations.

– Laura Einstadter, Amador County Library

Immigrants comprise fifty percent of our service population, and fast, high quality connections to the world are an important service. Also, we serve a large student population and providing expanded broadband is an important tool for homework use.

– Mary Beth Hayes, Arcadia Public Library

At the Azusa City Library, technology questions are by far are most common interaction with community members. Our users are bringing their devices to the library to complete a broad set of tasks, all of which require more and more bandwidth.

– Ann Graf, Azusa City Library

The Beaumont Library District needs to upgrade to a faster internet connection in order to provide patrons and staff access to basic services. The current internet connection provides download speeds of 0.21 Mbps, and upload speeds of 0.23 Mbps. This translates into a great deal of frustration for patrons and staff. With an upgraded connection patrons would be able to check their accounts online, renew books and search upcoming library events. Staff would be able to participate in online classes to develop new skills, post videos showing patrons how to take advantage of the resources available through the library, and would be able to access all of the information provided by library subscriptions.

– Clara J. DiFelice, Beaumont Library District

The Library is a community commons, a community cooperative, and a life-long learning center. Libraries are founded on the democratic principle of providing free and equal access to knowledge, information and ideas. Expanded broadband would make it possible for libraries to continue to fulfill this role and equalize access to information and ideas for people of all income levels and all ages.

– Deborah Mazzolini, Belvedere-Tiburon Library

Our Library strives to provide the fastest bandwidth speeds that it can afford in order to support Library patrons' bandwidth needs as multimedia, streaming media, videoconferencing and webconferencing and large file sizes have proliferated on the Internet. However, faster network speeds can be compared to adding new lanes to a congested highway – for a short while, everyone realizes an improvement, then demand seems to slowly outpace supply until once again, the "lanes" (or lines) are once again clogged with traffic. This situation is largely due to the ever increasing bandwidth of Internet based media and applications. While the Library may try to alleviate this problem through locally implemented measures such as bandwidth and traffic management, ultimately a more global solution is needed that includes affordable and ubiquitous broadband for Libraries.

– Donna Corbeil, Berkeley Public Library

Given the ubiquity of wireless devices coupled without growing daily visitor count, our current capacity is consumed as quickly as IT is able to increase it. Combined with the increased sophistication in streaming options available to take our programming, lifelong learning options and economic development to the ne x t level, we foresee the day when we may be left behind. For e x ample, we have the founder of a highly successful gaming company presenting to a group of local business people and interested community members and we are concerned that the video he would like to show, including advance gaming animation, will stall given our wireless capacity. This type of keynote program, which highlights economic successes in our city and encourages new entrepreneurism, is not provided anywhere else.

– Barbara Wolfe, Camarillo Public Library

The library connects the community with information, health and employment resources, government agencies and services, learning, culture and people. From ensuring continued access during disaster recovery to providing resources for economically struggling Californians, the library serves a vital role in creating a resilient community. Connecting with resources is increasingly reliant on a sustainable digital infrastructure. Insufficient connection serves as a limiter. Expanded broadband capacity at the library increases the opportunities for our entire community. It supports the library's critical role through improved tools to education, family, jobs, and information resources around the world.

– Heather Pizzuto, Carlsbad City Library

Our community and our library will always need information. Access to information increasingly depends on expanded bandwidth. Public libraries must provide an information access safety net. As businesses around the world develop applications that require many gigabytes of bandwidth, libraries need to keep up to maintain a level playing field for everyone.

– Betty Waznis, Chula Vista Public Library

We have many patrons who are taking online educational courses and use our library computers or wireless system. They are often frustrated when unable to access or kicked off the wireless due to lack of broadband or unable to download information on the public computers.

– Barbara Lawrence Lockwood, City of Calabasas Library

Expanded broadband is not only critical to the future growth of electronic services to the El Segundo community, but for our immediate needs today. Our system network is already maximized to the point of being slow or with blackout periods where there is no internet service for patrons or staff. The expectation of expanded internet, wireless, e-books, and database services will only continue to grow -- broadband is the solution which needs to be addressed and implemented as soon as it is feasible.

– Debra Brighton, El Segundo Public Library

In order to ensure a positive library experience, our patrons need unencumbered access to streaming video tutorials, and secure and reliable exam sites. A consistent and effective means to submit employment applications. A non-frustrating experience for seniors learning how to navigate the internet.

– Hilary G. Keith, City of Santa Fe Springs

Expanded bandwidth will allow us to record events taking place in the library and share them with all members of our community on our website.

– Wendy Burke, Colusa County Library

Our library has become an extension of government at all levels. We have people completing EDD applications because the closest office is more than 20 miles away. The Superior Court sends people to the library to look up trial information. Patrons use the library to apply for all kinds of social services. Even the local school district requires parents to complete information online and then print it.

– Julie Fredericksen, Corona Public Library

As more and more critical information and services become available only online, the public library is the institution that can provide equitable access to all citizens. Bandwidth must be adequate to deliver the multimedia formats in which information and services now come.

– Chela Anderson, Daly City Public Library

Like other libraries with remote locations and geographical challenges, we are still the major access point for Internet in our communities. Economic development depends on education, quality of life, and information networks – and the library is the conduit to those essential needs.

– Jeanne Amos, El Dorado County Library

In communities with high rates of poverty, unemployment, and homelessness, libraries level the playing field and allow access to all. In rural areas, libraries are the community center and the safe place. They can change lives because of the services they provide and the relationships they build.

– Laurel C. Prysiazny, Fresno County Public Library

With computational functions moving to the Cloud and massive data files being stored in remote server farms, the network has become the computer. In this environment bandwidth is a major and critical factor in determining computational efficiency. However, in the most advanced telecom systems bandwidth is no longer a constraint and does not need to be conserved. As broadband expands so does the imagination of the people who have access to it. They find ways of using it that were not possible with less bandwidth. Streaming video at extremely high definition becomes feasible. Telepresence becomes viable and routine. Collaboration on huge data files (movies and multimedia content) can be done over great distances. Researchers and students are able to control the collection and manipulation of massive amounts of data from many sources. Sensors can be imbedded in all sorts of devices to control processes and monitor systems. Fiber is the backbone for myriad wireless devices and networks. The cost of bandwidth has dropped precipitously. Delivering 1Gbps data rates will soon be routine and relatively inexpensive. 100Gbps is now possible with fiber optic cable. Telcos and cablecos limit bandwidth in an effort to milk their legacy systems for which there is often little competition. New startups and larger companies that rely on developing and delivering services and digital content over the Internet often spring up or move to communities with modern fiber optic telecom systems with high data rates. Communities have found it to be a classic case of "If you build it they will come". High speed telecommunications are to modern economic development as the train and freeways were in an earlier age.

– Maureen Gebelein, Fullerton Public Library

Humboldt County Library provides free access to public computers and to the Internet, and for many residents living at or near the poverty level for a family, the public library is the only free source of information on a variety of community-based social services, job search and job preparation resources, and face-to-face assistance for health care providers in the local community. We do all this while continuing to provide for the educational and entertainment needs of adults and children with audiovisual, electronic, and printed materials and monthly historical society presentations and an ongoing film series. We remain the one of the primary anchor institutions for the communities we serve in Humboldt County.

– Victor Zazueta, Humboldt County Library,

Expanded broadband is critical to many communities located in the 8,141 square miles of Kern County and serviced by the Kern County Library branches. Access to real-time information is imperative for decision-making in all aspects of life and work; something that has not been available in some of Kern's desert, rural and mountainous communities.

– Sherry K. Gomez, Kern County Library

The connectivity limitations impact library operations and the capacity to provide technology programs and services to the community. The Kings County Library has reached the limit in terms of the number of computers our current connectivity can support. As a consequence, wait times for computers is common. This is the only place in the whole county where residents have access computers and technology, but the library cannot meet their demand.

– Natalie R. Rencher, Kings County Library

Lake County is a rural area and access to the internet is often slow and e x pensive for residents, if it's available at all. For many the Lake County Library is their only access point to the internet, either due to financial hardships or geographic reality. The internet is quickly becoming the premier place where cultural and educational e x change is happening in our society and in our local community. Access to fast, reliable internet is essential for participating in our 21st century society and as the institution that provides access to information the library should be able to provide that access for our community.

– Christopher Veach, Lake County Library

Supporting the educational and communication needs of all of the citizens of the City of Lincoln is critical to the development and survival of our community. Improved broadband access will support the economic and cultural health of Lincoln.

– Jon Torkelson, Lincoln Public Library

As more and more informational and instructional content goes online, residents will be left with inadequate access to these important and life-changing resources if California libraries are not able to provide a broadband connection for their communities.

– Tamera LeBeau, Livermore Public Library

Right now some opportunities and information are only available electronically. Many in our community are socio-economically challenged and look to their library for access to online resources. They submit job applications, access databases, do research for assignments, or connect with family and friends via social media. We constantly struggle to keep up with demand and have had to patch together WiFi, DSL, and a T-1 line to provide internet access and it is still not enough. This e x panded broadband connection would enable us to increase services we offer and truly connect people to the information and resources they need.

– Dean Gualco, Lodi Public Library

In 2012 the County of Los Angeles Public Library provided its communities with over 2.7 million internet sessions on more than 1,500 public PCs across 80 libraries. Our communities use the internet for a variety of essential services like submitting job applications and applying for state and local assistance programs. Many families don't have broadband access at home and rely on us to complete homework assignments or stay connected to their friends and family via email. Also in 2012, the County Library provided 122,000 WiFi sessions, a 41% increase over the previous year. These sessions used 4.28 million minutes of internet access, which is a 30% increase over 2011. While some customers use the Library's WiFi as a convenience, many more that can afford a laptop or smart phone still rely on the Library as a primary source of internet access. During the fiscal year 2012, the use of the Library's downloadable eBook collection has grown 112%. While many customers download from home, work, or school, a sizable portion rely on the Library's internet access to download our digital content. As we begin to offer downloadable video, the demands for internet bandwidth will continue to grow.

– Margaret Donnellan Todd, Los Angeles County

We live in an increasingly inter-connected world. To fully participate in this world – whether students learning at a distance, job-seekers remotely interviewing with a potential employer via video conferencing, or a group of teens uploading the film they've created to YouTube – requires ever increasing bandwidth. The digital divide has decreased, but it has not disappeared, and libraries – open to all – are key to providing this kind of access to all in our communities.

– Sara Jones, Marin County Free Library

Currently Merced County Library System operates on 2003 operating system at small sites and only three sites have WiFi. Merced County needs to become competitive in the job market and higher education. It is a struggle to offer technology to our residents.

– Diane Satchwell, Merced County Library

A significant population group in our community depend on the public library for access to the Internet. Increasingly, the need for broadband is the norm, not the exception. Currently, there is insufficient or the absence of infrastructure for the library to have access to broadband to provide important services to our community. It is critical that our library be able to fully participate equitably in online activities.

– Cheryl Davis Baker, Modoc County Library

In our small, isolated rural communities, the public library is sometimes the only Internet available to many in the community. Even with just T1 bandwidth we offer more than any other facility in the towns. Real broadband to the libraries in these rural communities will benefit the entire community, and maybe lead the way to true broadband access in rural Mono County.

– Bill Michael, Mono County Library

The focus of the library is to make available free and equal access to information for everyone. As technology advances, the library is the only place that gives the community access to information and resources for a better quality of life. About ten years ago, staff noticed the federal government required the public to go online to make appointments for such services as renewing a green card, eliminating telephone reservations. Today, that requirement has expanded to applying for jobs, registering for classes, distance learning, and e-filing taxes. As federal, state and local services required more online access for their services, library staff discovered a digital divide necessitating in expanding library services to provide basic training in technology. As the economic downturn continued to envelop the country, the community started asking staff how to search for jobs and how to submit online job applications. This trend required staff to develop workshops for job searchers and small business topics, such as how to run a business from your personal computer. The library continues to provide services in the form of technology centers for online information, WiFi for individual use, early learning stations for children and adult literacy stations for learners. The library is looking towards the future for downloading stations to provide free access to electronic books and equip meeting rooms with WiFi, projectors, electronic whiteboards and web conferencing equipment to assist individuals with distance learning, to assist community businesses and students to electronically illustrate their projects, and assist community members with ways to share their knowledge. As more and more people go online for their needs and the library continues to provide information and resources to meet those needs, access to electronic information continues to slow down because of the lack of bandwidth for broadband. The library needs to start planning for future electronic needs, instead of reacting, to be better prepared to serve the community and that requires more broadband access to guarantee the flow of information continues for the community.

– Michele Tompkins, Monrovia Public Library

We are already losing customers because we cannot keep up with the increasing bandwidth demand. Customers are losing their ability to conduct important business, health, life, and education transactions because they cannot do what they need to do in their community libraries and they often have no other place to go. It hurts the social and economic fabric of our communities. It leaves people feeling helpless, hopeless and downtrodden. If the library won't help them anymore, who will?

– Jayanti Addleman, Monterey County Free Libraries

Even in smaller and rural libraries that do not have staff dedicated to technology, there is still a huge need for high speed internet access and technology training. It is often the only access to technology that our patrons have. I hope they can count on the library to help them better their lives and enrich their leisure time. Technology in rural libraries can create a better community and a better future for our region.

– Jessica Hudson, Nevada County Library

More and more services are available online and the demand at OPL for Internet access is high. When our network is slow, nearly all our activities are negatively impacted and patron and staff frustration runs very high. Without expanded broadband, over time, we will not be able to meet patron expectations.

– Gerry Garzon, Oakland Public Library

Many of our residents do not have computers and access to the Internet in their homes, and they rely on the O x nard Public Library for their computing needs. Our current speed is 20 Mbps (shared by all 3 libraries); however, the increase to 1 Gbps (or greater) for the Library will improve computing in our community. Some of the things we would like to explore and support are the following: Cloud Computing, Expand Research, Support Small Business Incubator Center, E-Book Distribution, Social Media, Video Conferencing, Video Classroom participation, and Online Disaster Recovery Backups.

– Barbara J.Murray, Oxnard Public Library

With the increased demand for technology in our library, the faster speeds mean we can help more people without long waits. Everyone would be more efficient and find more of what they need without the frustratingly slow connections. Last year we had 57,446 public computer sessions and answered 23,702 reference questions. Expanding broadband will help THOUSANDS of people with their information needs.

– Jeannie Kays, Palm Springs Public Library

This library's future relevance is closely tied to our capacity to provide fast, dependable technological access. Presenting data via DSL, dial-up, T1, or even higher capacity lines fails to give us any space to grow and always frustrates those users who depend on us for their total access. Libraries MUST step up to be the gateway for electronic resources and information, just as we have historically assumed that role for hard copy formats. The more agencies that become "online only," the more we are compelled to provide that gateway. Otherwise, we become only a "nice building that no one enters."

– Jan Sanders, Pasadena Public Library

In Placer County we have both rural and suburban communities and there are great disparities in many areas regarding access to technology. Some communities just got telephone service recently and some have the best Internet service in the country. Our libraries respond to the whole range of needs and reduce the disparities in access among our residents. We are committed to demonstrating the value of technology to our patrons. People find out that they need technology when someone explains to them all the things they are able to do that they could not do before. There are many people in the county who think that technology has passed them by and that it is too late for them to derive any benefit. The library can show them how important technology can be in their lives.

– Mary George, Placer County Library

Expanded Broadband connects library services with the community's technological needs and priorities; especially in a rural area like ours, it bridges the digital divide to help keep our population competitive in the marketplace of today and the future.

– Vikki Cervantes, Porterville Public Library

The Richmond Community lags behind in the number of home computers, Internet connections, and more importantly digital literacy skills. The City must take responsibility to provide resources for our adults and our children to enable them to compete in the 21st century world.

– Katy Curl, Richmond Public Library

The number of persons/households with no connectivity is quite alarming given the push to move things online in the name of keeping current and "going green". In doing so, we're leaving people behind. Accordingly, the strength and reliability of existing service is not sufficient to meet the demand of those who are connected and savvy enough to utilize the service. A prime example is that due to a lack of broadband, streaming media is blocked by users accessing the Internet in our Libraries. Consequently, customers cannot access many of the sites/tools they would like to and library staff is unable to take advantage of free tools such as YouTube to create staff and customer tutorials, marketing pieces, and the like.

– Tonya Kennon, Riverside Public Library

Maintaining the highest quality broadband addresses increased patron need, and community expectation for up-to-the-minute services from public libraries.

– Rivkah Sass, Sacramento Public Library

Because there is no other agency in our community who is providing this service, and by providing it, we are setting the stage for the future economic and social progress of our City.

– John Alita, San Bruno Public Library

Online content is where more and more of our customers' information needs are coming from. The demand for bandwidth has grown exponentially in the past few years and will continue to do so. Libraries must keep up with this demand to be able to help those who are not connected at home to keep up.

– Jill Bourne, San Jose Public Library

The Library is the only source for free internet access in the city that does not require you to buy something to use it. We are the great equalizer and need to provide our residents, all residents, with the access speeds and tools they require to succeed.

– Sarah Houghton, San Rafael Public Library

PC users and digital content users are major percentages of our libraries patron base. It is also the fastest growing category of patrons. Our business model needs to change to reflect the reality that less than half of our customers are visiting us online or in person and leaving with a book.

– Ed Kieczykowski, Santa Clarita Public Library

The role of libraries in our communities is changing and we need to be responsive, nimble and flexible. Bandwidth needs are only going to grow. We need to stay in front of this and not let it slam us into being reactive instead of proactive for a change.

– Teresa Landers, Santa Cruz City/County Library

Content is increasingly migrating to a digital only environment, and libraries serve to educate communities on the use of the tools as well as provide the equipment and connectivity to access the information. Example of high broadband content that patrons access include: healthcare and telemedicine services; online courses (including MOOCs); born-digital news publications and blogs; public safety alerts (e.g. safe routes, current hotspots); telecommuting and large file uploads.

– Diane Bednarski, Santa Monica Public Library

The Library is a community focal point for gaining employment, doing career research, and accessing information with assistance that may be hard to navigate without help. The library must have the best of connectivity to both offer the end user the experience and information they need, and to stay relevant in the years to come.

– Janice K. Erickson, Shasta Public Library

Access to online information and resources is analogous to the amount of lighting resources for our physical resources. Our online capacity is like having a few candles for patrons to huddle around to share. But no individual enters our library wondering if there will be enough electric light to read a book or newspaper. There is light in the library. That is the norm. And rightly so. But patrons should have the "same" experience when using digital resources: they should focus on what they want and not whether there's enough "light" for them to see it. Expanding bandwidth and increasing speeds would allow patrons to focus on the content of their information needs and not focus on whether there are enough resources to allow them to access it.

– Michael Perry, Siskiyou County Library

Online resources are now a core facet of modern society. People of all ages and in all locations now use the Web on a daily, hourly and even constant basis. Expanding bandwidth at the Sonoma County Library is critical to provide the online resources for our patrons to ensure that the library remains relevant and central in our communities. Not only do patrons in our facilities rely on the Library to access resources from our public internet computers, patrons now rely on the Library to provide wireless access for their mobile devices. Additionally, the Library serves a thriving online community that expects to access our resources from wherever they are in the world. Online Resources continually incorporate more media rich features that require more bandwidth. The Library needs an ever expanding amount of bandwidth to not only access online resource, but to serve our internally created and hosted in a way that can fulfill our patrons' information needs.

– Sandra Cooper, Sonoma County Library

Many people take advantage of our library's public computers and the primary use is for Internet connectivity. In the last year we averaged four sessions per capita, a number that does not capture use of WiFi in our building which would more than double the amount. St. Helena is considered a very wealthy community and this is true for a certain percentage of our users. However, we find that the largest number of people using our computer and Internet resources are those who do not have access to these resources at home – a growing segment in the community as the disparity between "haves" and "have nots" increases. Having access to broadband would enable many more people in our community to have the same access to technology and information as their more affluent neighbors.

– Jennifer Baker, St. Helena Public Library

The demand for speed increases while what we can offer stays the same. This means the high quality service we offered a few years ago has diminished. Many people walk through the door with devices which immediately pull from our existing WiFi. The more devices the slower the service. People expect to be able to connect, especially in the library. People with Laptops, tablets and other devices will continue to expect that information will be available through the library. And, more and more, much of that information will be accessed through the Internet. Slow Internet is frustrating to patrons and for many is equivalent to no Internet.

– James Ochsner, Sutter County Library

Most of Tulare County is disconnected from the internet. Without proper broadband, these communities will be left behind. These are communities that don't have convenient access to books, let alone proper internet. This is a needed service.

– Jeff Scott, Tulare County Library

To meet our communities needs we need to improve digital literacy, employment opportunities and training, adult literacy and tutor training. Enhanced broadband would open collaboration with other agencies that may not be geographically close. Basic computer training and employment research are highly sought skills that could be utilized through remote training and interviews.

– Maggie Durgin, Tuolumne County Library

Greater broadband opens a world of possibilities and the pace of progress could quicken for our community. With greater broadband, both patrons and staff can be more efficient in retrieving or creating data.

– Roberta Knighten, Upland Public Library

The public library is vital to our communities to provide not only access to information, but online access to resources. Today we are faced with helping people apply for jobs online, apply for school and financial aid online, apply for federal and state benefits online, and soon, apply for medical insurance programs. We still have many patrons who are not computer literate and have no access in their homes to online resources. The library is the one place they can come for free access and help for all these needs.

– Paymaneh Maghsoudi, Whittier Public Library

1. Online resources have replaced many critical methods for people to conduct daily life such as employment applications, shopping, paying bills, getting news and information. 2. Broadband is the 21st Century equivalent of the automobile in the 20th Century. 3. As shrinking budgets continue to challenge libraries throughout the State, we need to focus on consolidating resources. Broadband access for all, especially rural communities/libraries will allow us the same advantage as our larger community counterparts, including access to speakers, programming, training, education & social opportunities. As the world gets smaller, the smaller communities deserve a wider rate of access through broadband infrastructure. 4. Looking to the future, so many of society's innovations include technology and the Internet – we need to be ready.

– Patricia M. Wong, Yolo County Library

Broadband requirements are regularly increasing as media and services migrate to the Internet. The library is the primary institution in the community providing access to these services and media to those who cannot secure their own access.

– Melinda Steep, Yorba Linda Public Library

Appendix B

Library Jurisdictional Information and Branch Needs Assessment Surveys

This survey is composed of the two parts:

- The Library Jurisdictional Information Survey
- The Library Branch Needs Assessment Survey

We strongly recommend that you have all of your information gathered before completing the online survey.

THIS PDF COPY OF THE ASSESSMENT SURVEY IS PROVIDED TO FACILITATE YOUR DATA GATHERING ONLY. THE SURVEY MUST BE COMPLETED ONLINE. PLEASE FOLLOW THE LINKS THAT WILL BE PROVIDED IN A SUBSEQUENT E-MAIL.

LIBRARY JURISDICTIONAL INFORMATION SURVEY

Contact Information

Library Jurisdiction Name:	
Library Director:	
Phone:	
E-mail Address:	
Primary Technical Contact:	
Phone:	
E-mail Address:	
Person Completing Survey:	
Phone:	
E-mail Address:	

Staff and Finance

Does your library currently take advantage of federal E-rate discounts for circuit or equipment costs?		Yes for both circuit and equipment
		Only for the circuit
		Only for internal connection (equipment)
		No
Does your library current take advantage of state Teleconnect Fund (CTF) discounts?		Yes
		No
Do you have IT or networking staff on site, either part-time or full time?		Yes
		No
If not, do you have access to networking staff from your county, city, or other agency/department?		Yes
		No
Can you provide 24-hour remote hands support during emergencies?		Yes
		No
Please list all branches for which you will be completing the Needs Assessment Survey:	_____	
	_____	
	_____	
	_____	
	_____	

Desired/Planned Usage

What would be your desired/planned **INSTRUCTIONAL** usage if you had a broadband connection with the necessary bandwidth? (Check all that apply.)

- ☐ Support for individual online learning
- ☐ Support for group online learning
- ☐ Computer classes
- ☐ One-on-one tutorials
- ☐ Partnerships with community organizations offering instruction (ex. literacy, health care, veterans services)
- ☐ Videoconferencing with experts (ex. health professionals, legal aid)
- ☐ Other (Please describe below.)

_____
_____
_____
_____
_____
_____
_____
_____

What would be your desired/planned **LIBRARY ADMINISTRATION** usage if you had a broadband connection with the necessary bandwidth? (Check all that apply.)

- ☐ Install or expand your wireless network
- ☐ Administrative efficiencies (ex. videoconferencing meetings and self check out)
- ☐ Patron support (ex. online tutorials for frequently asked questions and librarians on the floor answering questions using mobile devices)
- ☐ Cloud hosting of applications or services
- ☐ Voice over IP telephone (VoIP)
- ☐ Expand existing computer terminals
- ☐ Other (Please describe below.)

_____
_____
_____
_____
_____

What would be your desired/planned **DIGITAL CONTENT** usage if you had a broadband connection with the necessary bandwidth? (Check all that apply.)

☐	Streaming live events from around the country into the library
☐	Expanding community research options (ex. digitizing family and community history materials)
☐	Develop and support a small business incubation center
☐	Provide and support use of social media by patrons
☐	Distribution of e-books and/or video on demand services
☐	Creating a "maker space" where patrons can create content (ex. use video equipment and 3-D printers)
☐	Enriching website with video content (ex. taped story times, speakers, etc.)
☐	Other (Please describe below.)

_____
_____
_____
_____
_____

What is the most compelling argument you could make about why expanded broadband is critical to the future of your library and your community?

_____
_____
_____
_____
_____

LIBRARY BRANCH NEEDS ASSESSMENT SURVEY

Your Jurisdiction must complete a Library Branch Needs Assessment for each branch listed in Question 16 in the Library Jurisdictional Information Survey. This includes main library, branches, or headquarters.

We recommend that you have all your information gathered before completing the survey.

Branch or Jurisdiction Information

1. Jurisdiction Name:	
2. Branch Name:	
3. Branch Address:	
Address 1:	
Address 2:	
County:	
City:	
State:	
ZIP:	

Existing Internet Connection

4. Please select your Internet provider from the list below:

	Allegiance		Cricket		SureWest
	AT&T		Ducor		TelePacific
	Cal-ORE		Frontier/Citizen		Time Warner Cable
	Calaveras		Level3		TW Telecom
	CA Broadband Co-op		Plumas-Sierra		Vast Networks
	Charter		Ponderosa		Verizon
	Cogent		Sebastian		Volcano
	Comcast		Sierra Telephone		Other (please specify)
	Cox Communications		Siskiyou		

5. What is your current connection speed to the Internet?

	1.5 Mbps (T1 or less)		45 Mbps (DS3)		300 Mbps
	5 Mbps		50 Mbps		500 Mbps
	10 Mbps		100 Mbps		1000 Mbps (1 Gbps)
	20 Mbps		155 Mbps (OC3)		
	30 Mbps		250 Mbps		

6. What form or type of Internet connection do you currently have?

	ATM circuit
	Cable modem
	DSL (Digital subscriber line)
	Metro Ethernet
	Point-to-point circuit
	Other (please specify)

7. What is your current upload speed?

	1.5 Mbps (T1 or less)		45 Mbps (DS3)		300 Mbps
	5 Mbps		50 Mbps		500 Mbps
	10 Mbps		100 Mbps		1000 Mbps (1 Gbps)
	20 Mbps		155 Mbps (OC3)		Other (please specify)
	30 Mbps		250 Mbps		

8. What is your current download speed?

	1.5 Mbps (T1 or less)		45 Mbps (DS3)		300 Mbps
	5 Mbps		50 Mbps		500 Mbps
	10 Mbps		100 Mbps		1000 Mbps (1 Gbps)
	20 Mbps		155 Mbps (OC3)		Other (please specify)
	30 Mbps		250 Mbps		

9. What is the current utilization percentage of your Internet connection, if known?

	Up to 25%
	25% to 50%
	50% to 75%
	75% to 100%
	Unknown

10. When does the contract of your existing Internet connection expire?

	We are on a month-to-month basis.
	0 to 6 months
	6 to 12 months
	12 to 18 months
	18 to 24 months
	24 to 36 months
	36 to 48 months

11. What is the pre-discounted monthly cost of your existing Internet connection?

	$0 to $25
	$25 to $50
	$50 to $100
	$100 to $200
	$200 to $300
	$300 to $500
	$500 to $1000
	$1000 to $1500
	$1500 to $2000
	$2000 to $2500
	Over $2500

12. What is the local telephone company that services your location?

	Allegiance		Cricket		SureWest
	AT&T		Ducor		TelePacific
	Cal-ORE		Frontier/Citizen		Time Warner Cable
	Calaveras		Level3		TW Telecom
	CA Broadband Co-op		Plumas-Sierra		Vast Networks
	Charter		Ponderosa		Verizon
	Cogent		Sebastian		Volcano
	Comcast		Sierra Telephone		Other (please specify)
	Cox Communications		Siskiyou		

13. If known what cable company provides services in your area?

	Cablevision		Cox		SureWest
	Charter		Mediacom		Time warner Cable
	Comcast		SuddenLink		Other (please specify)

Space and Equipment

DEFINITION OF TERMS:

HVAC: Heating, ventilation and air conditioning

Telco: Service provider such as telephone company or cable company

MPOE: Main Point of Entry. This is where telephone and data circuits come into your facility and where the local phone company has its equipment.

Server room: The location where you keep your router/modem and servers if you have any, or where you would likely place a new router for a possible new broadband connection.

Relay Racks: Standardized 19-inch frame or enclosure for mounting multiple equipment modules.

Router: Electronic device that handles and manages the flow of data to and from the Internet.

Switch: Electronic device that connects individual devices (PCs, printers) to each other, to the Integrated Library System, and to the router for connection to the Internet.

UPS (Uninterruptible Power Source): An electrical device that combines battery backup and power sensing features that will deliver electricity to data equipment for a period of time in the event of power failure.

14. Where is the MPOE for your library site located? (Bldg, floor room #)

_____
_____
_____
_____
_____
_____

15. What is the length, width, and height of your MPOE?

Length in feet:	
Width in feet:	
Height in feet:	

16. What is the composition of the walls?

	Drywall
	Plywood
	Concrete
	Block or brick
	Other (please specify)

17. What type of flooring does the MPOE have?

	Concrete
	Raised
	Wood
	Tile
	Other (please specify)

18. If known, is there vacant entrance conduit to the MPOE for a new fiber optic cable?

	Yes
	No

Library Networking Equipment

19. Is your equipment (router or modem) kept in the MPOE or in a different location or separate server room?

	MPOE
	Server room
	Other (please specify)

20. If you have a separate server room, what is the length, width, and height?

Length in feet:	
Width in feet:	
Height in feet:	

21. Do you use relay racks to mount your library's telecommunication equipment?

	Yes
	No

22. If you use relay racks, how much unused rack space do you have available, in inches?

	0 to 6 inches
	6 to 12 inches
	12 to 18 inches
	18 to 24 inches
	24 to 36 inches

23. Is there sufficient overhead space for seismic bracing of racks, if required?

	Yes
	No

24. Does your library currently have a router and Ethernet switches in place?

	Yes
	No

25. If you answered yes to question 24, who is the equipment manufacturer of the router?

	3COM		Enterasys		Nortel
	ADC		Fujitsu		Panasonic
	Alcatel-Lucent		Hawking Technologies		Paradyne
	Asante		HP		Perle Systems
	Asus		IMC Networks		QLogic
	Belkin		IOMagic		Samsung
	Brocade		Juniper		Siig
	Canary		Kentrox		TRENDNet
	Ciena		LG		US Robotics
	Cisco		Linksys		Western Digital
	CMS		Motorola		ZOOM
	Cnet		Multitech Systems		Other (please specify)
	D-Link		Netgear		
	Edge-CorE		Netopia		

26. If you answered yes to question 24, what is the model of the router?

_____

27. If you answered yes to question 24, does your router have a Gigabit Interface Converter (GBIC) or Small Form-factor Pluggable (SFP) transceiver interface capability?

	Yes
	No

28. If you answered yes to question 27, have you installed a GBIC of SFP?

	Yes, GBIC
	Yes, SFP
	No

29. Does your library currently have any fiber optic equipment or services in use?

	Yes
	No

Power

30. Is the telco equipment in your MPOE on UPS backup power?

	Yes
	No

31. If so, how many minutes/hours can your UPS provide power?

	Less than 15 min
	15 to 30 min
	Over 30 min

32. If you have a server room, is it on UPS backup power?

	Yes
	No

33. If so, how many minutes/hours can your UPS provide power?

	Less than 15 min
	15 to 30 min
	Over 30 min

34. Is your library or building the library is part of, on backup generator power?

	Yes
	No

35. If you have a backup generator, how many minutes/hours is it rated for?

	0 to 30 min
	30 to 60 min
	1 hour to 2 hours
	Over 2 hours

36. Can you have additional AC power outlets installed in the MPOE, if needed?

	Yes
	No

37. Can you have additional AC power outlets installed in your server room, if needed?

	Yes
	No

Environment

38. Is the telco equipment in the MPOE water/rodent proof?

	Yes
	No

39. Is your server room water/rodent proof?

	Yes
	No

40. Does your server room have overhead water or sewer pipes?

	Yes
	No

41. Does your server room or the location of your current equipment have overhead lighting?

	Yes
	No

HVAC Systems

42. Does your library have 24-hour HVAC?

	Yes
	No

43. Are your HVAC systems on backup power?

	Yes
	No

44. If so, how many minutes/hours is backup power available?

	0 to 30 min
	30 to 60 min
	1 hour to 2 hours
	Over 2 hours

45. Please characterize the airflow for your server room or the location of your current equipment.

	HVAC, same as library
	Separate HVAC for server room/equipment
	Passive ventilation (ex. airflow to outside)
	None
	Other please specify)

46. Do you control the ambient temperature in your server room?

	Yes
	No

47. Do you control the humidity in your server room?

	Yes
	No

Fire Suppression

48. Does your server room have a fire suppression system (water, gas, Halon)?

	Yes
	No

49. If you have a water/sprinkler system, is it a wet or dry pipe system?

	Wet
	Dry

50. Is there a manual power shutdown switch for your server room?

	Yes
	No

51. Do you have a fire alarm system for your server room?

	Yes
	No

Security

52. Is your server room locked (ex. key/card key/cypher)?

	Yes
	No

53. If so, are keys/access codes issued to a limited number of staff?

	Yes
	No

54. Can you provide 24-hour access for emergencies?

	Yes
	No

Location Permanency

55. Do you expect your library to move/relocate in the next 5 years?

	Yes
	No

56. Do you expect that your telco equipment or server room will need to be relocated in the next 2 years?

	Yes
	No

Appendix C

Data Normalization Rationale

After the survey closed on September 13, the team compiled the data and prepared it for analysis. Because multiple tools were used for conducting the analysis (SurveyMonkey, Excel, Batchgeo, Google Maps, ESRI ArcView), it was important to ensure that all team members used a consistent set of data.

Data was exported into Excel from SurveyMonkey and duplicate entries, inconsistent formatting and spelling mistakes were identified and corrected in both data sets.

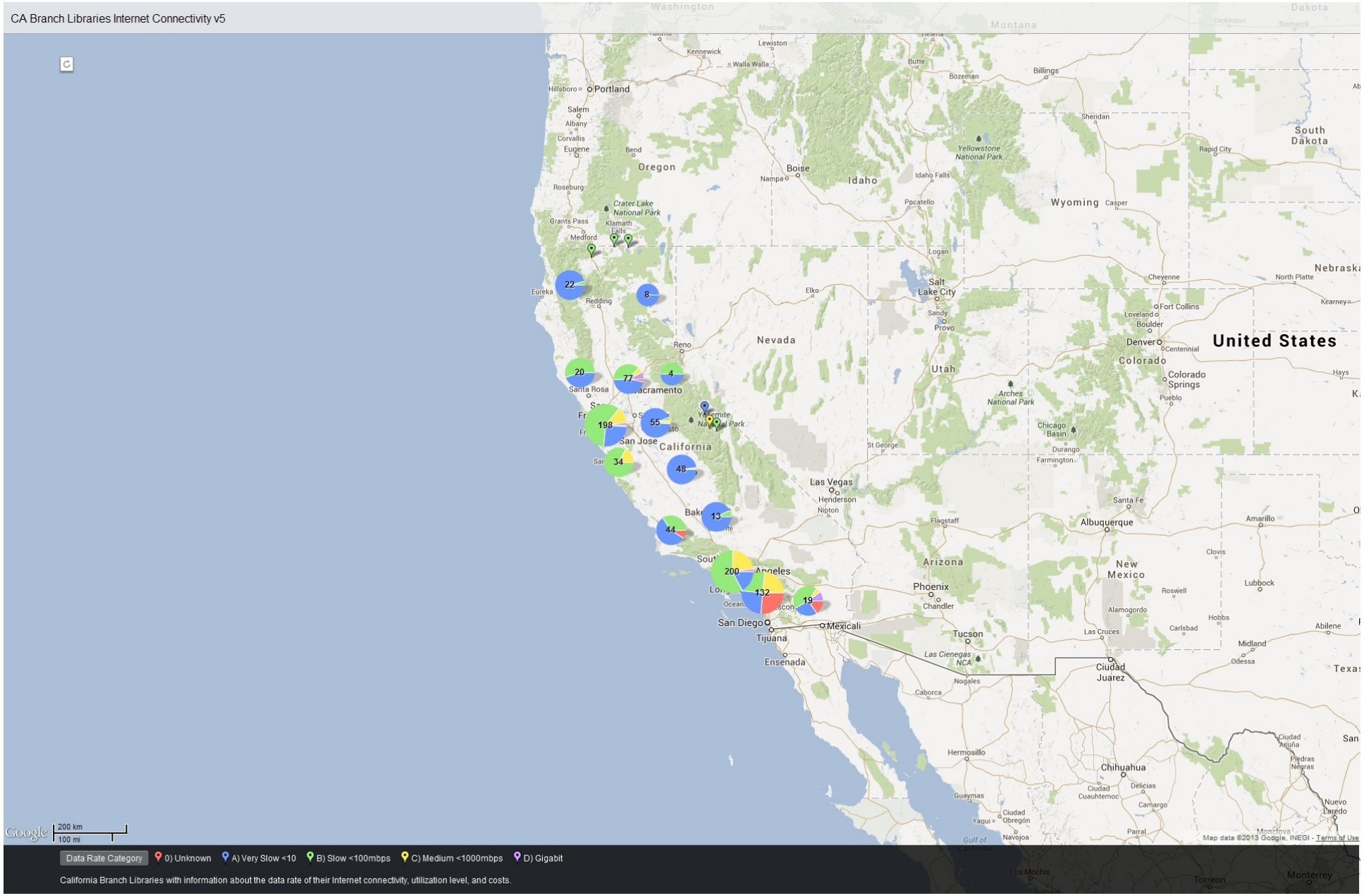
- The contents of both output files, the Jurisdictional Information Survey and the Library Branch Needs Assessment Survey, were reviewed and de-duplicated. Survey contents were compared to source documents (two California public library directories) and anomalies were repaired where possible.
- A number of small edits were made to the contents of both files, focused on formatting and consistency. For example, all Library Branch Needs Assessment Surveys for the same jurisdiction were reviewed to be sure jurisdiction names were uniform and telephone numbers were checked for consistency of format. These elements affect sorting and output, and the project benefits from the consistency in the data elements.
- Data values were adjusted to make them calculable and to normalize them for display purposes. In that regard, where respondents answered using “Other” (and provided descriptions) in this survey, those descriptions were converted to the nearest pre-formatted value used by the survey, if possible.
- For some purposes new numeric data elements were created (columns, in Excel) based on the text responses to the Survey. For example:
    - A text response to the question "What is your current connection speed to the Internet?" might have been "500 Mbps" or "1.5 Mbps (T1 or less").
    - In these cases the numbers "500" and "1.5" were put in the respective cells of the new data column.
- These are the columns that were added (as described above) to aid in numeric analysis: Calculated Numeric Data Rate, Mbps; Calculated Numeric Upload Speed; Calculated Numeric Download Speed.
- In the case of costs, the survey asked "What is the pre-discounted monthly cost of your existing Internet connection?" and respondents chose from a list of cost ranges which began at: "0 to $25" and went up to "Over $2500". In order to calculate costs, the midpoint of the cost range was used in an additional column

called "Calculated Cost Per Month for Internet Connection (Using Mean Value in Range").

- In many cases some respondents chose to enter "Unknown" while others left the response blank. For the purposes of the analysis, all blank entries were treated as equivalent to "Unknown".
- For the purposes of mapping the data the addresses were used as given, but some were missing zip codes. For these, zip codes were looked up using the US Postal Service's zip code search tool on www.usps.gov.
- In several cases there were anomalies in the responses to network speeds because of different interpretations of the questions. For example, one city library system entered their connection speed as "T1 (1.5 or less"), yet entered much higher upload and download speeds. In these cases team members tried to contact the person who filled out the survey. After consultation, correct data was then entered into the new columns in the Excel spreadsheet, but the original survey responses were not changed.

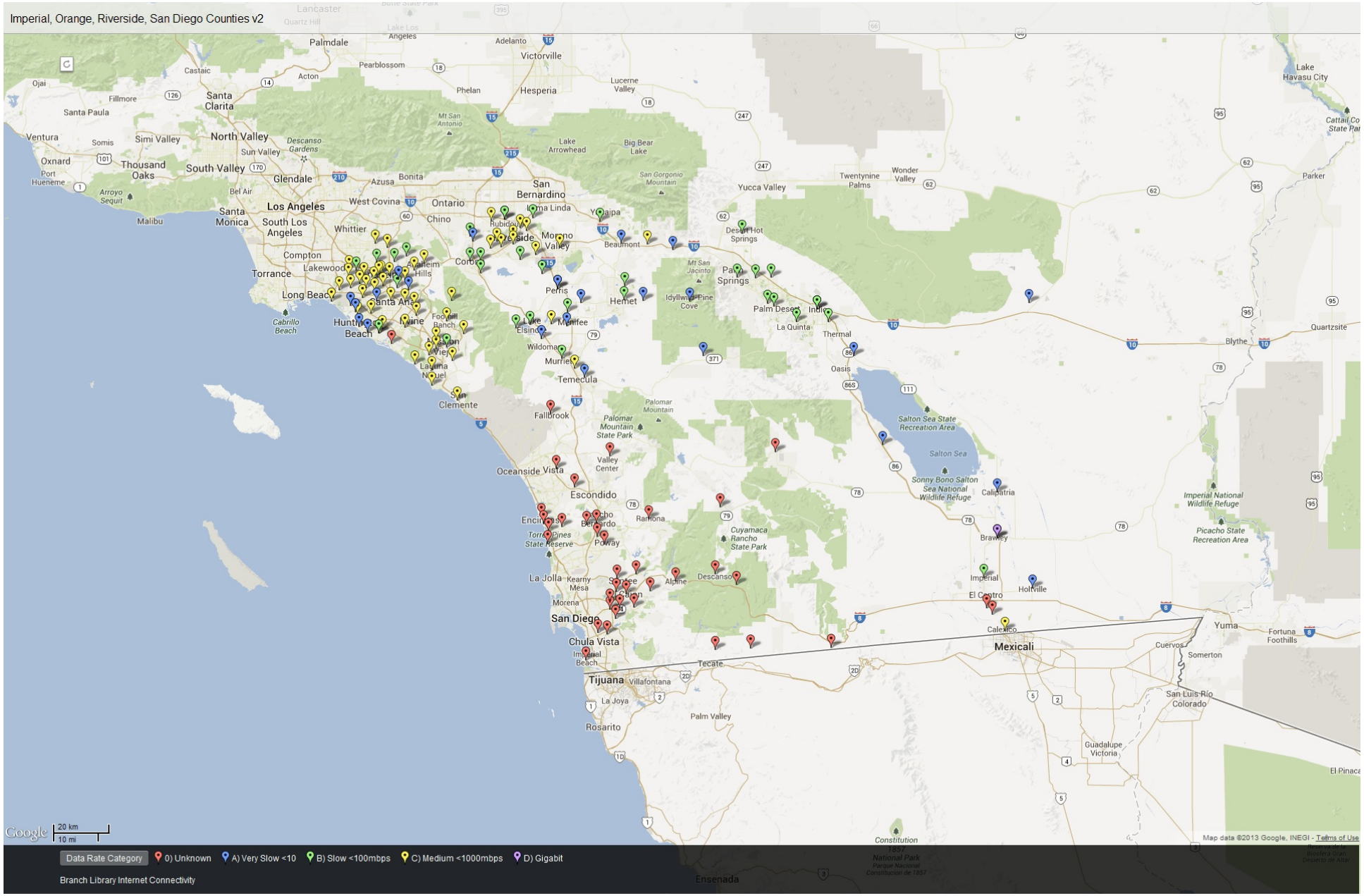
Appendix D

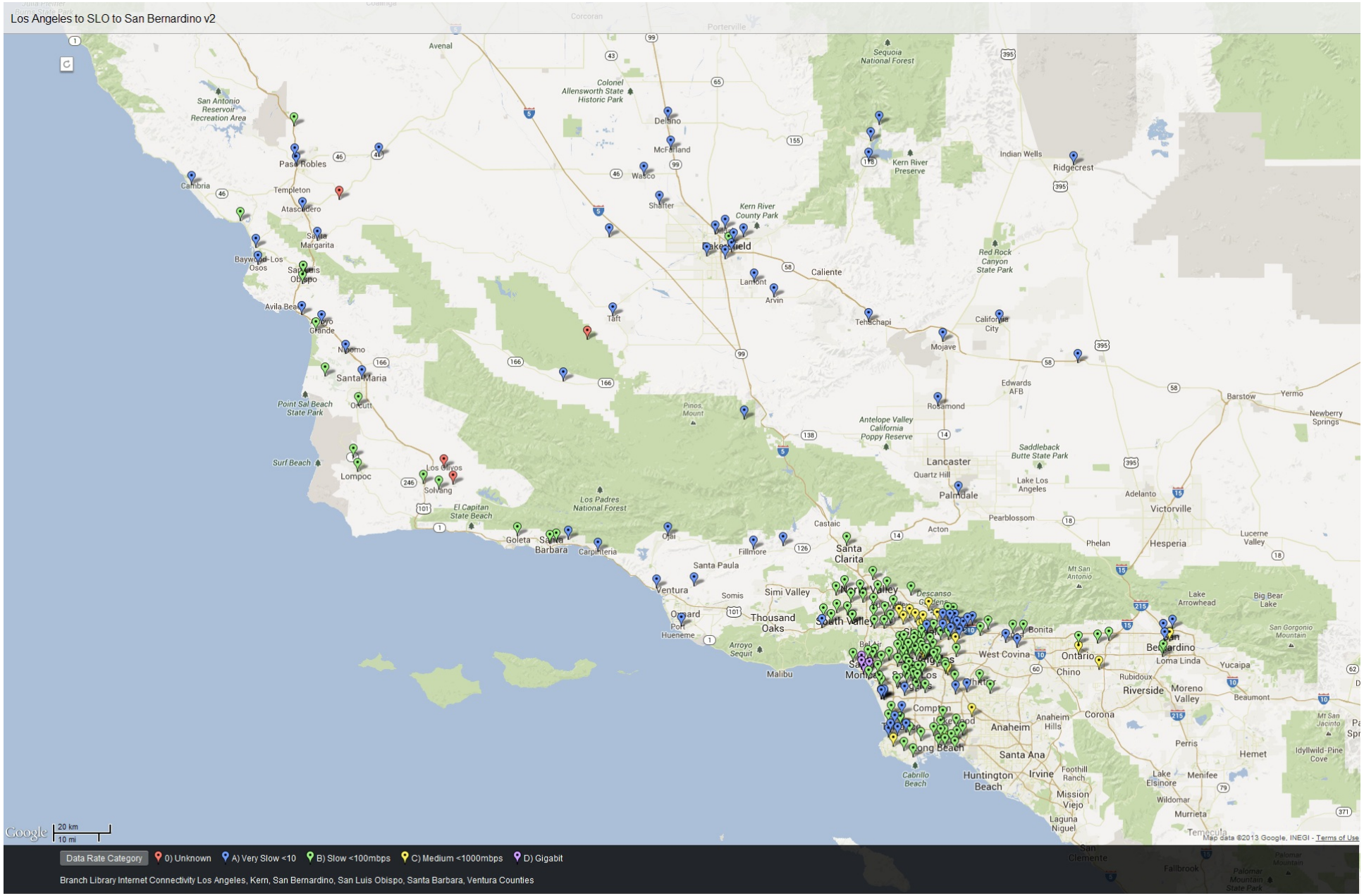
CA Branch Libraries Internet Connectivity v5

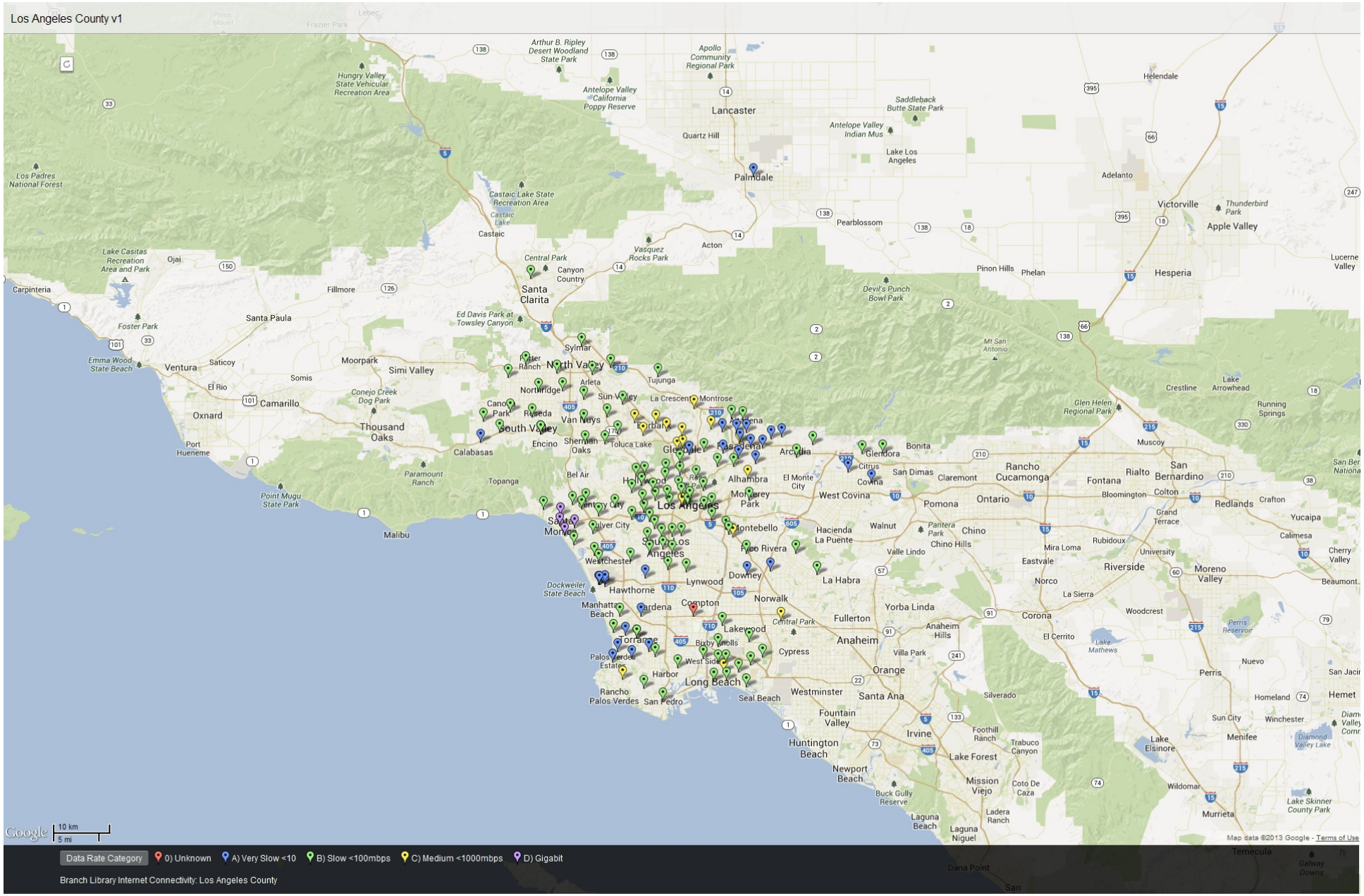


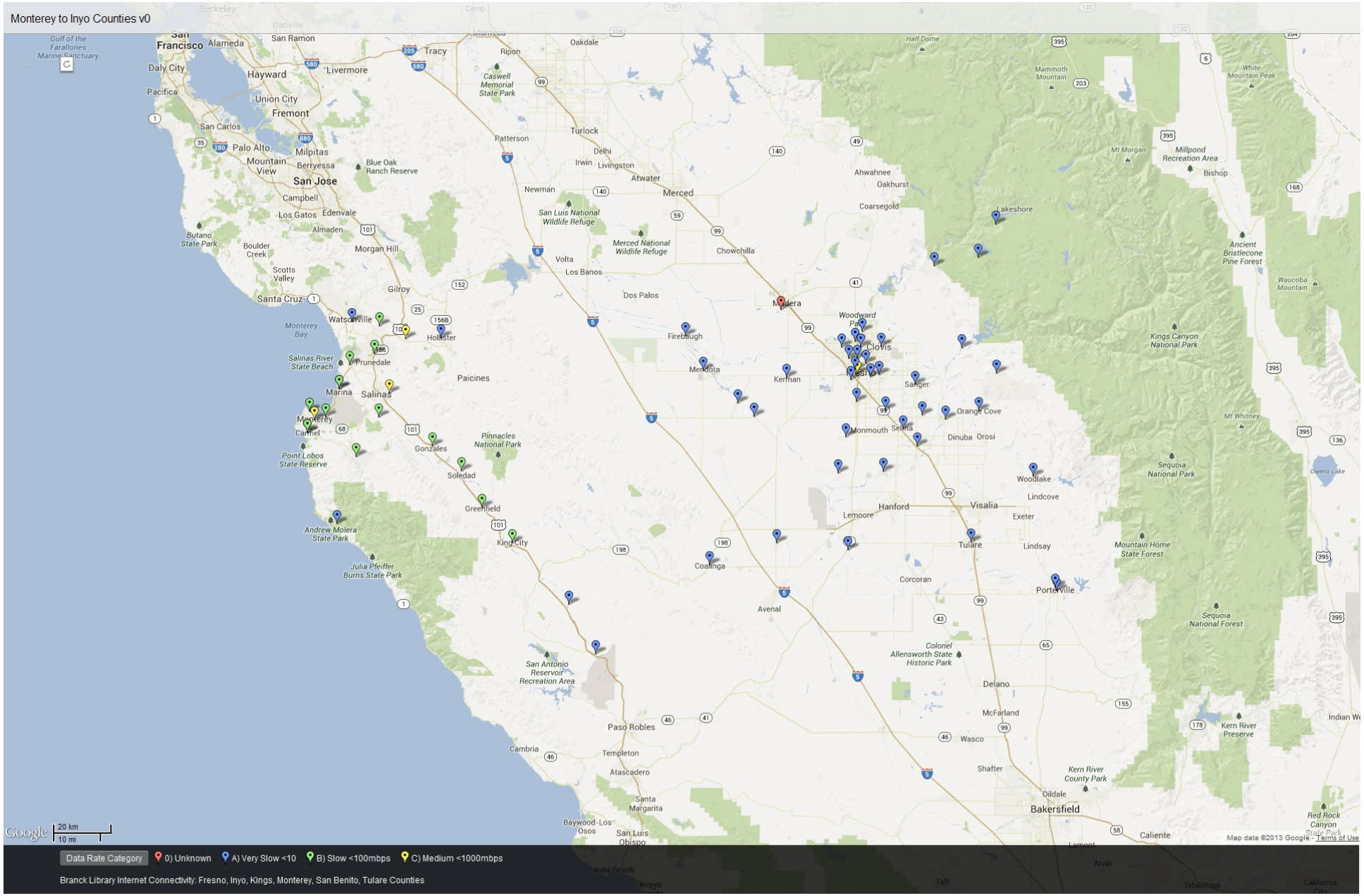
Data Rate Category 0) Unknown A) Very Slow <10 B) Slow <100mbps C) Medium <1000mbps D) Gigabit

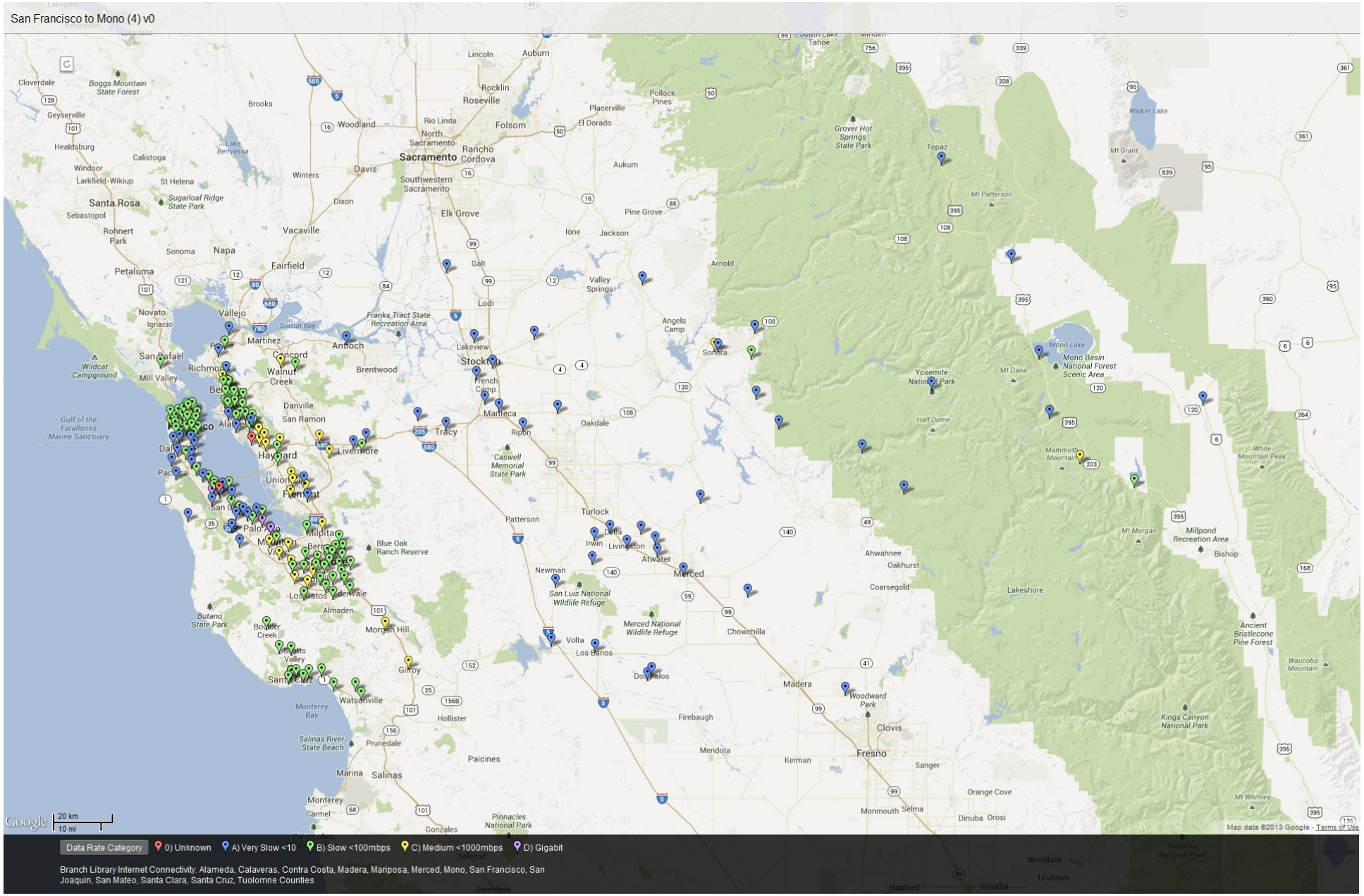
California Branch Libraries with information about the data rate of their Internet connectivity, utilization level, and costs.

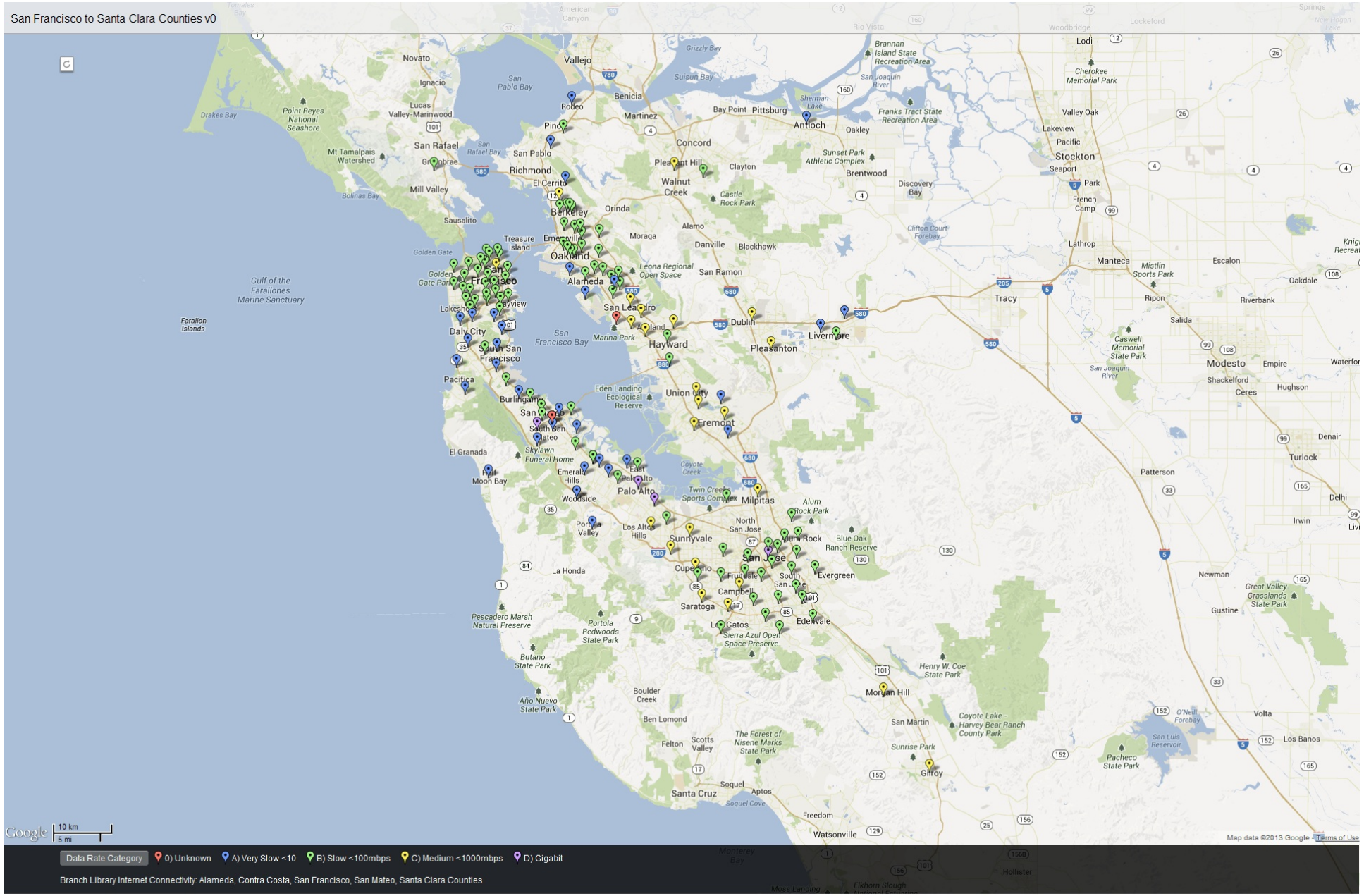

Imperial, Orange, Riverside, San Diego Counties v2
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity
Map data ©2013 Google, INEGI - Terms of Use

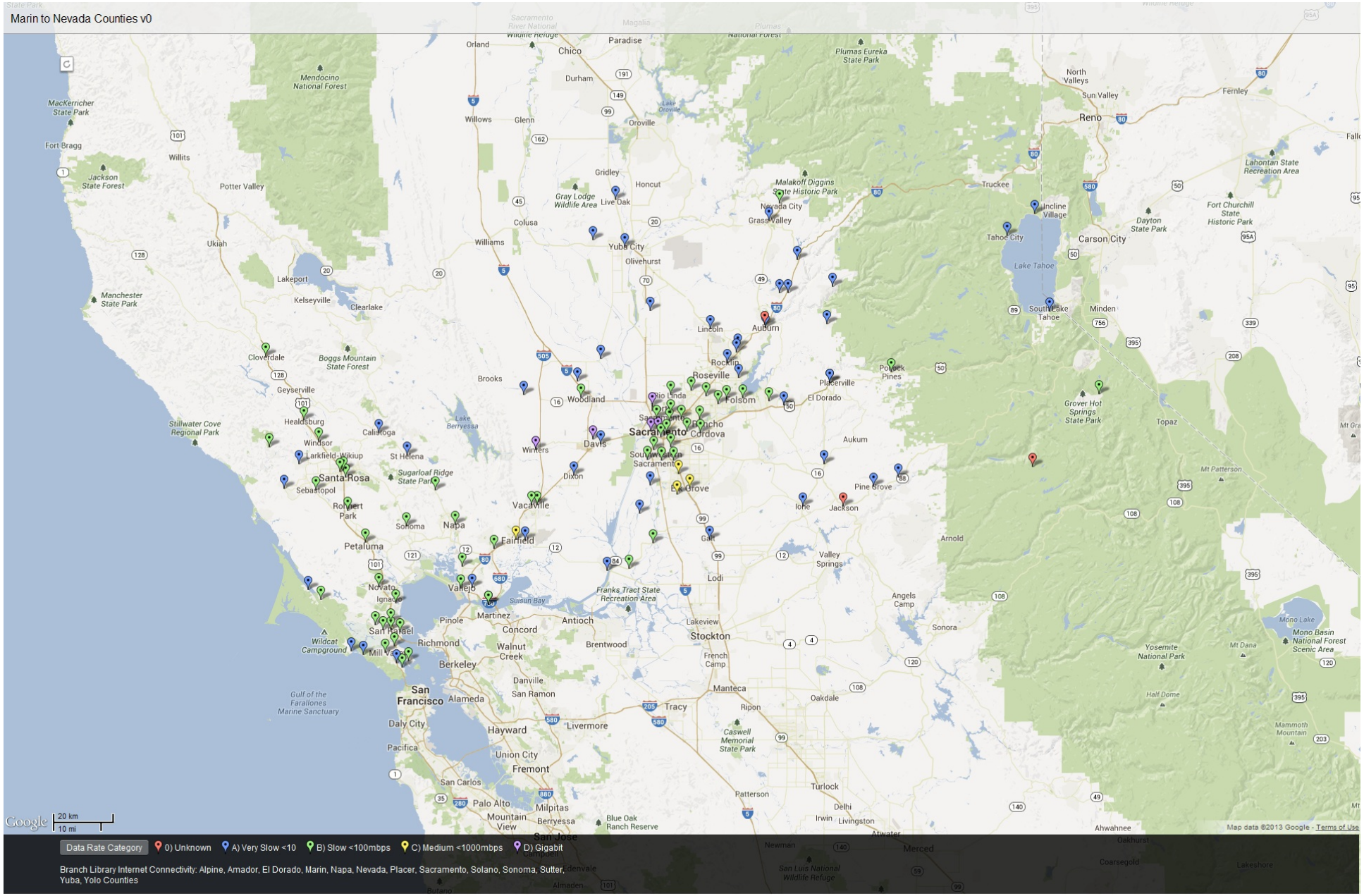

Los Angeles to SLO to San Bernardino v2
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity Los Angeles, Kern, San Bernardino, San Luis Obispo, Santa Barbara, Ventura Counties
Google
20 km
10 mi
Map data ©2013 Google, INEGI - Terms of Use

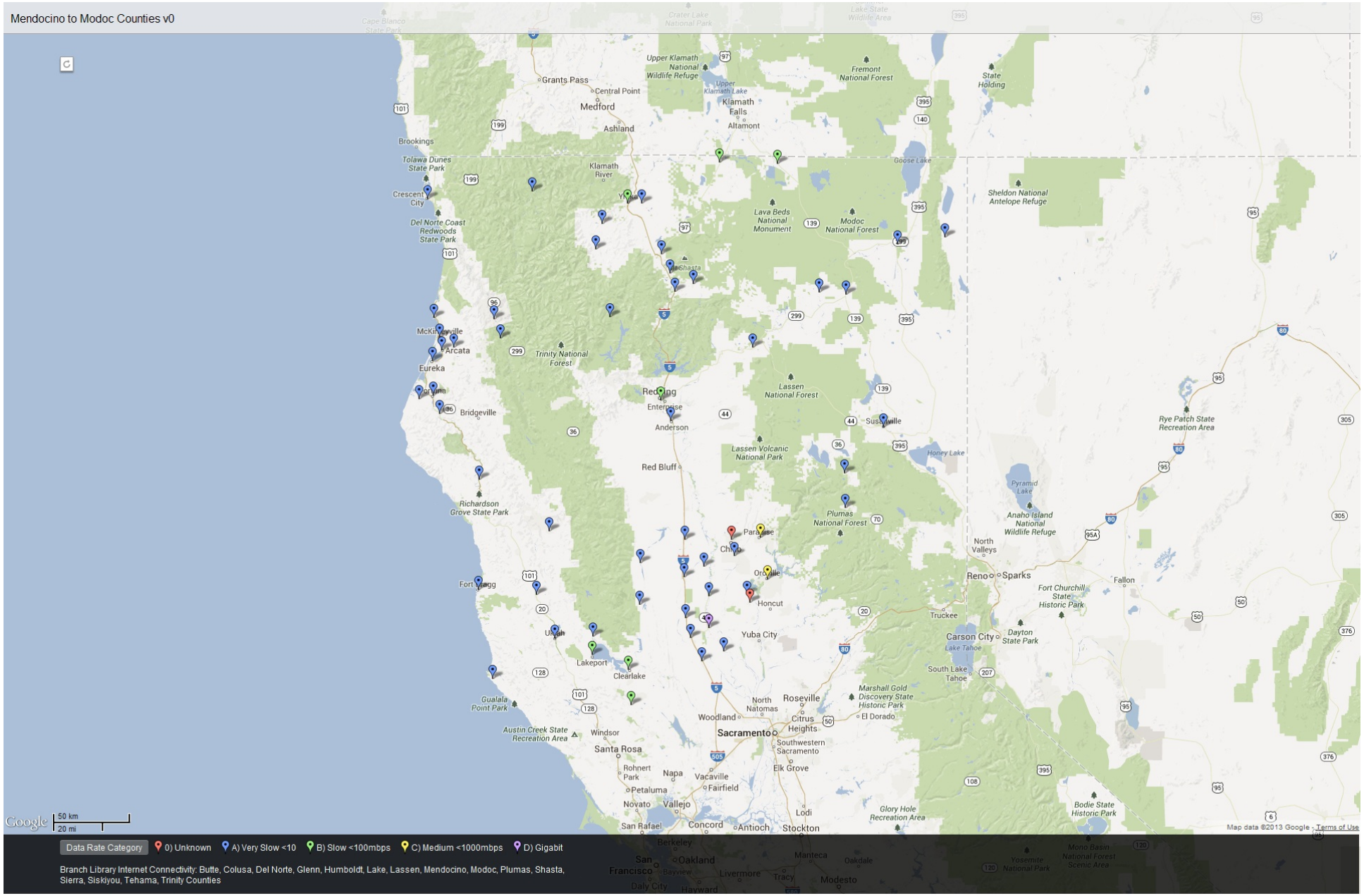

Los Angeles County v1
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity: Los Angeles County
Google
10 km
5 mi
Map data ©2013 Google - Terms of Use


Monterey to Inyo Counties v0
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
Branck Library Internet Connectivity: Fresno, Inyo, Kings, Monterey, San Benito, Tulare Counties
Google
20 km
10 mi
Map data ©2013 Google - Terms of Use


San Francisco to Mono (4) v0
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity: Alameda, Calaveras, Contra Costa, Madera, Mariposa, Merced, Mono, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Tuolomne Counties
Google
20 km
10 mi
Map data ©2013 Google - Terms of Use


San Francisco to Santa Clara Counties v0
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity: Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara Counties
Google
10 km
5 mi
Map data ©2013 Google - Terms of Use


Marin to Nevada Counties v0
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity: Alpine, Amador, El Dorado, Marin, Napa, Nevada, Placer, Sacramento, Solano, Sonoma, Sutter, Yuba, Yolo Counties
Google
20 km
10 mi
Map data ©2013 Google - Terms of Use


Mendocino to Modoc Counties v0
Data Rate Category
0) Unknown
A) Very Slow <10
B) Slow <100mbps
C) Medium <1000mbps
D) Gigabit
Branch Library Internet Connectivity: Butte, Colusa, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Plumas, Shasta, Sierra, Siskiyou, Tehama, Trinity Counties
Google
50 km
20 mi
Map data ©2013 Google - Terms of Use