

Wired for Wireless?

Towards Digital Inclusion and
Next Generation Government-Led
Wireless Networks



A Summary
Report of the
Wireless
Comparative
Analysis and
Best Practices
Education
Project

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Table of Contents

Project Team	ii
Panel of Expert Advisors	iii
Acknowledgements	iv
Dedication	vi
Letter From the Sponsor	vii
Foreword	ix
Executive Summary	x
Wired for Wireless?	
Introduction	1
The Foundation for Digital Inclusion	5
The Pursuit of a Digitally Inclusive California	9
The Rise of Government-Led Wireless Networks	13
Defining “Government-Led Wireless Networks”	
Table 1. Number of Government-Led Wireless Networks Since 2004	
Characteristics of Government-Led Wireless Networks	15
Table 2. Variables of Government-Led Wireless Networks	
Lessons Learned and Promising Practices	19
Five Reasons Why Some Government-Led Wireless Networks Failed	
Planning	
Business Model and Sustainability	
Technology	
Digital Inclusion	
Recommendations	27
Conclusion	29
Endnotes	31
Appendices	
I. Checklist	36
II. Draft Version of Lessons Learned and Promising Practices	41
III. Government-Led Wireless Networks in California	43
IV. Cities and Counties in California that Responded to the Survey	44
V. Jurisdictions Analyzed in the Case Studies	46
VI. Case Studies Overview Chart (as of 06/30/08)	47
VII. Select Bibliography	49

Please note:

This Summary Report and the following supporting research documents are available at: www.CommunityPartners.org/wireless-documents.html and www.cetfund.org/resources/information.

- California Cities and Counties Survey
- Case Studies
- Literature Review (with annotated bibliography)
- Regulatory Review

Project Team

Community Partners is a Los Angeles-based non-profit organization established in 1992 to support social entrepreneurs and accelerate their ideas into action to advance the public good. As an incubator and fiscal sponsor, program manager, facilitator, and intermediary organization, Community Partners has sponsored and supported more than 550 community projects and initiatives, and has worked closely with community, civic, and business leaders, public sector service providers, and funders in diverse, multicultural communities across California. Community Partners has been working on technology issues as they affect underserved communities since 1995. (www.CommunityPartners.org)

The California Community Technology Policy Group (CCTPG) is a diverse network of more than 200 organizations working to promote social justice through access to and use of technology tools in underserved communities to improve quality of life. Founded in 1998, the Network's members represent a broad spectrum of the community, ranging from after-school programs, consumer advocates, assistive technology centers, multi-service agencies, community technology centers, and other organizations that recognize the potential of technology and use it to enhance their effectiveness and advance their missions. (www.cctpg.org)

The BroadBand Institute of California (BBIC) is a public policy institute at the Santa Clara University School of Law specializing in applied research and education in the areas of law, technology and public policy. Through its research, publications, and conferences conducted in collaboration with public, government and private institutions, the BBIC seeks to identify, document, address and publicize the broadband and advanced network technology needs of California and the impact of state and federal policies on California's needs. California is in the midst of a critical transformation, driven by the expanding diversity of its population; the explosive growth of its high-tech sector; and the convergence of technology and competition in its telecommunications marketplace. These developments have placed California at the forefront of a social, political and technical evolutionary process that is sweeping the nation. The BBIC was established to help bridge the gap between the public and the state and federal policies governing their access to advanced network technologies. (<http://scu.edu/law/bbic>)

The California Emerging Technology Fund (CETF) is a non-profit private foundation established pursuant to requirements from the California Public Utilities Commission in approving the mergers of SBC-AT&T and Verizon-MCI. Its mission is to provide leadership statewide to minimize the Digital Divide by accelerating the deployment and adoption of broadband and other advanced communication services to underserved communities in a way that advances actions to make California a global leader in the availability and use of broadband technology. CETF's initiatives address the 5As of Adoption: Access, Applications, Affordability, Accessibility, and Assistance to increase Adoption and use of broadband in rural and remote areas, urban disadvantaged neighborhoods, and among people with disabilities. The major initiatives in these communities include access and literacy of affordable housing residents, development of a telemedicine network and applications, skills training for 21st Century jobs in Information, Communication, and Technology, increased adoption and use of broadband by small businesses and greater availability of affordable computers, training, and technical assistance. (www.cetfund.org)

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In addition, the Project Team would like to thank the following organizations and individuals for their support and contribution to the Project.

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Jorge Jackson

1944-2008



This Summary Report is dedicated to the memory of Jorge Jackson who devoted his life to ensuring equity and opportunity for the underserved.

It is also dedicated to the hundreds of thousands of Californians who will achieve better lives through Digital Inclusion and the use of new technologies.

Letter from the Sponsor

The mission of the California Emerging Technology Fund (CETF) is to provide leadership statewide to minimize the Digital Divide by accelerating the deployment and adoption of broadband and other advanced communication services to underserved communities and populations. The California Public Utilities Commission directed the establishment of CETF in approving the mergers of SBC-AT&T and Verizon-MCI in 2005. To provide additional public benefit, AT&T and Verizon are contributing a total of \$60 million in seed capital to CETF to help close the Digital Divide in California. In pursuing this goal, CETF identifies challenges and opportunities to promote Digital Inclusion.

The Wireless Comparative Analysis and Best Practices Education Project was initiated in 2007 to provide reliable information to policymakers (particularly local government officials), community leaders, and industry about: (a) the experience with government-led wireless projects; and (b) best practices for Digital Inclusion within these projects. CETF was concerned that there were an increasing number of local jurisdictions becoming involved in one way or another with “government-led” wireless projects throughout California and they were being regarded by local officials as the primary strategy for providing ubiquitous broadband access for residents. However, there was no consolidated information about best practices and lessons learned from previous efforts, particularly how best to achieve Digital Inclusion as an integral component of these projects instead of regarding it as a “mitigation” for the opportunity to do business in the jurisdiction.

Further, the lack of respected research and information about the government-led wireless projects had several implications that were potential hindrances to achieving the CETF mission: local officials were becoming preoccupied with trying to promote and implement government-led wireless projects without fully understanding either the range of broadband technologies (and their advantages and limitations) or the factors contributing to the Digital Divide; community leaders and industry providers were being pulled into local government debates about wireless projects without the benefit of common information or common ground about viable models for Digital Inclusion; and Digital Inclusion was being jeopardized because of flawed and failing business models for these wireless projects.

The Wireless Comparative Analysis and Best Practices Education Project was implemented through a partnership with three other organizations: Community Partners, California Community Technology Policy Group, and the BroadBand Institute of California at the University of Santa Clara School of Law. We appreciated the opportunity to work with these dedicated partners and express our gratitude to their diligence in examining this approach to Digital Inclusion.

The Project was designed to obtain information from three kinds of research: literature review; survey of local governments; and case studies. The Project was guided by a Panel of Expert Advisors to whom we are grateful for volunteering their time and expertise. In addition, the Project engaged three categories of stakeholders to review the research and help reach conclusions about best practices: community leaders, local government officials, and providers. Videoconferencing was employed with the generous assistance of CENIC (Corporation for Education Network Initiatives in California) to connect stakeholders statewide in different locations to review the results of the research and to help formulate the Lessons Learned and Promising Practices. We are especially grateful to the California State Association of Counties and the League of California Cities for their assistance in reaching out to local government officials. Thus, the value of the Project went beyond the research itself to the involvement of stakeholders in a conversation about public policy implications of government-led wireless projects. As a result, the new level of awareness among the stakeholder participants provides a foundation for future public policy deliberations.

We invite policymakers and stakeholders throughout California to review and discuss this report, particularly the Lessons Learned and Promising Practices if considering a government-led wireless project. And, we welcome comments and critiques about this report. Please contact the California Emerging Technology Fund or our partner organizations to request a presentation about the findings of this Project and visit our websites for more information.

In closing I want to thank the CETF Board of Directors for their attention to and oversight of this Project and I want to acknowledge the professional assistance of CETF Senior Vice President Susan E. Walters and the late Jorge Jackson who served as Senior Advisor at CETF.

Sunne Wright McPeak

President and CEO, California Emerging Technology Fund



Foreword

As a result of Executive Order S-23-06, the California Broadband Task Force was commissioned by Governor Arnold Schwarzenegger to “remove barriers to broadband access, identify opportunities for increased broadband adoption, and enable the deployment of new advanced communication technologies.” This state-wide effort is based on the conviction that broadband provides significant benefits to communities, businesses, families, education and healthcare institutions, government, arts and cultural organizations, and transportation systems. The culmination of more than a year of work was incorporated into the recently released report *State of Connectivity: Building Innovation Through Broadband*. (<http://www.calink.ca.gov/taskforcereport>)

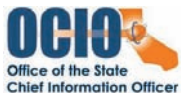
This Summary Report, *Wired for Wireless*, complements the efforts of the California Office of the State Chief Information Officer and the California Broadband Task Force by taking a closer look at the role of wireless networks as part of local governments’ strategies to deploy broadband. These types of networks — in this Project referred to as government-led wireless networks — are being used to expand Internet connectivity to underserved communities, and to improve the functions of business, government, and civil society. This groundbreaking report provides a clear snapshot of why and how government-led wireless networks are being implemented throughout California.

The initial attempts by local governments to implement wireless networks have faced many challenges — generating many questions for community, government, and industry stakeholders. Even within this context, local governments continue to look at wireless networks as a way to address many of their local needs. Thus, the findings, the analysis, and the lessons learned and promising practices identified in this Project are fundamental in helping communities throughout California develop wireless networks that are effective, inclusive, and sustainable as part of their larger broadband strategies. Of particular importance is the Summary Report’s recommendation to make local broadband data accessible to local governments for their strategic planning. The State of California will continue to work with partners such as the California Emerging Technology Fund to support this data collection.

This Summary Report should be read by any individual interested in understanding the deployment of wireless networks and Digital Inclusion programs by local governments throughout California. I invite you to consider the findings and recommendations as we work together towards the goal of ubiquitous broadband in California.

Teri Takai

Chief Information Officer, State of California



Executive Summary

The [Wireless Comparative Analysis](#) and Best Practices Education Project was initiated in 2007 to provide reliable information to policymakers (particularly local government officials), community leaders, and industry about: (a) the experience with government-led wireless projects; and (b) best practices for Digital Inclusion within these projects. It was a collaborative effort among Community Partners, California Community Technology Policy Group, and BroadBand Institute of California funded by the California Emerging Technology Fund (CETF). The Project Team was concerned that there were an increasing number of local jurisdictions becoming involved in one way or another with “government-led” wireless projects throughout California without the benefit of

comprehensive information about best practices and lessons learned from previous efforts, particularly how best to achieve Digital Inclusion as an integral component of these projects instead of regarding it as a “mitigation” for the opportunity to do business in the jurisdiction.

A government-led wireless network refers to a network that is implemented, solely or partly, for public benefit, and in which the local government determines the objectives of the project and/or plays a significant role in the financing, implementation, and operation. The public benefit may be direct, such as affordable access to the Internet and improving the delivery of government services, or indirect, such as supporting educational achievement and generating economic development opportunities.

For many, the story of government-led wireless networks begins and ends with the challenges reported in the popular press. When viewed both in a larger market and regulatory context that same story proves to be far more complex and nuanced. There are many reasons why local governments have become directly involved in the deployment of wireless technology, including the cost of wired broadband, lack of broadband availability, emergence of new technologies, importance of mobility, and local constraints. Within this context, the number of government-led wireless networks in the United States grew significantly between 2004 and 2007. A decision by several broadband service providers in late 2007 to re-evaluate their involvement in government-led wireless networks resulted in a “reality check” on the initial enthusiasm for these types of projects. This research helps to answer questions about what was actually occurring and what can be learned.

Written for representatives of communities, local governments, and industry, this research on government-led wireless networks provides guidance and lessons for further application and advancement towards the greater goal of Digital Inclusion. In communities across California and the United States, political, community, and business leaders are looking to address some of their community needs with the use of wireless technology.

Methodology

The Project employed the following research methodologies and produced results which are synthesized in the Summary Report:

- *Literature Review:* A comprehensive review and annotated bibliography of articles on broadband and government-led wireless projects.
- *Regulatory Review:* A review of wireless regulations to identify incentives and barriers that might support or constrain wireless implementation.
- *Survey:* An online survey of cities and counties in California on the role of wireless networks in their broadband deployment strategies. The survey was sent to all 478 cities and 52 counties; 104 unique responses collected between January 24, 2008 and April 4, 2008 from across the state are incorporated into the findings.
- *Case Studies:* A comparative analysis of 26 case studies of government-led wireless projects — 20 from California, and six from outside of the state. This Summary Report reflects data collected as of June 30, 2008.
- *Panel of Expert Advisors:* A group of experts was engaged to advise and guide the research process and to provide feedback on the various components of the Project. The panel brought a depth of experience across such topics as Digital Inclusion, municipal networks and contracts, wireless technology, public safety, the needs of people with disabilities, and policy.
- *Stakeholder Engagement:* A series of meetings, teleconferences, and videoconferences with stakeholders from community, government, and industry to advise and inform the Project efforts.

The Summary Report and the underlying research are available at www.CommunityPartners.org/wireless-documents.html and www.cetfund.org/resources/information. The Summary Report contains the following sections:

- *The Foundation for Digital Inclusion* discusses the need for all individuals to have access and know how to use technology effectively to fully function in society, and the current extent of the Digital Divide that exists in the United States.
- *The Pursuit of a Digitally Inclusive California* defines the core elements of Digital Inclusion strategy.
- *The Rise of Government-Led Wireless Networks* analyzes the rise of these networks as a strategy by local governments to deploy broadband and to enable better, cheaper government services.
- *Characteristics of Government-Led Wireless Networks* describes the core characteristics of these networks, including objectives, project administration, business model, technology, scope of deployment, and network management.
- *Lessons Learned and Promising Practices* summarizes the successes and challenges of broadband deployment and government-led wireless networks.
- *Recommendations* present a series of recommendations for community, government, and industry stakeholders in the planning and deployment of broadband projects.
- *Conclusion* presents a summary of the findings and a look to the future of broadband networks.

- *Appendices* contains additional resources and references for the reader, including: a Checklist that provides some guidance to representatives of community and local governments in California interested in a government-led wireless network, a draft of the lessons learned and promising practices as they were presented to the Board of Directors of the California Emerging Technology Fund in June 2008, a list of government-led wireless networks in California as of June 2007, and other reference materials.

Digital Inclusion

Digital Inclusion means that everyone — regardless of who they are or where they live — can participate in and take advantage of the economic, educational, health, and civic opportunities afforded by broadband and related information technology. As documented in multiple studies and reports, broadband and related information technology are being used for a range of important civic and public policy goals. These goals can be categorized into five general areas:

- Educate and train people for 21st Century employment.
- Improve the quality of health care.
- Enable economic and community development.
- Support civic engagement.
- Promote public safety and delivery of government services.

More than just access to the Internet, Digital Inclusion means that all stakeholders are engaged in the planning and implementation of technology systems; that all potential users can access the technology and know how to use it; and that with these technologies come more services, increased information, and greater community access. As digital technology is increasingly used for educational, employment, health, commercial, and informational purposes, Digital Inclusion is critical for full engagement, participation, and opportunity in the social, economic, and civic life of society. This Summary Report argues that to truly pursue a comprehensive Digital Inclusion strategy, consideration must be given to Stakeholder Engagement and Adoption. In order to reach high adoption rates it is necessary to focus on five components: Availability, Applications, Affordability, Accessibility, and Assistance. These key aspects provide a framework for assessing government-led wireless networks implemented to meet the needs of communities.

Characteristics

In the Characteristics of Government-Led Wireless Networks section of the Summary Report, the Project Team identifies some key characteristics of government-led wireless networks.

- *Objectives.* Local government objectives fall into three categories: to enhance government services and operations, to achieve public policy goals, and to provide public and affordable access to the Internet as a way to bridge the Digital Divide.
- *Project Administration.* Project administration refers to the way the overall project is coordinated. Although most of the case study projects were directly administered by the local government, some were working through a non-profit organization to coordinate the work. In looking at the cases, the use of a non-profit to administer the project seems to foster greater stakeholder involvement and transparency.

- *Business Models.* The business model refers to the way the project generates revenue to secure implementation and sustainability. Based on the case studies, the provider financed model was most commonly used (16 out of the 26 case studies), especially among local governments wanting to provide Internet access to its residents without having to make any monetary investment in the project. In six of the cases, local governments combined the provider financed model with the anchor tenant business model by committing funding for using the network to conduct government and public security services. Four business models were identified: *Provider Financed*, *Anchor Tenant*, *Sponsorship*, and *Government Financed*. The provider financed model was the most commonly used, especially among local governments because the cost of deploying a city-wide wireless network can be very high.
- *Technology.* Local governments are looking primarily at WiFi technology for their wireless networks. The case studies reveal that this technology is most commonly used by jurisdictions intending to provide wireless Internet access. In the Project survey, 66% of the local governments implementing or considering a wireless network identify WiFi as their technology choice.
- *Scope of Deployment.* The scope of deployment is the intended coverage area of the network at full implementation. Not all government-led wireless networks intend to provide coverage throughout the jurisdiction. Based on 28 responses in the Project survey, only 11 plan on covering their entire jurisdiction as part of the project, while seven will cover smaller areas, and 10 are undecided. The case studies revealed a close relationship between the provider financed business model and a jurisdiction-wide scope of deployment.
- *Network Management.* Network management refers to the day-to-day operation and maintenance of the network. According to Project survey respondents, 30% of the wireless networks in place or planned will be managed by a private party, while 70% will be managed by local governments. The case studies revealed a relationship between network management and the network objective and business model. The local governments that sought to use the networks solely for conducting government and public services chose to own and manage the network.

Findings

The Lessons Learned and Promising Practices section of the Summary Report goes on to identify the key findings of the Project. The most important findings are summarized here and detailed in the full report.

Planning

- *California local governments report they are moving ahead with wireless networks.* California cities and counties continue to pursue government-led wireless networks, though many are still in early stages. Of the 104 survey respondents, 29 stated that they are implementing a government-led wireless network. Of those 29 respondents, two classified themselves in the *Fully Functioning* stage, six in the *Proof of Concept* stage, four in the *Build-Out* stage, and two in the *Contract* stage. The remaining 15 are still in the initial stages of the project. Of those 15, 11 classified themselves in the *Exploration* stage, two in the *Request for Proposals* stage, one in the *Awaiting Approval* stage, and one in the *Re-Evaluating Plans* stage. These findings are based on survey data collected from January 24, 2008 to April 4, 2008. As this publication was going to print, new developments revealed that some jurisdictions have changed their original plans.

- *Leadership is needed to establish broadband policies that support strategic planning and implementation.* Leadership is needed to develop policies that foster the ubiquitous deployment of broadband and its effective use. Such policies establish a clear goal for policymakers, local government staff, industry representatives, and community members to work toward. The Project survey indicates that local governments in California are not setting such policies.
- *Partnerships make a difference.* An effective approach to Digital Inclusion may be successfully achieved through partnerships. Libraries have played a role in training people to use technology, and now over 600 library systems in California offer their own local wireless networks. Community-based organizations have also provided training and technical expertise to residents and are well positioned to provide services that are linguistically and culturally relevant.
- *Information technology departments are evolving and need greater coordination and involvement with other government leaders and departments.* The pursuit of new technologies by cities and counties requires complex institutional coordination, community outreach, technical training, and other skills which may go beyond those traditionally required of information technology (IT) department staff. In addition, it is important for IT departments to have adequate data in order to plan their broadband deployment strategies.

Business Model and Sustainability

- *Business models that involve local government investment are more successful.* While the business model is not the only reason many wireless networks have not been successful (technological and political challenges have also played a role), it is clear that in order for government-led wireless networks to work they require a sustainable business model, which in most cases requires investment from the local government.

Technology

- *Wireless networks are effectively supporting government operations and services.* Wireless technology is being used for a large range of government tasks: traffic light control, meter reading, data transport from regional offices to headquarters, video surveillance, communication between emergency vehicles, and much more. These projects have proven successful when jurisdictions commit funding toward the deployment and maintenance of the network.
- *Broadband is available in most but not all areas.* Project research indicates that many local governments in California pursued or are pursuing a wireless network in order to bring broadband access to underserved communities. In most of these cases, the wireless networks were intended to enhance or fill in gaps left by existing deployment.
- *WiFi technology is most prevalent but has limitations.* WiFi is the technology most broadly used in government-led wireless networks. However, WiMax and other new technologies face fewer limitations than WiFi and are more promising for challenging applications. To be most effective, wireless networks may employ a combination of technologies—WiFi where practical, combined with more robust technologies where necessary.

- *Several new technologies on the horizon show promise.* New technologies are making it easier for communities to deploy wireless networks. A new approach to building wireless networks is represented by what is called a peer-to-peer (P2P) or viral network which can evolve organically, leverage existing infrastructure and build on other networks. P2P networks use diverse connectivity between participants rather than connecting to a centralized server. In California this approach is exemplified in an urban area where the city is facilitating the development of a network using equipment from a private provider.
- *Next generation broadband technology is not accessible to everyone.* Optical fiber is used to transmit a large amount of data at very high speeds over long distances. However, this resource is less common in rural and inner-city areas. The survey data indicates that while 71% of all respondents have optical fiber in their jurisdictions, only 44% of those that are in rural areas have this resource. This discrepancy is important to recognize since the almost infinite capacity of fiber makes it essential for some advanced applications and a good way to connect local wireless networks to the Internet.

Digital Inclusion

- *The number of jurisdictions likely to provide public Internet access is decreasing.* Although there is strong public support for governments to provide Internet access, the Project survey suggests that local governments currently exploring the use of wireless are less likely than earlier adopters to use their network to provide Internet access to their community.
- *Stakeholder engagement is limited.* As a component of Digital Inclusion, stakeholder involvement is essential in defining the objectives, identifying the assets, and building awareness and support for wireless projects. However, Project data indicates that jurisdictions are only seeking limited stakeholder involvement that falls short of effectively engaging the entire community. The local governments in the case studies used a range of different strategies to engage stakeholders. Regardless of network purpose, stakeholder engagement will result in more responsive, innovative, and effective public-purpose networks.
- *Equipment, training, and maintenance are areas for growth.* One of the most common objectives of government-led wireless networks is to promote Digital Inclusion. However, local governments view this objective as being accomplished primarily by providing access to the Internet. The literature makes a strong argument that digital literacy is essential. It is an argument echoed by the stakeholders involved in this Project, who said repeatedly that training and coaching are critical for community members to learn to use technology productively and understand the benefits of broadband. Stakeholders also stressed the need for maintenance and technical support.

Recommendations

For local governments and communities currently pursuing technology solutions to their local needs, the Project Team identified eight overarching recommendations. Whether the solutions are government-led or not, these recommendations can enhance the likelihood of successfully deploying information networks and implementing Digital Inclusion programs.

- Map and evaluate government and other local assets that exist. For existing services, determine areas of deployment, consumer cost, and the type and speed of the technology in use.
- Develop broadband policies, determine specific goals and objectives, and adopt plans that meet resident, local business, non-profit, and local government needs.
- Understand the relationship between the local government's network plans and state and federal regulatory realities. Market entry and longevity are affected by regulatory as well as technological and market realities.
- Develop public-private partnerships yet be prepared to invest monetary and human resources into the projects.
- Ensure a level playing field for both wireline and wireless broadband providers, making the use of public assets available to all providers on a competitive basis, commensurate with their public benefit provisions.
- Review available technologies and applications of a wired and/or wireless network that meet local government needs. Consider how these technologies can be used together most effectively.
- Analyze the security of wireless technology and new encryption technology that can allow a single network to be used for internet access as well as for public safety tasks. Technological developments in these areas may significantly increase the utility of wireless networks.
- Engage stakeholders in determining public need and planning for implementation of wireless networks.
- Address barriers to Digital Inclusion beyond availability, including adaptive technologies, equipment, content, training, and technical assistance.

Next Steps

The reader pursuing a government-led wireless project is strongly encouraged to read the Summary Report and then use the Checklist which can be found in Appendix A. The document is intended for representatives of community and local governments interested in implementing a government-led wireless network. The Checklist is divided into four sections: Fact Finding, Decision Making, Request for Proposals (RFP), and Implementation. The Checklist concludes with references to additional guides and toolkits produced by other organizations.

Like many emerging technologies and systems, it is clear that government-led wireless networks are in a period of transition. Looking back, the first generation of government-led wireless can be characterized by well-intentioned efforts to deploy jurisdiction-wide networks using WiFi technology and the provider financed business model. During the same timeframe, private-sector investment in expanded broadband infrastructure also increased significantly. In some cases, the private-sector may have been motivated to invest in a given community by the interest of the jurisdiction in a government-led wireless project.

The second generation of government-led wireless networks — wireless 2.0 — has focused on applications that enhance government functions such as public safety, traffic control, and other forms of government services. These efforts have been successful to an extent but do not address Digital Inclusion objectives as a primary focus and suffer from a lack of vibrant stakeholder engagement.

The third generation of government-led wireless networks — wireless 3.0 — provides an opportunity to build stakeholder consensus of digital needs and opportunities, develop a robust, high capacity network, and emphasize integration of current and future wired and wireless technologies in areas of greatest need. In doing this, government-led 3.0 networks can be digitally inclusive and transformative. In rural areas, local governments can look at a combination of wireline and wireless technology to achieve ubiquitous broadband where it is not available. In urban areas, local governments can augment existing infrastructure with wireless technology to expand access for public facilities (such as libraries, convention centers, and transportation hubs) and affordable housing for lower-income families.

Certainly, the demand for broadband access only continues to grow among consumers who increasingly expect affordable, convenient, ubiquitous broadband access. Yet, the Digital Divide in California is as big as it was at the beginning of the new century. Therefore, the imperative for Digital Inclusion is as important as when the first generation government-led wireless projects were launched.

Today, the ability to be connected instantly to the Internet through broadband technology is increasingly critical for access to and success in education, jobs, and economic opportunity. Hopefully, this Summary Report will help stakeholders (government agencies, community organizations, and industry providers) collaborate at the beginning of any well-intentioned wireless project to develop a sound business model and to achieve successful Digital Inclusion for a productive, healthy, and prosperous California.



Wired for Wireless?

Towards Digital Inclusion and
Next Generation Government-Led
Wireless Networks

Introduction

Written for representatives of communities, local governments, and industry, this research on government-led wireless networks provides guidance and lessons for further application and advancement towards the greater goal of Digital Inclusion. In communities across California and the United States, political, community, and business leaders are looking to address some of their community needs with the use of wireless technology. The following fictional story reflects some of the needs to which government-led wireless networks are responding.

The Lozano family lives in an inner-city neighborhood in California. The mother works in a restaurant but is searching for ways to improve her family's economic status. Her daughter Marissa struggles in eleventh-grade math and is worried she won't pass the high school exit exam. One day Marissa brings home a flyer from school about a new city program that may result in low-income families getting a new or refurbished computer and a connection to the Internet. Marissa convinces her mom to go to the meeting so they can learn about the new city program.

At the meeting there is a presentation of how technology can make a difference in people's lives. For example, Mom can look and apply for jobs online, fill out necessary forms for health insurance, view updates on bus routes and train schedules, and pay bills. Marissa can take an online math course with cyber tutors to get help with her homework. The city program, supported by leaders from the government, community, and business sectors, includes establishing a wireless network so families like the Lozanos can access the Internet. The program would also provide training at community technology centers and at the library. Families that complete the training program will receive a computer. In addition, the city is also planning on using the wireless network to improve the delivery of many government services that would benefit the Lozanos, such as the improvement of traffic control and police/fire coordination in case of emergencies.

Both mother and daughter expressed enthusiasm for this program and look forward to enjoying the benefits generated by this new technology.



In this Summary Report we use the term *Digital Inclusion* because it is broader than the term *Digital Divide* — the gap between people with effective access to digital and information technology and those without.

We use the term *stakeholder* to mean any group, such as the community, industry, or government, that may be impacted by a specific project or initiative such as a government-led wireless network.

Digital Inclusion means that everyone — regardless of who they are or where they live — can participate in and take advantage of the economic, educational, health, and civic opportunities afforded by broadband and related information technology. More than just access to the Internet, Digital Inclusion means that all stakeholders are engaged in the planning and implementation of technology systems; that all potential users can access the technology and know how to use it; and that with these technologies come more services, increased information, and greater community access. As digital technology is increasingly used for educational, employment, health, commercial, and informational purposes, Digital Inclusion is critical for full engagement, participation, and opportunity in the social, economic, and civic life of society.

A key tenet of Digital Inclusion is applying technology — using various approaches — to meet the needs and goals of communities. One increasingly prevalent approach is an effort led by local governments to implement and use wireless networks. These *government-led wireless networks* have been pursued using different strategies and technologies. Were any of these approaches effective? What is sustainable? What can be learned from these government-led efforts? What mistakes can be avoided with future efforts?

In the summer of 2007, noting a marked increase in these government-led wireless networks and the questions their formation raised, the Wireless Comparative Analysis and Best Practices Education Project was formed. The Project is a collaborative effort among Community Partners, California Community Technology Policy Group, and BroadBand Institute of California funded by the California Emerging Technology Fund (CETF). The Project sought to research multiple aspects of government-led wireless networks and to identify lessons learned along with opportunities and promising practices, particularly those that promote Digital Inclusion.

The 14-month Project encompassed the following research components, which are synthesized in this Summary Report:

- *Literature Review:* A comprehensive review and annotated bibliography of articles on broadband and government-led wireless projects.
- *Regulatory Review:* A review of wireless regulations to identify incentives and barriers that might support or constrain wireless implementation.
- *Survey:* An online survey of cities and counties in California on the role of wireless networks in their broadband deployment strategies. The survey was sent to all 478 cities and 52 counties; 104 unique responses collected between January 24, 2008 and April 4, 2008 from across the state are incorporated into the findings.

- *Case Studies:* A comparative analysis of 26 case studies of government-led wireless projects — 20 from California, and six from outside of the state. This Summary Report reflects data collected as of June 30, 2008.
- *Panel of Expert Advisors:* A group of experts was engaged to advise and guide the research process and to provide feedback on the various components of the Project. The panel brought a depth of experience across such topics as Digital Inclusion, municipal networks and contracts, wireless technology, public safety, the needs of people with disabilities, and policy.
- *Stakeholder Engagement:* A series of meetings, teleconferences, and videoconferences with stakeholders from community, government, and industry to advise and inform the Project efforts.

This report and the underlying research are available at www.CommunityPartners.org/wireless-documents.html and www.cetfund.org/resources/information. The findings are presented in this Summary Report in the following sections:

- *The Foundation for Digital Inclusion* discusses the need for all individuals to have access and know how to use technology effectively to fully function in society, and the extent of the current Digital Divide that exists in the United States.
- *The Pursuit of a Digitally Inclusive California* defines the core elements of a Digital Inclusion strategy.
- *The Rise of Government-Led Wireless Networks* analyzes the growing use of these networks as a strategy by local governments to deploy broadband and to enable better, cheaper government services.
- *Characteristics of Government-Led Wireless Networks* describes the core characteristics of these networks, including objectives, project administration, business model, technology, scope of deployment, and network management.
- *Lessons Learned and Promising Practices* summarizes the successes and challenges of broadband deployment and government-led wireless networks.
- *Recommendations* presents a series of suggestions for community, government, and industry stakeholders in the planning and deployment of broadband projects.
- *Conclusion* presents a summary of the Project findings and a look to the future of broadband networks.
- *Appendices* contains additional resources and references for the reader, including: a Checklist that provides some guidance to representatives of community and local governments in California interested in a government-led wireless network; a draft of the lessons learned and promising practices as they were presented to the Board of Directors of the California Emerging Technology Fund in June 2008; a list of government-led wireless networks in California as of June 2007; and other reference materials.

For many, the story of government-led wireless networks begins and ends with the challenges reported in the popular press. When viewed both in a larger market and regulatory context — and as one strategy within a comprehensive technology plan that is digitally inclusive — that same story proves to be far more complex and nuanced. But despite the challenges, local governments continue to pursue wireless networks to meet the needs of their communities.

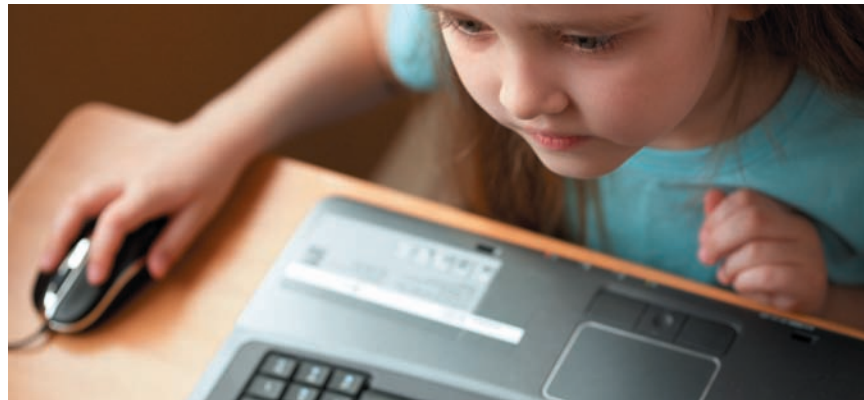
The Foundation for Digital Inclusion

Digital Inclusion means that everyone — regardless of who they are or where they live — can participate in and take advantage of the economic, educational, health, and civic opportunities afforded by broadband and related information technology. Digital Inclusion also means that stakeholder representatives are engaged at key points during the planning and implementation of the project to address barriers such as access, equipment, training, and technical assistance. Thus, to be truly comprehensive, Digital Inclusion must be more than just a discrete “program”; it is an overarching goal that must be embraced and integrated into any effort that applies technology.

The rapid development of the Internet, computer technology, and supportive communications mechanisms since the 1980s — accompanied by increased affordability and ease of use — has significantly altered the social, economic, and political institutions of society. As documented in multiple studies and reports, including the *The State of Connectivity: Building Innovation through Broadband* released by the California Broadband Task Force,¹ broadband and computer technology are being used for a range of important civic and public policy goals. These goals can be categorized into five general areas:

- **Educate and train people for 21st Century employment.** Digital Inclusion

means that students of all ages have access to broadband, new software, and online applications. With access to broadband, students are able to connect to a whole world of research and information, and gain new means of communicating with teachers at their local schools and other learners across the globe. Some government reports and other kinds of information are now available most easily — and sometimes only — online. Self-paced online applications and distance learning give adults new skills to be competitive in the workplace. Online video, sound, and interactive education programs more readily excite and engage children in the learning process.² In *Helping Our Children Succeed: What’s Broadband Got to Do With It?*, the Children’s Partnership — a national non-profit advocating for children’s issues — states that “early research indicates that such technology can have a strong impact on improving academic performance, particularly among children with lower grades.”³ Interactive communications between student, teacher, and parents can also help improve student performance.



“...technology can have a strong impact on improving academic performance, particularly among children with lower grades.”

Dale Mann, et al.

“Digital Inclusion is also fundamental to generate economic growth and develop strong, healthy neighborhoods.”

- **Improve the quality of health care.** The medical field is also pursuing the tenets of Digital Inclusion with the increasing use of new technology to provide health services, to monitor patient symptoms, and to train providers at a distance.⁴ Programs led by the California Telehealth Network, the University of California, the California Telemedicine and eHealth Center, and others are expanding the application of telemedicine and telehealth. Research has demonstrated that these digitally inclusive systems can greatly improve the quality of care, enable patients to manage chronic conditions more effectively from home, reduce costs, and allow access to vital health information. For example, in *Improving Asthma Outcomes and Self-management Behaviors of Inner-city Children*, author Sylvia Guendelman concluded that “monitoring asthma symptoms and function status with the Health Buddy (a computerized pediatric asthma management tool) increases self-management skills and improves asthma outcomes.”⁵

- **Enable economic and community development.** Digital Inclusion is also fundamental to generate economic growth and develop strong, healthy neighborhoods. Employment in many industries is positively associated with broadband availability and use. It has been reported that 60% of jobs now require computer skills.⁶ Thus, the training and experiences that produce skilled workers are essential for economic development and growth. Broadband is also important for job creation. In *The Effect of Broadband Deployment on Output and Employment*, Crandall, Lehr, and Litan noted that every percentage increase in broadband availability increased employment by at least 0.2 percent per year, representing an estimated 300,000 jobs nationwide. This direct correlation is particularly true in manufacturing and services industries such as finance, education, and health care.⁷ Additional evidence of the economic benefits of broadband can be found in the *Measuring Broadband’s Economic Impact* report released in 2005. The authors of that study concluded that mass-market broadband availability created growth in the number of businesses and overall employment.⁸

Additionally, broadband, and specifically wireless technology, generates economic activity by attracting large and small businesses that need infrastructure to run their operations and draw customers. For example, the Seattle WiFi project documented the positive impact their program had on businesses, with 25% reporting increased revenues and customers.⁹ Travel and tourism are similarly enhanced — hotspots, information and reservation kiosks, and the ability to work remotely are attractions for recreational and business travelers. From the consumer perspective, many merchants offer discounts and rebates only available to customers online.

- **Support civic engagement.** Digital Inclusion also enables new forms of civic engagement and participation in democracy. Broadband has become an essential conduit for information.¹⁰ In the *Californians and Information Technology* survey conducted by the Public Policy Institute of California (PPIC) in partnership with the California Emerging Technology Fund (CETF) and ZeroDivide, Mark Baldassare, President and CEO of PPIC, states, “Many Californians go online to research the decisions they make as voters, taxpayers, and consumers.”¹¹ Additionally, the Internet has facilitated the association and collaboration of people across state and national borders for information and advocacy purposes. Without Digital Inclusion, citizens could not participate in movements like MoveOn.org or Save Darfur to generate awareness, discuss common issues, and mobilize people to take action.

Internet technology has changed the way citizens interact with their government. This new dynamic is included in the term e-government — referring to the use of Internet technology both as a platform for

exchanging information and for providing services. Internet technology also enables greater citizen participation and the timely receipt of public information. The real benefit of e-government is that it allows citizens to impact policy and make decisions online. Experiments in this area are occurring abroad with countries like Estonia leading the way in online and mobile voting in national elections.¹² Domestically, Arizona and Michigan have begun to experiment with online voting; the improvement of network security and reliability will only make these efforts more accessible and available to citizens.

- **Promote public safety and delivery of government services.** Digitally inclusive technologies support the delivery of government services and enhance public safety efforts. Jurisdictions use email to communicate with residents and have implemented websites that deliver information and basic services online. People can now apply for a professional license, check the status of a potential contractor, and file their taxes online. Local governments have applied technologies to improve public safety through services such as security monitoring and emergency communications.

Wireless broadband has proved beneficial in community disaster management,¹³ traffic control, and citizen response. In their efforts to improve public safety, local governments are making efficient use of video surveillance, hazardous material tracking, incident reporting, and management from the field. Efficiencies have also been reported in using wireless for parking meters and utility meter reading.

These examples of how broadband and computer technology are being applied to support education, economic development, health care, government services, and other civic goals highlight the importance of pursuing and implementing technology with an eye to Digital Inclusion.

The Pursuit of a Digitally Inclusive California

Many have called for Digital Inclusion. In 2004, Tony Wilhelm in *Digital Nation* noted that “Without a more robust, forward-looking national approach to weaving information and communications tools intentionally and democratically into the economic and social agenda, the nation’s future is jeopardized.”¹⁴ Also in 2004, President Bush established the goal of bringing broadband to “every corner of America.”¹⁵ The United States, however, is falling short of meeting this challenge. Recently, President Elect Barack Obama highlighted this challenge and included broadband as a key issue in his campaign platform. His website (www.barackobama.com) states, “Barack Obama believes that America should lead the world in broadband penetration and Internet access. As a country, we have ensured that every American has access to telephone service and electricity, regardless of economic status, and Obama will do likewise for broadband Internet access.”

To truly pursue a comprehensive Digital Inclusion strategy, consideration must be given to the following key components:¹⁶

- **Stakeholder Engagement.** The involvement of community, government, and industry stakeholders is essential to ensure that the broadband deployment strategies selected accurately reflect the needs and the day-to-day realities of the communities being served. It is particularly important to have community representation, because this sector has been traditionally less engaged. The engagement process also serves as a means to inform potential users of why they should be online.
- **Adoption.** This is the number of people who have some form of broadband service. While improvements have been made in the U.S. in the area of adoption, disparities remain within certain geographic, ethnic, and socio-economic groups. The Organization for Economic Cooperation and Development (OECD) 2007 annual survey places the United States as the largest broadband market, with 66.2 million subscribers. However, the OEDC also notes that the United States stands at 15th worldwide in the number of broadband


“ Without a more robust, forward-looking national approach to weaving information and communications tools intentionally and democratically into the economic and social agenda, the nation’s future is jeopardized. ”

Anthony Wilhelm



subscribers per 100 inhabitants.¹⁷ At the state level, broadband adoption may be growing among some groups, but the divide is widening for many others. While only 55% of Californians have broadband at home, residents who are white, black, or over age 55 have significantly increased their use of computers and the Internet since 2000. However, low-income residents — especially Latinos and Asians — have not.¹⁸ In order to reach high adoption rates it is necessary to focus on five components.

- **Availability.**¹⁹ Availability means whether broadband is physically accessible in a geographic area. This availability, often called deployment, is a key barrier to Digital Inclusion in some geographic regions. The Federal Communications Commission (FCC) reports on broadband deployment indicate “significant and steady progress in broadband deployment and adoption nationwide.” However, these reports have been widely criticized because the data has not been detailed enough to identify those specific areas that lack connectivity. Only recently, based on more detailed assessment at the state level, has more accurate information been collected. In California, *The State of Connectivity* report found that while broadband is available to 96% of California residences, 1.4 million people — mostly rural — still lack broadband access at any speed.²⁰



“Online content and software applications must be available and relevant. Technology adoption is powerfully driven by applications that are linked to specific needs within a community.”

Availability also refers to the need for people to have the computers, accessories, and the software necessary to use technology effectively. In the United States, there is more than a decade of research on digital disparities, mainly based on increasingly sophisticated *Current Population Survey* data. The data show a persistent gap in computer ownership and Internet access.²¹ *The Californians and Information Technology* report, produced by PPIC in partnership with CETF and ZeroDivide, indicates that 72% of Californians report having a computer at home. However, when analyzed by race and income, only 48% of Latinos and 50% of lower income respondents have a computer. While 75% of California adults say they have a cell phone, only 25% use their cell phones to access the Internet.²²

- **Applications.** Online content and software applications must be available and relevant. Technology adoption is powerfully driven by applications that are linked to specific needs within a community. These applications allow

people to write, make their voices heard, and publish local content. Currently, applications that don't reflect the language needs of the community may discourage people from using services online. For example, in the article *Latinos Online: Hispanics with Lower Levels of Education and English Proficiency Remain Largely Disconnected from the Internet*, the authors state that Spanish-speaking Latinos are less likely to use the Internet at all income and education levels.²³ This trend may be due to the fact that Spanish-speaking Latinos cannot use applications in other languages, which can discourage them from using the Internet.

- **Affordability.** Price is a barrier to both adoption of Internet services and ownership of computer technology. Internet use for low-income adults (those with household incomes of less than \$40,000) has only grown to 49%. In contrast, 92% of adults with household incomes of over \$80,000 use the Internet at home.²⁴ As previously discussed, cell phones are increasingly being used to connect to the Internet. This strategy shows promise for expanding broadband connectivity. However, the price of cell phones with Internet features and the cost of monthly data plans present a barrier for broadband adoption using this technology.
- **Accessibility.** Disparities in levels of access are evident among people with disabilities. People with disabilities are less likely to have computers and use the Internet. In *Californians and Information Technology*, a survey conducted by PPIC in partnership with CETF and ZeroDivide, only 60% of those reporting a disability have a computer compared with 78% who did not, 57% of people reporting a disability use the Internet compared to 73% who did not and, even more dramatically, only 36% of people reporting a disability reported having use of broadband compared with 60% who did not report a disability.²⁵ Digital Inclusion also assumes a commitment to enable people to have the knowledge and any necessary tools (often called assistive technology) that allow them to make use of digital resources.²⁶
- **Assistance.** Availability and connectivity must be married with the knowledge to fully access digital technologies. In *Electronic Literacies*, Warschauer argues that “The ability to participate in the global economy increasingly depends on having the tools and the training to exchange, analyze, and interpret information.”²⁷ Affordable technical assistance is important in helping users learn to use and maintain their equipment. Without assistance, the use of the equipment and the Internet would be short-lived.

These key aspects provide a framework for assessing government-led wireless networks implemented to meet the needs of communities.

The Rise of Government-Led Wireless Networks

As [technology advanced](#) over the past two decades, local governments began to consider different approaches to respond to the challenges of Digital Inclusion and to achieve their public policy and service delivery objectives. They pursued several types of strategies and technologies, including deploying their own fiber networks and supporting wireless networks. Local governments became directly involved in the deployment of wireless technology for four main reasons:

- **Wireline services were costly or otherwise unavailable.** Local governments found that commercial providers and applications were either too expensive or not available to meet their needs, particularly for internal operations and service delivery. Broadband was becoming increasingly available to limited sectors in some communities; in response, some local governments began to develop wireless networks to provide free or low-cost public access to the Internet for communities where commercial services were unavailable or unaffordable.

Defining “Government-Led Wireless Networks”

For the purpose of the Project, “government-led wireless networks” refer to those networks that are implemented, solely or partly, for public benefit and in which local governments determine the objectives of the project and/or play a significant role in the areas of financing, implementation, and operation. This public benefit may be direct, as in affordable access to the Internet, or indirect, as in supporting education, generating economic development, or improving the delivery of government services.

Government-led systems are generally operated by either the government, a partnership, or private enterprise contracted for services by a jurisdiction.

This definition is more comprehensive than others have been. The term “municipal wireless” limits the scope, excluding projects that were pursued by counties, districts, or regional consortia. The phrase “government-sponsored” may be misinterpreted to mean only those that were somehow “paid” for by the government entity. The fuller concept of government-led wireless networks is the focus of the Project and this Summary Report.

“Wireless” is a generic word that encompasses several different specific technologies, including WiFi and WiMax. Wireless can be either fixed or mobile; this Summary Report focuses on fixed.

- **New wireless technologies were emerging.** In the early 1990s, some regulatory decisions provided a window of opportunity that ultimately resulted in local governments selecting wireless as one strategy for meeting their local needs. The federal decision to allocate unlicensed spectrum (unused radio waves) — and later the information technology industry’s establishment of standards — contributed to the development of chips and equipment that led to the formation of wireless networks using WiFi technology. Industry and local government interests began to converge as chip and equipment manufacturers developed an interest in establishing a market for their products at the same time local governments were interested in addressing their own needs, such as improving the delivery of government services, promoting community and economic development, and bridging the Digital Divide.²⁸
- **Mobility was important.** Local governments also have been under pressure to improve their emergency and communications systems and make them more mobile, particularly in light of catastrophic events such as the terrorist attacks of 9/11 in 2001, Hurricane Katrina in 2006, and the massive California wildfires. All of these events have highlighted the need for innovative, reliable, and redundant systems. In addition, new kinds of services, such as meter reading and priority traffic signaling for express buses, were becoming more prevalent and desirable. While these services can and do use a range of specific technologies, most require mobility that only wireless technologies can provide.
- **Other opportunities were constrained.** Federal and state governments since the late 1980’s have reduced local government control over fees, program pricing, and network deployment decisions, making it more challenging for local governments to respond to local needs.²⁹ Consequently, local governments have

pursued wireless networks as a way to have more influence on how, where, and when new technology could address their needs.

Within this context, the number of government-led wireless networks in the United States grew significantly between 2004 and 2007.

Table 1.
Number of Government-Led Wireless Networks Since 2004

	6/2004	7/2005	2/2006	6/2007
United States	52	112	176	385
California	10	19	31	64

Source: www.muniwireless.com

As shown in Table 1, Muniwireless.com reports that the number of projects being implemented or planned nationally increased from 52 in June of 2004 to 385 in June of 2007 — a growth trend that was mirrored in the State of California.³⁰

A decision by several service providers in late 2007 to re-evaluate their involvement in government-led wireless networks resulted in a “reality check” on the initial enthusiasm for these types of projects. These providers, including EarthLink and MetroFi, cited insufficient return on investment as the major reason for their retreat. The pull-back by these providers left some local governments stranded and created significant uncertainty among stakeholders interested in this sector. The decision of companies to withdraw from the market raises questions about what was actually occurring and what can be learned.

Characteristics of Government-Led Wireless Networks

In order to better understand government-led wireless networks, it is important to explore their characteristics. Government-led networks encompass a wide range of projects with various objectives, management strategies, business models, technologies, and coverage areas. Table 2 illustrates the key variables that shape government-led wireless networks. Each of these variables is discussed below with references to specific cases that illustrate the characteristic. In addition, an overview chart detailing some of the characteristics of the government-led wireless networks as part of the Case Studies can be found in *Appendix VI* of this Summary Report.

Objectives. Project research indicates that local governments' wireless objectives fall into three categories: to enhance government services and operations; to achieve public policy goals; and to provide public and affordable access to the Internet as a way to bridge the Digital Divide. Each of these categories is discussed in greater detail below:

- *Government operations and services.* Local governments are looking to improve the delivery of government operations and services,³¹ such as traffic control, meter reading, video monitoring, communication with field workers, online/mobile bill payment, and transit information. They are also using wireless networks to improve the delivery of public safety services, such as video surveillance, incident reporting, hazardous material monitoring, and emergency vehicle communication.³² In many cases these networks were not being used simultaneously for public Internet access based on security concerns. However, development of encryption technology may allow networks to be used for both Internet access and government services.

Table 2
Variables of Government-Led Wireless Networks

Objectives:	<ul style="list-style-type: none"> • Government Operations and Services • Public Policy Goals • Public Access • Combination of the Above
Project Administration:	<ul style="list-style-type: none"> • Government • Non-Profit / Collaborative
Business Models:	<ul style="list-style-type: none"> • Provider Financed • Anchor Tenant • Sponsorship • Government Financed
Technology:	<ul style="list-style-type: none"> • WiFi • WiMax • Combination of the Above
Scope of Deployment:	<ul style="list-style-type: none"> • Jurisdiction • Targeted (within jurisdiction) • Regional (beyond a jurisdiction)
Network Management:	<ul style="list-style-type: none"> • Government • Service Provider • Combination of the Above



“Communities and their governments are realizing that access to broadband is not a ‘luxury’ but a necessity for their social, economic, and political survival.”

- *Affordable access to the Internet.* Communities and their governments are realizing that access to broadband is not a “luxury” but a necessity for their social, economic, and political survival. Nine in 10 Californians say it is very important (69%) or somewhat important (21%) to have Internet access.³⁴ When designed for home or multi-family and neighborhood use, wireless networks are often more affordable than wired broadband access options, making them a good choice for low-income residents, small businesses, and community organizations.

Recognizing this need, over half (56%) of Project survey respondents involved at some stage with a wireless network indicated Digital Inclusion as a reason they were pursuing it. Furthermore, 38% indicated that the request for proposals (RFP) or contract for the project included Digital Inclusion provisions, usually focused on making sure free or affordable Internet access was provided as part of the project. In other instances, the RFP or contract also required the service provider to coordinate with other government agencies and/or non-profit organizations for distributing equipment and training to the community.

The decision of local governments to pursue wireless networks for public access is supported by Californians. In *Californians and Information Technology*, a survey conducted by PPIC in partnership with CETF and Zero-Divide, 67% of Californians support their government in providing free wireless — an increase of 9% from the first time this question was asked in the survey in March 2007.³⁵

Project Administration. Project administration refers to the way the overall project is coordinated. The administration may range from direct control by the local government to a decentralized strategy in which stakeholders are involved through an advisory board or a non-profit entity. Although most of the case study projects were directly administered by the local government, some were working through a non-profit organization to coordinate the work, including: Winston-Salem, Riverside, and Philadelphia. In looking at these cases, the use of a non-profit to administer the project seems to foster greater stakeholder involvement and transparency. However, it should be acknowledged that administering the project through a non-profit may add additional costs and complexity to the project.

In the Project survey of cities and counties, 74% of the respondents indicated public safety as a reason they were pursuing a wireless network, 26% indicated automated meter reading, and 22% indicated traffic control.

- *Public policy goals.* Local governments are pursuing wireless technology to achieve various public policy goals, including: improving education, promoting workforce development, drawing tourism, and attracting high-tech companies to the region.

To achieve these public policy goals, providing access to the Internet was a core function of the wireless network. In the Project survey, 70% of respondents indicated economic development as the reason they were pursuing a wireless network and 37% indicated education as the reason. In the case studies, many local governments focused on promoting economic development.³³

Business Models. The business model refers to the way the project generates revenue to secure implementation and sustainability. Based on the Project research, four business models were identified:

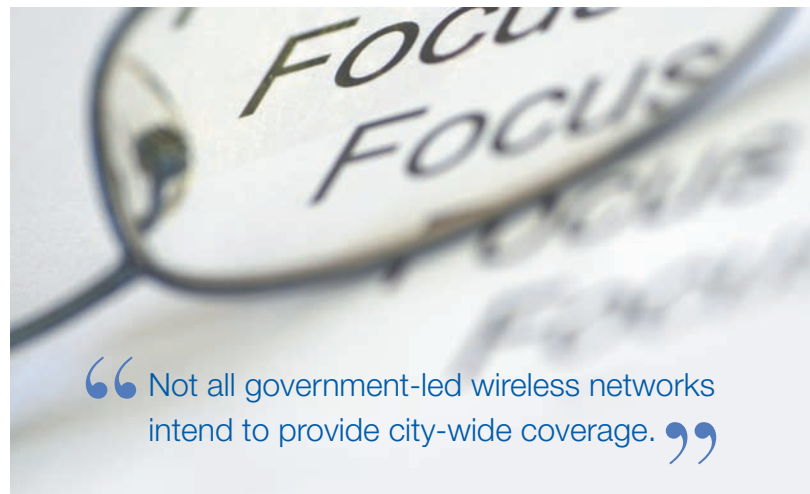
- *Provider Financed:* The network provider finances the system and recoups its investment via advertising and/or subscription fees.
- *Anchor Tenant:* The local government agrees to buy a certain amount of service from the wireless provider. The agreement guarantees the provider a revenue stream, thus making the transaction attractive to the provider. The anchor tenant model is usually used in combination with the provider financed model.
- *Sponsorship:* An entity such as a company or a foundation pays for the deployment, public access and/or community benefits.
- *Government Financed:* The local government pays for and owns the system, and may contract to have it managed.

Based on the case studies, the provider financed model was most commonly used (16 out of the 26 case studies), especially among local governments wanting to provide Internet access to its residents without having to make any monetary investment in the project. The provider financed model appeared very attractive to local governments because the cost of deploying a city-wide wireless network can be very high. Based on a feasibility study published in May 2007 for the City of Tucson, Arizona, the cost to deploy and maintain the city-wide wireless network for two years was estimated between \$40.8 and \$56 million.³⁶

In six of the provider financed cases, local governments committed funding for using the network to conduct government and public security services — anchor tenant business model. Further, when the network was planned solely for providing government and public emergency services, the local government generally chose to pay and own the system.³⁷

Technology. Local governments are looking primarily at WiFi technology for their wireless networks. The case studies reveal that this technology was most commonly used by jurisdictions intending to provide wireless Internet access.³⁸ WiMax is being used in some cities to connect the wireless network to the Internet (called “backhaul”). In the Project survey, 66% of the local governments implementing or considering a wireless network identify WiFi as their technology choice.

Scope of Deployment. The scope of deployment is the intended coverage area of the network at full implementation. Not all government-led wireless networks intend to provide coverage throughout the jurisdiction. Based on 28 responses in the Project survey, only 11 plan on covering their entire jurisdiction as part of the project, while seven will cover smaller areas, and 10 are undecided. The case studies revealed a close relationship between the provider financed business model and a jurisdiction-wide scope of deployment. This link can be explained by the fact that providers want to leverage the expense of building the physical infrastructure by providing service to the whole jurisdiction (or beyond) and maximizing the potential number of network customers.



Network Management. Network management refers to the day-to-day operation and maintenance of the network. According to Project survey respondents, 30% of the wireless networks in place or planned will be managed by a private party, while 70% will be managed by local governments. The case studies reveal a relationship between network management and the network objective and business model. The local governments that sought to use the networks solely for conducting government and public services chose to own and manage the network. This decision could be credited to potential long-term cost savings along with the perception of local governments that planned network applications were user sensitive and confidential and should not be managed by a third party.

Lessons Learned and Promising Practices

Through the literature review, regulatory review, survey, case studies, and stakeholder input, the Project Team identified lessons learned and promising practices in broadband and government-led wireless networks.³⁹ The most important findings are summarized here.⁴⁰

Planning

- *California local governments report they are moving ahead with wireless networks.* California cities and counties continue to pursue government-led wireless networks, though many are still in early stages. Of the 104 survey respondents, 29 stated that they are implementing a government-led wireless network.⁴¹ Of those 29 respondents, two classified themselves in the *Fully Functioning* stage, six in the *Proof of Concept* stage, four in the *Build-Out* stage, and two in the *Contract* stage. The remaining 15 reported they were in the initial stages of the project. Of those 15, 11 classified themselves in the *Exploration* stage, two in the *Request for Proposals* stage, one in the *Awaiting Approval* stage, and one in the *Re-Evaluating Plans* stage. These findings are based on survey data collected from January 24, 2008 to April 4, 2008. As this publication was going to print, new developments revealed that some jurisdictions have changed their original plans.

The governments profiled in the case studies were all selected because they were at some stage of pursuing wireless networks in the summer of 2007. Over the course of the research period, changes in the wireless industry and in individual local circumstances led four local governments to change their original business models or build-out strategies — Anaheim, Napa, Pasadena, and San Francisco. However, the rest of the California cases are still moving ahead with their original plans to deploy a government-led wireless network.⁴²

Based on the Project survey, the Project Team found that many of the local governments still planning to implement wireless strategies are small and medium-sized cities with populations between 25,000 and 100,000 residents. This data reflects a trend also identified in other literature: that the model of government-led wireless networks may be most successful for smaller cities because the upfront investment costs are



Five Reasons Why Some Government-Led Wireless Networks Failed

1. Service providers implemented unsustainable business models.
2. Local governments were not willing to invest significant financial resources into the projects.
3. The geographic range of the network was too large to focus on areas of highest need and impact.
4. The limitations of the selected technology were not carefully considered.
5. End users were not sufficiently engaged in the planning and implementation of the network.

lower and the geographical area is often smaller and may have fewer technical challenges related to distance or geography.⁴³

- *Leadership is needed to establish broadband policies that support strategic planning and implementation.* Leadership is needed to develop policies that foster the ubiquitous deployment of broadband and its effective use. Such policies would establish a clear goal for policymakers, local government staff, industry representatives, and community members to work toward. Moreover, to be most effective, the policy-making process should be digitally inclusive. It should also be integrated with other economic development, human services, and community development planning. Without clear direction, related policies and contracts are likely to be fragmented and ineffective. (See the section on page 25 on stakeholder engagement for promising practices in this area.)

The Project survey indicates that local governments in California are not setting such policies; 91% of respondents indicated that they did not have policies specifically on broadband.⁴⁴ To remedy this situation, The California Emerging Technology Fund is supporting efforts to develop model policies.⁴⁵

- *Partnerships make a difference.* An effective approach to Digital Inclusion may be successfully achieved through partnerships. Libraries have played a role in training people to use technology, and now over 600 library systems in California offer their own local wireless networks.⁴⁶ Community-based organizations have also provided training and technical expertise to residents and are well positioned to provide services that are linguistically and culturally relevant. Some have already begun to develop their own wireless networks. Thus, leveraging the experience and capacity of libraries and community-based organizations may be one way to extend the reach and effectiveness of government-led wireless networks.

It is also important for jurisdictions to know about Wireless Internet Service Providers (WISPs) in their area. A recent working document by the California Broadband Initiative reveals that “Fixed wireless Internet service providers contribute to California’s broadband market either by acting as a sole broadband provider or increasing competition among providers in a community.”⁴⁷ In their study, “almost all of the WISPs who responded to the survey reported that they have contracts with government agencies.” In addition, “WISPs reported that they provided Internet access to emergency responders such as police, fire, and forestry agencies, as well as local schools and government administrative facilities.” However, only 42% of the jurisdictions in the Project survey knew about WISPs in their area, suggesting that this resource is underutilized.

- *Information technology departments are evolving and need greater coordination and involvement with other government leaders and departments.* The pursuit of new technologies by cities and counties requires complex institutional coordination, community outreach, technical training, and other skills which may go beyond those traditionally required of information technology (IT) staff. The wireless planning and implementation processes in many case studies involved partnerships with multiple departments, community-based organizations, and consultants.

IT staff have suggested that communication within different departments and agencies of local government is critical and yet often insufficient. When asked their lessons learned, chief information officers (CIOs) reported that they wished they’d spent more time educating and getting the buy-in of other departments, and done a more thorough inventory of available assets.⁴⁸

It is also important to note that some smaller cities do not have internal IT departments. Therefore, these jurisdictions may need to invest additional resources in training the staff working in wireless networks, since they may not have the experience or technical background.

CIOs completing the Project survey suggested that it would be helpful to have a means to exchange information about planning and implementing wireless networks and other new technology projects. This may require local governments to budget for travel costs for their IT staff to meet with colleagues and attend regional or national conferences. Funding institutions may also consider supporting the development of a government-led wireless network document clearinghouse (to include planning and outreach materials, RFPs, contracts, and other resources).

As one major wireless consultant noted, “Despite the fact that most major municipal WiFi projects did not result in citywide deployments, we conclude that the overall experience contributed to cities’ understanding of their local broadband markets and their knowledge about the business, technology, and public policy issues they would face going forward. This understanding and knowledge will inevitably be valuable to cities in the future as they embark on other technology-related initiatives.”⁴⁹

In addition, it is important for IT departments to have adequate data in order to plan their broadband deployment strategies. Currently, however, many IT departments do not have data about broadband availability or upload speed for key sites within their jurisdiction. For example, 48% did not know the level of broadband availability at local schools and 55% did not know upload/download speeds. This may be because broadband data has not historically been collected or analyzed at the municipal or county level. Nevertheless, this point is important because lack of data can impact a local government’s broadband and/or wireless deployment strategy. Accurate data on availability and speed at the census tract level can help local governments decide whether to pursue a wired and/or wireless network, and identify the best deployment technologies and strategy. One example would be whether to pursue a jurisdiction-wide or a “hotspot” wireless network.⁵⁰



“...it is important for IT departments to have adequate data in order to plan their broadband deployment strategies. Currently, however, many IT departments do not have data about broadband availability or upload speed for key sites within their jurisdiction.”

Business Model and Sustainability

- *Business models that involve local government investment are more successful.* The question of how to finance and sustain public wireless networks emerged as an important area of concern in the literature and case studies. The research indicates that early adopters of government-led wireless networks relied on outside financing, using the provider financed model. This was driven by their desire to provide free or low-cost broadband service to communities that remained disconnected from the Internet; the provider financed model typically required little government investment in building out a public access network across the local jurisdiction. In retrospect, the research suggests that this model narrowed the strategies that local governments used to address their needs. The private sector was interested in this model because they anticipated a new market that would provide a return on their investment in building a jurisdiction- or region-wide wireless network. In many cases this meant competing with existing broadband providers who were dropping their DSL prices. By late 2007, as noted earlier, wireless providers began to withdraw their support for wireless projects, citing that subscriptions and/or advertising revenue were not high enough to recoup their investments. They began to request that local governments serve as anchor tenants by committing to purchase an agreed level of service from the vendor. Many local governments have shied away from this type of commitment.

“While the business model is not the only reason many wireless networks have not been successful (technological and political challenges have also played a role), it is clear that in order for government-led wireless networks to work they require a sustainable business model, which in many cases requires investment from the local government.”

In the cases studied, anchor tenancy does appear to increase the likelihood of network success. Moreover, all three of the government-financed projects (Fresno, Fullerton, and Garden Grove) have been successful.⁵¹

While the business model is not the only reason many wireless networks have not been successful (technological and political challenges have also played a role), it is clear that in order for government-led wireless networks to work they require a sustainable business model, which in many cases requires investment from the local government. Because it may be easier for local governments to invest in internal operations or traditional services (especially when there are some off-setting cost savings), it is not surprising that more recently planned local government wireless networks are less likely to offer public access to the Internet.

Several practices are emerging to address this challenge. At least one observer has suggested that “Local-government leaders should investigate the possibility of less costly interventions specifically targeted at the excluded populations, rather than the entire city.”⁵² One strategy that shows promise is the development of public-private partnerships in which the local government is involved with community-based efforts and community networks. For example, in Los Angeles a community network covering a neighborhood in redevelopment has an agreement with the city to use city-owned fiber to connect their wireless network to the Internet.⁵³ Another example is the City of San Francisco, which as part of its broadband strategy is facilitating the development of a grassroots community network using technology described below.

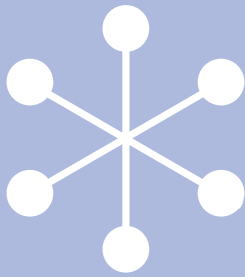
Technology

- *Wireless networks are effectively supporting government operations and services.* The literature and the case studies suggest that government-led wireless networks are increasingly and effectively being used for improving government operations and delivery of services, including public safety and emergency services.⁵⁴ Wireless technology is being used for a large range of government tasks: traffic light control, meter reading, data transport from regional offices to headquarters, video surveillance, communication between emergency vehicles, and much more. These projects have proven successful when jurisdictions commit funding toward the deployment and maintenance of the network.
- *Broadband is available in most but not all areas.* Ninety-nine percent of all of the cities and counties that completed the survey indicated that broadband was available somewhere in their jurisdiction. However, within each jurisdiction, lack of infrastructure was cited as the major reason for the lack of broadband availability (60%). The case studies indicate that many local governments in California pursued or are pursuing a wireless network in order to bring broadband access to underserved communities.⁵⁵ In these cases, the wireless networks were intended to enhance or fill in gaps left by existing deployment.
- *WiFi technology is most prevalent but has limitations.* WiFi is the technology most broadly used in government-led wireless networks. Survey results indicate that 64% of the respondents are using or plan to use WiFi in their wireless network.

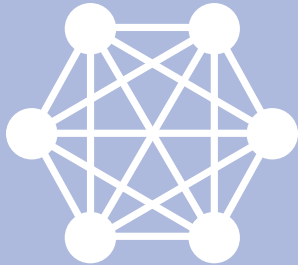
However, additional emphasis should be placed in evaluating the limits of the technology. WiFi works most effectively when equipment can be placed with a clear line of sight; moving through walls, trees, and hilltops presents technical challenges that must be addressed. Equipment such as repeaters and signal amplifiers may solve this problem but the cost to the consumer and the network owner should be evaluated. In the case studies, several jurisdictions faced technical difficulties in the deployment of their network due to faulty planning that did not accurately calculate the limitations of the WiFi technology.

Fiber Investment

In *The Future of Municipal Broadband: Business, Technology, and Public Policy Implications for Major U.S. Cities*, a recent report by the wireless consulting firm Civitium, the authors concluded that “without some form of intervention by local government, there is little chance that major cities will see substantial investment by the private sector in high-capacity, next-generation FTTP [fiber] systems over the next decade.” In addition, recent regulatory developments in California have increased the burden on jurisdictions for the deployment of fiber. The California Digital Infrastructure and Video Competition Act of 2006 (DIVCA) relaxed the requirements about where and how providers build infrastructure such as cable and fiber. Unlike the prior cable regulations, DIVCA does not require providers to deploy to 100% of any area they serve. Consequently, many communities seen as not profitable by the providers may not get next generation broadband technology unless the jurisdictions invest directly in deployment.



A. Centralized Architecture



B. Peer-to-Peer

WiMax and other new technologies face fewer limitations and are more promising for challenging applications.⁵⁶ Thus, to be most effective, wireless networks may employ a combination of technologies — WiFi where practical, combined with more robust technologies where necessary.

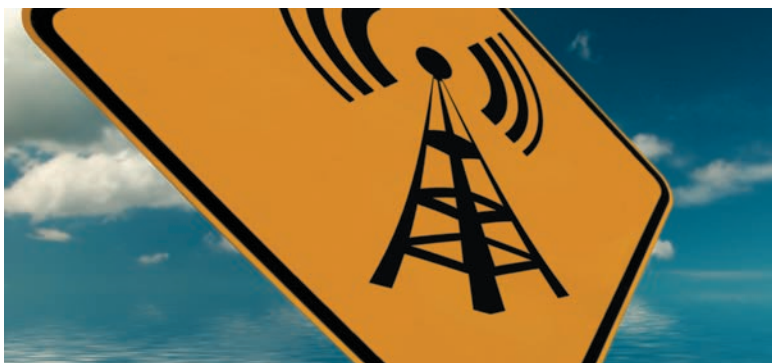
- *Several new technologies on the horizon show promise.* New technologies are making it easier for communities to deploy wireless networks. The wireless efforts discussed thus far have been planned and built as a single network structure (called a centralized architecture). A new approach to building wireless networks is represented by what is called a peer-to-peer (P2P) or viral network. P2P networks use diverse connectivity between participants rather than connecting to a centralized server. In P2P networks there is no planned roll-out of the network; instead the network evolves organically by popping up in specific locations, then spreading out along streets, with islands of connectivity eventually joining together.

In California this approach is exemplified in San Francisco, where the city is facilitating the development of a network using equipment from Meraki, a private provider.⁵⁷ “Meraki networks consist of outdoor, solar-powered equipment (specifically mesh nodes), usually installed on rooftops, balconies and windows, and optional repeaters to bring a high quality signal indoors.”⁵⁸ The Meraki network grows whenever repeaters are added. As of August 2008, there were reportedly over 120,000 people in San Francisco using this network for wireless connections to e-mail and the Internet.⁵⁹ The City’s role has included bringing potential partners together; developing programs to enable low-income residents to purchase low cost computers and network equipment; and engaging volunteers to help deploy networks, computer

labs, and provide computer training. In addition, the City is deploying wireless networks in major public housing sites using City fiber to connect to the Internet backbone. The initial results of this kind of community-based network are promising. The City of San Francisco has identified a model worthy of further study.

Another opportunity may arise from the upcoming transition from analog to digital television. Digital television enables more efficient use of the spectrum (radio waves) and results in unused frequencies, called “white spaces.”⁶⁰ These white spaces could solve the problems posed by WiFi technology because white spaces can penetrate trees and walls. On November 4, 2008, the Federal Communications Commission (FCC) ruled that unlicensed white spaces would be available for public use. This ruling promises to spur the development of new wireless devices and networks.

“Another opportunity may arise from the upcoming transition from analog to digital television. Digital television enables more efficient use of the spectrum (radio waves) and results in unused frequencies, called *white spaces*.”



While the focus of most wireless networks thus far has been on WiFi, many other wireless technologies are becoming available and/or being deployed. In 2003, the FCC made available licensed spectrum for public safety use (4.9GHz). Six of the local governments that responded to the Project survey and several of the local governments⁶¹ in the case studies are using or planning to use this technology. Some of these are receiving grants from the Homeland Security Administration to deploy these networks. Additional spectrum was set aside in the recent FCC spectrum auction “for construction of a nationwide, interoperable wireless network for use by public safety agencies.” This part of the auction was unsuccessful and new rules for a next auction are being developed in an FCC proceeding.

- *Next generation broadband technology is not accessible to everyone.* Optical fiber is used to transmit a large amount of data at very high speeds over long distances. The survey data indicates that while 71% of all respondents have optical fiber in their jurisdictions, only 44% of those that are in rural areas have this resource. This discrepancy is important to recognize since the almost infinite capacity of fiber makes it essential for some advanced applications and a good way to connect local wireless networks to the Internet.

Digital Inclusion

- *The number of jurisdictions likely to provide public Internet access is decreasing.* Although there is strong public support for governments to provide Internet access,⁶² the Project survey suggests that local governments exploring the use of wireless are less likely than earlier adopters to use their network to provide Internet access to their community. Of the 14 survey respondents already in the deployment stage,⁶³ 13 (93%) planned to provide Internet access. However, of the 15 respondents still in the planning stage,⁶⁴ only nine (60%) planned to provide Internet access.
- *Stakeholder engagement is limited.* As a component of Digital Inclusion, stakeholder involvement is essential in defining the objectives, identifying the assets, and building awareness and support for wireless projects. However, of 29 Project survey respondents deploying or planning wireless networks, only half (54%) have or will discuss the project in city councils and boards of supervisors meetings. Furthermore, only 25% have or are planning to conduct town hall meetings and 29% indicated they have not or will not seek any public input.⁶⁵ This data indicates that not all jurisdictions are seeking stakeholder involvement and those who are fall short of effectively engaging the entire community.

“Of the 14 survey respondents already in the deployment stage, 13 (93%) planned to provide Internet access. However, of the 15 respondents still in the planning stage, only nine (60%) plan to provide Internet access.”

The local governments in the case studies used a range of different strategies to engage stakeholders. In general, local governments used traditional channels of engagement, such as council meetings, public forums, and working groups. In addition, many also asked for feedback in the development of their project’s RFPs. Others tasked consultants with conducting feasibility studies, which included focus groups, surveys, and interviews with stakeholders.

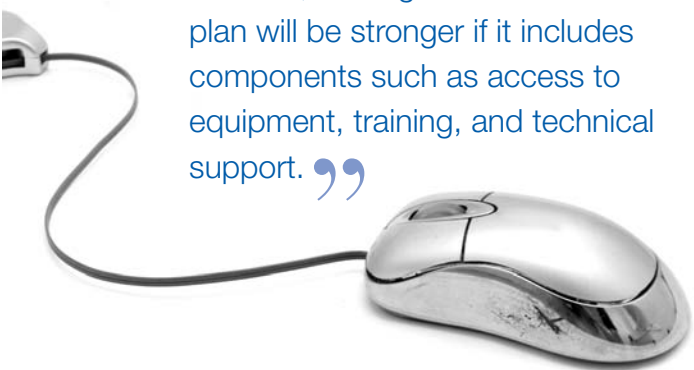
The stakeholder engagement was usually conducted at the planning or beginning stage of the project. Only a handful of jurisdictions have established a permanent process for community engagement.⁶⁶ In these cases, the projects are being administered through non-profit entities, which are representative of local stakeholders and involve such entities as government, community, industry, and educational institutions. This type of project administration strategy seems to permanently secure some level of stakeholder engagement.

In many cases in which stakeholder engagement was not conducted, it appears the project was perceived by the local government to be off-limits from public input because the network was being planned for government operations and/or public emergency services. However, the Project Team believes that stakeholder engagement in these specific cases will result in more responsive, innovative, and effective public- purpose networks.

- *Equipment, training, and maintenance are areas for growth.* One of the most common objectives of government-led wireless networks is to promote Digital Inclusion.⁶⁷ However, local governments view this objective as being accomplished primarily by providing access to the Internet. This limited perspective on Digital Inclusion was evident in both the case studies and the survey of this Project. The literature about broadband and wireless networks makes a strong argument that digital literacy is essential. It is an argument echoed by the stakeholders involved in this Project, who said repeatedly that training and coaching were critical for community members to learn to use technology productively and understand the benefits of broadband. Stakeholders also stressed the need for maintenance and technical support. Thus, when public access or public services are an objective of the network, the Digital Inclusion plan will be stronger if it includes components such as access to equipment, training, and technical support.⁶⁸

Wireless efforts, such as those in Chicago, Philadelphia, and San Francisco, that planned to address training and language as well as access seem better positioned to encourage an increasing number of low-income residents to acquire wireless access.

“...when public access or public services are an objective of the network, the Digital Inclusion plan will be stronger if it includes components such as access to equipment, training, and technical support.”



Recommendations

Based on the research findings, the Project Team identified eight overarching recommendations for local government, community, and industry stakeholders as they develop technology solutions to address unique local needs. It is critical for these solutions to be based on sustainable business models that are built upon the assets of the overall community and in partnership with business and community stakeholders.

Planning

- Map and evaluate government and other local assets that exist. For existing services, determine areas of deployment, consumer cost, and the type and speed of the technology in use.
- Develop broadband policies, determine specific goals and objectives, and adopt plans that meet resident, local business, non-profit, and local government needs.
- Understand the relationship between the local government's network plans and state and federal regulatory realities. Market entry and longevity are affected by regulatory as well as technological and market realities.

Business Model and Sustainability

- Develop public-private partnerships yet be prepared to invest monetary and human resources into the projects.
- Ensure a level playing field for both wireline and wireless broadband providers, making the use of public assets available to all providers on a competitive basis, commensurate with their public benefit provisions.

Technology

- Review available technologies and applications of a wired and/or wireless network that meet local government needs. Consider how these technologies can be used together most effectively.
- Analyze the security of wireless technology and new encryption technology that can allow a single network to be used for Internet access as well as for public safety tasks. Technological developments in these areas may significantly increase the utility of wireless networks.

Digital Inclusion

- Engage stakeholders in determining public need and planning for implementation of wireless networks.
- Address barriers to Digital Inclusion beyond availability, including adaptive technologies, equipment, content, training, and technical assistance.

Whether the solutions involve government-led wireless networks or other strategies, these recommendations can lead to a productive, healthy, digitally inclusive society.

Conclusion

Like many emerging technologies and systems, it is clear that government-led wireless networks are in a period of transition. Looking back, the first generation of government-led wireless can be characterized by well-intentioned efforts to deploy jurisdiction-wide networks using WiFi technology and the provider financed business model that relied on subscriptions and advertising. During the same timeframe, private-sector investment in expanded broadband infrastructure also increased significantly. In some cases, the private-sector may have been motivated to invest in a given community by the interest of the jurisdiction in a government-led wireless project. This era required low government investment and seemed a means for local governments to provide public and affordable access to the Internet.

However, hindsight has shown that these initial efforts were not replicable or sustainable. Jurisdiction-wide deployment, especially in large cities, was not attainable due to cost and technological issues. In many cases limited stakeholder engagement negatively impacted the objectives, support, build-out, and eventual use of these networks. Thus, while the pursuit was intended to address the Digital Divide, it failed to create the intended impact. However, these challenges faced by the first generation of government-led wireless networks set the stage for the second generation of government-led wireless networks, often referred to as wireless 2.0.⁶⁹

The second generation of government-led wireless networks — wireless 2.0 — has focused on applications that enhanced government functions such as public safety, traffic control, and other forms of government services. Cities and counties have enjoyed initial success with these specific applications for several key reasons. Many local governments have formed a public-private partnership, using anchor tenancy or government financing as business models. In this way, the networks are sufficiently and sustainably funded, with the government's portion of the costs typically supported by an investment of government general funds (and grants, especially for public safety and emergency services). Learning from the lessons of their predecessors, and leveraging technological advancements, wireless 2.0 networks use a broader array of technologies and target specific hot zones rather than attempting a jurisdiction-wide effort. These efforts have been successful to an extent, but do not address Digital Inclusion objectives as a primary focus and suffer from a lack of vibrant stakeholder engagement.

The third generation of government-led wireless networks — wireless 3.0 — provides an opportunity to build stakeholder consensus of digital needs and opportunities, develop a robust, high capacity network, and emphasize integration of current and future wired and wireless technologies in areas of greatest need. In doing this, government-led 3.0 networks can be digitally inclusive, transformative and provide long-term support of multiple strategies to address Digital Divide challenges. In rural areas, local governments can look at a combination of wireline and wireless technology to achieve ubiquitous broadband where it is not available. In urban

areas, local governments can augment existing infrastructure with wireless technology to expand access for public facilities (such as libraries, convention centers, and transportation hubs) and affordable housing for lower-income families.

Certainly, the demand for broadband access only continues to grow among consumers who increasingly expect affordable, convenient, and ubiquitous broadband access. Yet, the Digital Divide in California is as big as it was at the beginning of the new century. Therefore, the imperative for Digital Inclusion is as important as when the first generation government-led wireless projects were launched.

Today, the ability to be connected instantly to the Internet through broadband technology is increasingly critical for access to and success in education, jobs, and economic opportunity. Hopefully, this Summary Report will help stakeholders (government agencies, community organizations, and industry providers) collaborate at the beginning of any well-intentioned wireless project to develop a sound business model and to achieve successful Digital Inclusion for a productive, healthy, and prosperous California.

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- 10 Baldassare, Mark, Dean Bonner, Jennifer Paluch, and Sonja Petek, "Californians and Information Technology," Public Policy Institute of California, (2008) at <http://www.ppic.org/main/publication.asp?i=831>. (Last viewed 19 Dec 2008.)

- 11 The growing reliance on the Internet as a source of information parallels the importance of newspapers in the 18th and 19th centuries. In 1787, Thomas Jefferson stated, "Were it left to me to decide whether we should have a government without newspapers, or newspapers without a government, I should not hesitate a moment to prefer the latter." Excerpt from "Letter to Edward Carrington," (1787).
- 12 Broache, Anne, "Estonia Pulls Off Nationwide Net Voting," CNETNews.com, (17 Oct 2005) at http://news.cnet.com/Estonia-pulls-off-nationwide-Net-voting/2100-1028_3-5898115.html. (Last viewed 19 Dec 2008.)
- 13 For example, the Livermore Info Net Collaborative (LINC) uses a high-speed wireless network to synchronize and disseminate video and emergency data among city/state emergency agencies, public libraries, the school district, and the police/fire departments. LINC was successfully demonstrated during emergency drills, (Apr and Nov 2007) at <http://www.wca.org/sig/ecllc>. (Last viewed 19 Dec 2008.)
- 14 Wilhelm, Anthony, *Digital Nation: Toward an Inclusive Information Society*, (Cambridge: MIT Press, 2004).
- 15 In 2004, President Bush said "This country needs a national goal...the spread of broadband technology...we have to have... universal, affordable access for broadband technology by the year 2007," (26 Mar 2004) at http://www.whitehouse.gov/infocus/technology/economic_policy200404/chap4.html. (Last viewed 19 Dec 2008.)
- 16 The components presented in this Summary Report build upon the "5As" advocated by CETF: *Access, Applications, Affordability, Accessibility, and Assistance*. For more information see: <http://www.cetfund.org/aboutyou/form/ideas>. (Last viewed 19 Dec 2008.)
- 17 Organization for Economic Co-Operation and Development (OECD), "OECD Broadband Portal," at <http://www.oecd.org>. (Last viewed 19 Dec 2008.)
- 18 Baldassare, "Californians & Information Technology."
- 19 In CETF's "5As," CETF labels this component as Access. However, for clarity purposes, the Project Team uses the term *Availability* since the term Access has become a catch-all term in popular literature to refer to any aspect of Digital Inclusion.
- 20 California Broadband Task Force, "The State of Connectivity: Building Innovation through Broadband."
- 21 In addition to the current Nation Online, see: National Telecommunications and Information, "Falling Through the Net: A Survey of the 'Have-Nots' in Rural and Urban America," (Washington, DC: NTIA, 1995); NTIA, "Falling Through the Net II: New Data on the Digital Divide," (Washington, DC: NTIA, 1998); NTIA, "Falling Through the Net: Defining the Digital Divide," (Washington, DC: NTIA, 1999); NTIA, "Falling Through The Net: Toward Digital Inclusion, A Report On Americans' Access To Technology Tools," (Washington, DC: NTIA, 2000); NTIA, "A Nation Online: How Americans Are Expanding Their Use of the Internet," (Washington, DC: NTIA, 2002); and United States Department of Commerce, Economics and Statistics Administration and National Telecommunications and Information Administration, "A Nation Online: Entering the Broadband Age," (Sep 2004). See also Mossberger, Karen, Caroline J. Talbert, and Mary Stansbury, *Virtual Inequality: Beyond the Digital Divide*, (Washington, DC: Georgetown University Press, 2003); Cooper, Mark N., "Inequality in Digital Society: Why the Digital Divide Deserves All the Attention it Gets," *Cardozo Arts and Entertainment Law Journal*, 20:1, (2002); Horrigan, John, "Home Broadband Adoption 2007," (Washington, DC: Pew Internet and American Life Project, 2007) at http://www.pewinternet.org/PPF/r/217/report_display.asp. (Last viewed 19 Dec 2008); Fox, Susannah and Gretchen Livingston, "Latinos Online: Hispanics with Lower Levels of Education and English Proficiency Remain Largely Disconnected from the Internet," (Washington, DC: Pew Internet and American Life Project, 2007) at http://www.pewinternet.org/pdfs/Latinos_Online_March_14_2007.pdf. (Last viewed 19 Dec 2008.)
- 22 Baldassare, "Californians & Information Technology."
- 23 Fox, "Latinos Online: Hispanics with Lower Levels of Education and English Proficiency Remain Largely Disconnected From the Internet."
- 24 Baldassare, "Californians & Information Technology."
- 25 Baldassare, "Californians & Information Technology." See also Census Bureau, "Current Population Survey Supplement," (2003), as cited in Rothschild, Jessica and April Kirkhart, "Helping Our Children With Disabilities Succeed: What's Broadband Got To Do With It?" *Digital Opportunity for Youth Issue Brief*, No. 2, (Santa Monica: The Children's Partnership, 2007) at <http://www.childrenspartnership.org/AM/Template.cfm?Section=Home&Template=/CM/ContentDisplay.cfm&ContentFileID=2284>. (Last viewed 19 Dec 2008.)

- 26 For additional resources, see the Alliance for Technology Access at <http://www.ata.org>. (Last viewed 19 Dec 2008.)
- 27 Warschauer, Mark, *Electronic Literacies: Language, Culture and Power in Online Education*, (Mahwah, NJ: Lawrence Erlbaum, 1999): 168.
- 28 For more information, please refer to the Regulatory Review of the Wireless Comparative Analysis and Best Practices Education Project at <http://www.CommunityPartners.org/wireless-documents.html> or <http://www.cetfund.org/resources/information>. (Last viewed 19 Dec 2008.)
- 29 For more information, please refer to the Regulatory Review of the Wireless Comparative Analysis and Best Practices Education Project at <http://www.CommunityPartners.org/wireless-documents.html> or <http://www.cetfund.org/resources/information>. (Last viewed 19 Dec 2008.)
- 30 Based on data collected by MuniWireless.com. See "First Anniversary Report," (2004), "Second Anniversary Report," (2005), "February 2006 List of US Cities and Regions," and "June 2007 list of US Cities and Regions." The list of government-led wireless networks as of June 2007 can be found as Appendix III of this Summary Report.
- 31 See case studies on Atlanta, Chicago, Eureka, Garden Grove, Los Angeles, Minneapolis, Napa, Oakland, Pasadena, Philadelphia, Pomona, Riverside, Silicon Valley, Southern California Tribal Digital Village, and Tempe. See Appendix VI for an overview chart of the case studies.
- 32 See case studies on Anaheim, Atlanta, Chicago, Eureka, Fresno, Fullerton, Galt, Garden Grove, Minneapolis, Modesto, Napa, Oakland, Pasadena, Pomona, Riverside, Southern California Tribal Digital Village, and Silicon Valley. See Appendix VI for an overview chart of the case studies.
- 33 See case studies on Anaheim, Atlanta, Chicago, Escondido, Eureka, Fullerton, Galt, Los Angeles, Minneapolis, Napa, Oakland, Ontario, Pasadena, Philadelphia, Pomona, Riverside, Sacramento, San Francisco, Southern California Tribal Digital Village, Silicon Valley, Tempe, and Winston-Salem. See Appendix VI for an overview chart of the case studies.
- 34 Baldassare, "Californians and Information Technology."
- 35 Baldassare, "Californians and Information Technology." This support may be based on the fact that nine in 10 California residents say that access to broadband is important, as described above.
- 36 Communications Engineering & Analysis for the Public Interest (CTC), "Wireless Feasibility Study: Prepared for the City of Tucson," (May 2007) at http://www.tucsonaz.gov/it/docs/CMS1_028045.pdf. (Last viewed 19 Dec 2008.)
- 37 Provider Financed: Anaheim, Atlanta, Chicago, Galt, Minneapolis, Napa, Ontario, Pasadena, Philadelphia, Rio Dell, Riverside, Sacramento, San Francisco, Silicon Valley, Tempe, and Winston-Salem.
Anchor Tenant: Galt, Minneapolis, Pasadena, Riverside, Sacramento, and Winston-Salem.
Sponsorship: Escondido and San Diego.
Government Financed: Fresno, Fullerton, and Garden Grove.
- 38 See case studies on Anaheim, Atlanta, Chicago, Escondido, Fullerton, Galt, Minneapolis, Napa, Ontario, Pasadena, Philadelphia, Pomona, Rio Dell, Riverside, Sacramento, San Francisco, Southern California Tribal Digital Village, Silicon Valley, Tempe, and Winston-Salem.
- 39 The draft of the lessons learned and promising practices presented to the Board of Directors of CETF is included as Appendix II.
- 40 For more information, please refer to the individual research documents of the Wireless Comparative Analysis and Best Practices Education Project at <http://www.CommunityPartners.org/wireless-documents.html> or <http://www.cetfund.org/resources/information>. (Last viewed 19 Dec 2008.)
- 41 Based on survey data collected from January 24, 2008 to April 4, 2008. As this publication was going to print, new developments revealed that some jurisdictions have changed their original plans.
- 42 MuniWireless, "The State of the Market Report," (Oct 2007) at <http://www.muniwireless.com>. (Last viewed 19 Dec 2008.)

- 43 In order to address this need, CETF is funding a project that seeks to develop model broadband policies that could be used by jurisdictions in California.
- 44 Please refer to CETF's website for updates on their efforts to identify model broadband policies at <http://www.cetfund.org>. (Last viewed 19 Dec 2008.)
- 45 Free public wireless Internet access is available at many California state facilities. Please visit the following link for a list: <http://www.CA.gov/WiFi.html>. (Last viewed 19 Dec 2008.)
- 46 Morrison, Adam, "Bridging the Last Mile: California's Wireless Internet Providers," (Sacramento: California Broadband Initiative, Business, Transportation and Housing Agency, 2008).
- 47 W2i Digital Cities Joint State Briefing, (Riverside, CA, 13 May 2008).
- 48 Civitium, "The Future of Municipal Broadband: Business, Technology and Public Policy Implications for Major U.S. Cities," (2008): 41.
- 49 Civitium, "The Future of Municipal Broadband: Business, Technology and Public Policy Implications for Major U.S. Cities."
- 50 See case studies on Fresno, Fullerton, and Garden Grove.
- 51 Peha, Jon M, "Wireless Pittsburgh: Sustainability of Possible Models for a Wireless Metropolitan-Area Network," (Washington, DC: New America Foundation, 2008).
- 52 *Little Tokyo Unplugged* is a community network and non-profit project of the Little Tokyo Service Center, a Community Development Corporation, at <http://www.littletokyouunplugged.org>. (Last viewed 19 Dec 2008.)
- 53 See case studies on Anaheim, Atlanta, Chicago, Eureka, Fresno, Fullerton, Galt, Garden Grove, Los Angeles, Minneapolis, Modesto, Napa, Oakland, Pasadena, Philadelphia, Pomona, Riverside, Southern California Tribal Digital Village, Silicon Valley, and Tempe.
- 54 The following case studies are good examples of local governments pursuing Digital Inclusion: Riverside, San Francisco, and the Southern California Tribal Village.
- 55 Morrison, "Bridging the Last Mile: California's Wireless Internet Providers."
- 56 Cost of deployment of WiMax and other new technology should be considered. In addition, devices such as computers, laptops, or PDAs may not be currently equipped to connect to this broadband technology.
- 57 A similar model, FON, is also being deployed in the United States and abroad.
- 58 Cox, John, "Municipal WiFi 2.0; As Large-Scale, For-Profit Projects Falter, Innovative New Models Emerge," *Network World*, (21 Apr 2008): 22.
- 59 Meraki, "Free the Net," at <http://www.meraki.com>. (Last viewed 19 Dec 2008.)
- 60 Calabrese, Michael and Sascha D. Meinrath, "Unlicensed White Space Devices and Myth of Interference; 'White Space Device' Operations on the TV Band and the Myth of Harmful Interference," (Washington, DC: New America Foundation, 2008) at http://www.newamerica.net/publications/policy/unlicensed_broadband_device_technologies. (Last viewed 19 Dec 2008.)
- 61 See case studies on Anaheim, Napa, and Silicon Valley.
- 62 As noted in the PPIC Californians and Information Technology report, 67% of Californians say that governments providing free Internet is a good idea. Approval for providing free wireless access has increased since the first time this question was asked in March 2007 when 58% said it was a good idea.
- 63 Deployment stages in the case studies: *build-out, proof of concept, contract, fully functioning*.
- 64 Planning stages in the case studies: *exploration, and request for proposals*.

65 The same trend can be seen in the development of broadband plans. Survey results indicate that only 42% of the survey respondents conducted community public forums to discuss the jurisdiction's broadband plans. Most frequently, broadband was discussed at governing board meetings (94%). Although important, this method falls short of effectively engaging the entire community.

66 See case studies on Winston-Salem, Riverside, and Philadelphia.

67 Over 73% of the case studies (19 of 26) and nearly 60% of the survey respondents (that are planning or implementing wireless networks) indicated that Digital Inclusion was a goal of the network.

68 An innovative example of a wireless network implementing a new Digital Inclusion strategy is the WiFi101.org community network. This is a wireless network operated by Community Wireless, a non-profit organization in East Palo Alto, which has the dual goal of providing affordable Internet connection to the community and serving as a training laboratory for students learning computer networking technology. Community Wireless offers both a free, non-supported Internet connection service and a low-cost supported service. As part of their on-the-job experience, the students provide computer technical support for the community for a nominal fee. The fees will provide paid internships to more advanced students and will offset some of the costs of running the network. This innovative approach also sheds light onto new revenue strategies that could contribute to the sustainability of a wireless network.

69 Recent literature has begun to refer to the current stage of evolution of wireless networks using the term 2.0. For example, see: Cox, "Municipal WiFi 2.0; As Large-Scale, For-Profit Projects Falter, Innovative New Models Emerge."

Checklist

This Checklist is intended for representatives of community and local governments in California interested in implementing a government-led wireless network. The Checklist is divided into four sections: Fact Finding and Planning, Decision Making, Request for Proposals (RFP), and Implementation. The steps in this Checklist are written in an ideal chronological order, but the reader should be aware that project implementation is usually affected by many factors that impact the timing and sequence of the steps. This document concludes with references to additional guides and toolkits produced by other organizations.

The reader is strongly encouraged to read the full *Wired for Wireless? Towards Digital Inclusion and Next Generation Government-Led Wireless Networks* report before using this Checklist. This Checklist is based on research data presented by this Summary Report and its associated research documents. Many issues are not fully elaborated here, which may affect their interpretation.

Fact Finding and Planning

Identify the current broadband policies in the jurisdiction.¹

Broadband policies provide a clear goal for policy makers, local government staff, industry representatives and community members to work toward.

Identify civic and political leaders in your community advocating for broadband.

Assess the broadband needs of the community.

- Some assessment mechanisms include focus groups, town hall meetings, interviews, and surveys. It is recommended that a comprehensive approach be developed, which would include a combination of all the mechanisms stated above. In many cases, local governments are contracting with consultants to conduct feasibility studies.
- Talk to different stakeholders: government agencies and departments, industry representatives, non-profit organizations, and the community at large.
- Assess how the identified needs impact the applications and technology requirements (type of wireless technology, upload/download speeds).

1. The California Emerging Technology Fund (CEFT) is currently funding research on model broadband policies. Please check the CETF website for more information about the research. Additionally, please refer to the Regulatory Review research document of the Wireless Comparative Analysis and Best Practices Education Project (<http://www.CommunityPartners.org/wireless-documents.html>) or (www.cetfund.org/resources/information).

Gather jurisdiction information and data pertinent to the business planning process.

- Obtain a topology map of the area to best understand where added costs may be incurred due to the terrain.
- Compile a list of the high altitude public access fixtures which a vendor may use to affix their wireless equipment, such as: cell, water, radio, TV, and fire look-out towers; and public buildings and structures. Also assess the availability of electrical power at each location.
- Identify hardware and software requirements that enable the services and features that government departments, resellers, and end-users need, want, and would like to have.²
- Understand the possible value-added³ services and features based on planned levels of security, quality of service, bandwidth, and redundancy.
- Explore and define the levels of services that would be provided to end-users.

Map broadband availability in your jurisdiction.

Obtain data about where broadband is currently available. Data may be obtained from: California Broadband Initiative (<http://www.calink.ca.gov>), local community technology organizations, libraries, schools, health facilities, and local providers (wired and wireless).⁴

Map the assets of the community by collaborating with stakeholders.

When assessing the needs of the community and government agencies/departments in your jurisdiction, also evaluate the assets they have available to invest in the project. In some instances, communities are already implementing community wireless networks. Also, as indicated above, government entities may have resources they can contribute, such as: access to fiber networks (e.g. water and power departments), current local government providers, light poles and tall buildings for the attachment of equipment (e.g. public utility and planning departments), and existing funding for specific broadband initiatives (e.g. city development agencies).

Make Digital Inclusion components an integral part of the network planning and implementation.⁵

Providing access to the Internet is only one of several key components to bridging the Digital Divide. Identify existing programs administered by government, industry, and community that:

- Develop online content and software applications that are relevant to the community using the wireless network.
- Help low-income communities with the costs of online devices (computers, cell phones, wireless cards, assistive technology) and monthly service.

2. Nice-to-have services and features are those that may not be required or needed but may be desirable to increase functionality and desirability.

3. Value-added services and features are those that increase user adoption or service value, such as voice-over internet protocol (VoIP), video telephony, internet protocol television (IPTV), managed firewalls, among others.

4. There are several online tools to find WiFi hotspots in California, such as Anchor Free (<http://anchorfree.com/hotspot/finder>), Wi-FiHotSpotList.com (<http://www.wi-fihotspotlist.com/browse/us/2000238/>), and JiWire (<http://www.jiwire.com/>). The State of California website also provides a list of State facilities/entities that provide free public wireless Internet (<http://www.ca.gov/WiFi.html>).

5. To truly pursue a comprehensive Digital Inclusion strategy, consideration must be given to the following key components: Stakeholder Engagement, Adoption, Availability, Applications, Affordability, Accessibility, and Assistance. For more information, please refer to The Pursuit of a Digitally Inclusive California section of the *Wired for Wireless? Towards Digital Inclusion and Next Generation Government-Led Wireless Networks* report (<http://www.CommunityPartners.org/wireless-documents.html>) or (www.cetfund.org/resources/information).

- Help populations with disabilities access and use the technology.
- Assist users with maintenance, technical support, and upgrading.

Learn from the past.

Communicate with other jurisdictions already implementing projects and review previous research.

Decision Making

Identify clear objectives for the project.

The objectives of government-led wireless networks can generally be categorized into three different areas:

- Government Operations and Services (emergency services, employee communication, movement of data).
- Public Policy Goals (improving education, promoting workforce development, and economic development that includes drawing tourism and attracting high-tech companies to the region).
- Public Access (providing broadband access to the community at affordable rates and/or deployment in underserved areas).

Identify very clear and concise objectives. Avoid general descriptions. Always consider: Who will it benefit? How will it benefit them? How will the network be used to accomplish the objectives? What is the necessary deployment area to accomplish the objectives?

Make a decision on whether a government-led wireless network is right for your community.

Representatives of all stakeholder groups should be involved in the decision making process.

Some guiding questions in making the decision include:

- How does the network address the broadband priorities of the jurisdiction?
- Are there clear objectives for the project?
- Can the needs identified be met by the private sector? Or through collaboration with local community projects?
- Are there enough assets to secure the sustainability of the project?⁶
- Is there sufficient leadership from the community, government, and business sectors to undertake the project?

Choose a business model.

The right business model is greatly dependent on the objectives of the network and the assets identified. Each business model has its advantages and disadvantages. While the business model is not the only reason many wireless networks have not been successful (technological and political challenges have also played a role), it is clear that in order for government-led wireless networks to be sustainable they require long-term investment from the local government. Once a business model is chosen, it is important to provide a level playing field for all vendors.

6. The City of San Francisco is pursuing a different approach in which they are building targeted networks in public housing sites and supporting various local initiatives in order to accomplish their original goal of providing Internet access to the community. See case study on San Francisco in the Case Studies research document of the Wireless Comparative Analysis and Best Practices Education Project (<http://www.CommunityPartners.org/wireless-documents.html>) or (www.cetfund.org/resources/information).

- **Provider Financed:** The network provider finances the system and recoups its investment via advertising and/or subscription fees.
- **Anchor Tenant:** The local government agrees to buy a certain amount of service from the wireless provider. The agreement guarantees the provider a revenue stream, thus making the transaction attractive to the provider. The anchor tenant model is usually used in combination with the provider financed model.
- **Sponsorship:** An entity such as a company or a foundation pays for the deployment, public access, and/or community benefits.
- **Government Financed:** The local government pays for and owns the system, and may contract to have it managed.

Select an ownership model.

Who will own the assets of the network? The ownership of the assets will greatly depend on the business model selected. If the government financed or sponsorship business models are selected, the network will be owned by the local government or administrative body. If the provider financed or anchor tenant models are selected, the network will most likely be owned by the provider.

Identify an administration model.

How will the overall project be administered? Project administration refers to the overall supervision of the project and its implementation and development. Some possible administration structures include:

- A local government agency (usually the IT department).
- A partnership between a government agency and a collaborative (task force, committee, etc.) from community, business, and government entities.
- A non-profit organization that represents all stakeholders.

Decide on a network management model.

How will the network be managed on a day-to-day basis (provision of technical assistance to the network, upgrades, maintenance, customer support)? Usually the network owner determines the management model. The network may be managed by:

- The local government.
- An outside vendor.
- A partnership between the local government and a vendor.

Request for Proposals (RFP)

Research previous samples.⁷

Important issues to include are:

- Require a pilot phase; determine clear pilot objectives and timetable.
State clear consequences in case objectives are not met (exit clause).
- Include provisions for technology upgrades.
- Include clear criteria for evaluating the proposals.

7. To access sample RFPs from other jurisdictions throughout the United States, visit MultiState Associates at <http://www.multistate.com/>.

Obtain input from stakeholders on a draft RFP.

Select provider.

Implementation

Conduct pilot.

Evaluate the pilot and share the results with the public.

Assess if the pilot is meeting objectives, especially technology effectiveness, and sustainability.

Expand implementation.

Conduct regular evaluation of the project.

Is the project meeting the objectives? Have the original needs changed? How do new technology developments affect the project?

Stakeholder Engagement

Engaging stakeholders in the community is a key component of an effective Digital Inclusion plan. Thus, pay particular attention to the following questions in the development of a government-led wireless network.

- How will stakeholders be engaged in the planning process?
- How will stakeholders be engaged in the decision making process?
- How will stakeholders be engaged in the organizational model selected?
- How will stakeholders be engaged in the implementation and evaluation process?

Other Resources

Below you will find additional guides or toolkits for representatives of community and local governments in California interested in implementing a government-led wireless network:

- *Action Plan for Deploying Broadband Internet to Michigan Local Governments*, Michigan Department of Information Technology, (http://www.michigan.gov/documents/dit/Broadband_Reference_Guidebook_FINAL_212166_7.pdf).
- *Municipal Wireless Buyer's Guide*, DailyWireless.com, (<http://www.dailywireless.com/buyers-guides/muni-wireless-bg/>). Also see, *Five Keys to Successful Metro-Scale Wi-Fi Deployment*, Tropos Networks, (http://www.tropos.com/pdf/technology_briefs/tropos_techbrief_five_keys.pdf).
- *Planning Your Municipal Wireless Network*, BelAir Networks, (http://www.belairnetworks.com/resources/pdfs/Chkfst_Muni_Ntwrk_BDMX00040_A01.pdf).
- Additional resources can also be found in the Bibliography document of this Summary Report, (<http://www.CommunityPartners.org/wireless-documents.html>) and (<http://www.cetfund.org/resources/information>).
- MuniWireless, (<http://www.muniwireless.com>).

Draft Version of Lessons Learned and Promising Practices

Below the reader will find the draft list of lessons learned and promising practices as they were presented to the Board of Directors of the California Emerging Technology Fund on June 5, 2008.

Technology

- Consider wireless networks as part of an overall information technology and broadband plan for the local government.
- Understand suitable applications for wireless technology – what it can and cannot do.
- Give serious consideration to the limitations of WiFi technologies.
- Incorporate provisions for scalability and/or technical upgrades in network plans.
- Articulate clearly and accurately, from local government to the public, the proposed scope of services of any wireless project and its major network limitations.
- Avoid poor initial network implementation as it can damage long-term network success.
- Address the need to provide technical assistance for end users.

Planning

- Link broadband deployment and use to local and regional needs and plans for information technology and other infrastructure.
- Include broadband deployment in local and regional planning processes and documents, such as general plans.
- Learn where broadband is deployed and at what speed the connection is at the census block level.
- Inventory available assets that could be leveraged in implementing a wireless network.
- Establish a working relationship with local and regional broadband service providers – both wireline and wireless.
- Undertake Proof of Concept projects before final contracts are approved to fully anticipate costs and technical feasibility.
- Establish opportunities for local government officials to discuss with each other broadband policy issues and wireless project implementation.
- Leadership from elected officials and executive managers is essential for projects to succeed.

Stakeholders

- Engage stakeholders in determining public need, selecting applications for a wireless network, gauging public readiness, and building support for the project.
- Establish opportunities for stakeholders, particularly community-based organizations, to discuss broadband policy issues, including wireless project implementation.

Business Models and Sustainability

- Choose a business model based on local and regional needs and network objectives. There is no single best business model for sustainability of wireless projects.
 - The “government-financed model” can be successful if local governments clearly understand the objectives of the network and are willing to provide support.
 - The “provider financed model” is less likely to succeed absent a commitment by the local government to serve as an anchor tenant.
 - The “sponsorship model” appears to have met with some success, but the reliance on foundation and corporate contributions has limitations.
- Ensure a level playing field for both wireline and wireless broadband providers, making the use of public assets available to all providers on a competitive basis, commensurate with their public benefit provisions.

Digital Inclusion

- Implement a comprehensive Digital Inclusion process and plan – more than just a ‘program’ or a ‘component’ of the wireless network.
- Engage community stakeholders from the beginning and throughout the planning and implementation of the wireless project.
- Consider such barriers to Digital Inclusion as lack of access, equipment, content, and technical assistance.

Government-Led Wireless Networks in California

List of local governments and regions implementing or planning government-led wireless as reported by Muniwireless.com (June 2007).

Implementing

1. Anaheim
2. Burbank
3. Cerritos
4. Chico
5. Clovis
6. Concord
7. Corona
8. Covina
9. Culver City
10. Cupertino
11. Elk Grove
12. Encinitas
13. Foster City
14. Fremont
15. Fresno
16. Fullerton
17. Galt
18. Hermosa Beach
19. Laguna Beach
20. Livermore
21. Lompoc
22. Long Beach
23. Los Angeles
24. Marin County
25. Marina del Rey
26. Maywood
27. Milpitas
28. Mountain View
29. Napa

Planning

30. Newport Harbor
31. Oakland
32. Ontario
33. Pacifica
34. Parlier
35. Pasadena
36. Pleasant Hill
37. Pleasanton
38. Pomona
39. Ripon
40. Riverside
41. Sacramento
42. San Diego County
43. San Diego
Indian Tribal Villages
44. San Francisco
45. San Joaquin
46. San Jose
47. San Mateo
48. Sanger
49. Santa Barbara
50. Santa Clara
51. Santa Monica
52. Silicon Valley
(region)
53. Sunnyvale
54. West Covina
55. West Hollywood
56. Butte County
57. Diamond Bar
58. El Dorado County
59. Glendale
60. Nevada County
61. Orick
62. Placer County
63. Solano County
64. Yolo County
65. Yuba County

APPENDIX IV

Cities and Counties in California that Responded to the Survey

Cities

Alameda
Antioch
Aracadia
Bakersfield
Belmont
Beverly Hills
Burbank
Campbell
Ceres
Chula Vista
Clovis
Coachella
Coronado
Costa Mesa
Daly City
Davis
Del Mar
Diamond Bar
Dinuba
Dublin
Escalon
Fontana
Foster City
Fremont
Fresno
Fullerton

Gilroy
Glendora
Hawthorne
Hayward
Hercules
Huntington Beach
Huntington Park
Irwindale
Jackson
Laguna Hills
Lakewood
Livermore
Long Beach
Los Angeles
Los Banos
Malibu
Menlo Park
Merced
Mission Viejo
Monrovia
Moreno Valley
Norco
Ontario
Pacifica
Palm Desert
Pasadena
Paso Robles

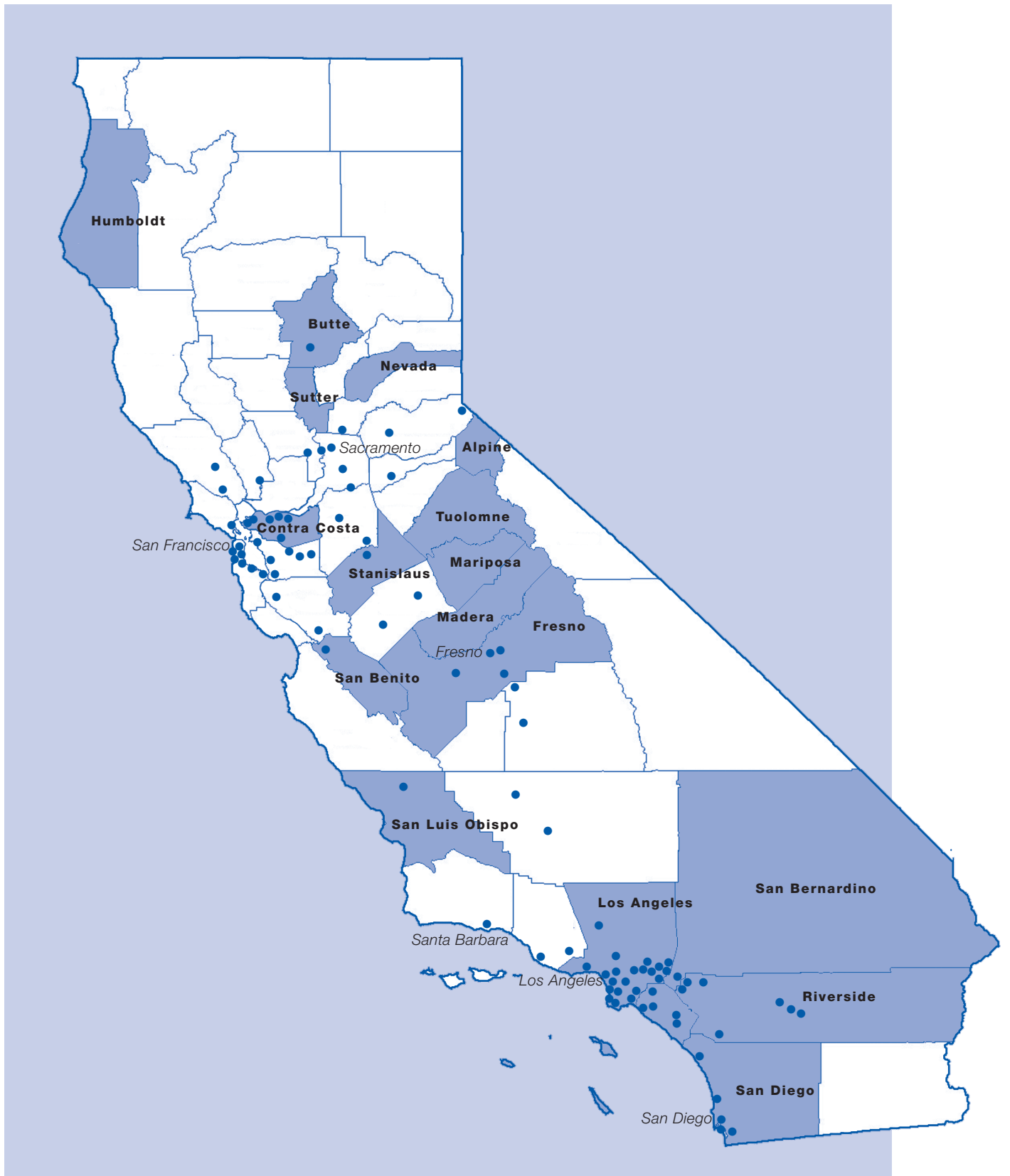
Petaluma
Pinole
Placerville
Pleasant Hill
Pomona
Port Hueneme
Rancho Mirage
Redondo Beach
Redwood City
Riverside
Rolling Hills
Rolling Hills Estates
Roseville
San Bruno
San Francisco
San Juan Bautista
San Pablo
San Rafael
Santa Barbara
Santa Clarita
Santa Monica
Santa Rosa
Selma
South Lake Tahoe
South Pasadena
Stockton
Temecula

Thousand Oaks
Torrance
Tulare
Walnut Creek
Wasco
West Sacramento
Westminster

Counties

Alpine
Butte
Contra Costa
Fresno
Humboldt
Los Angeles
Madera
Mariposa
Nevada
Riverside
San Benito
San Bernardino
San Diego
San Luis Obispo
Stanislaus
Sutter
Tuolumne

Responses received from January 24, 2008 to April 4, 2008



APPENDIX V

Jurisdictions Analyzed in the Case Studies

Arizona

Tempe

California

Anaheim
Escondido
Eureka
Fresno
Fullerton
Galt
Garden Grove

Los Angeles

Modesto

Napa

Oakland

Ontario

Pasadena

Pomona

Rio Dell

Riverside

Sacramento

San Francisco

Silicon Valley

Southern California

Tribal Digital Village
(SCTDV)

Georgia

Atlanta

Illinois

Chicago, IL

Minnesota

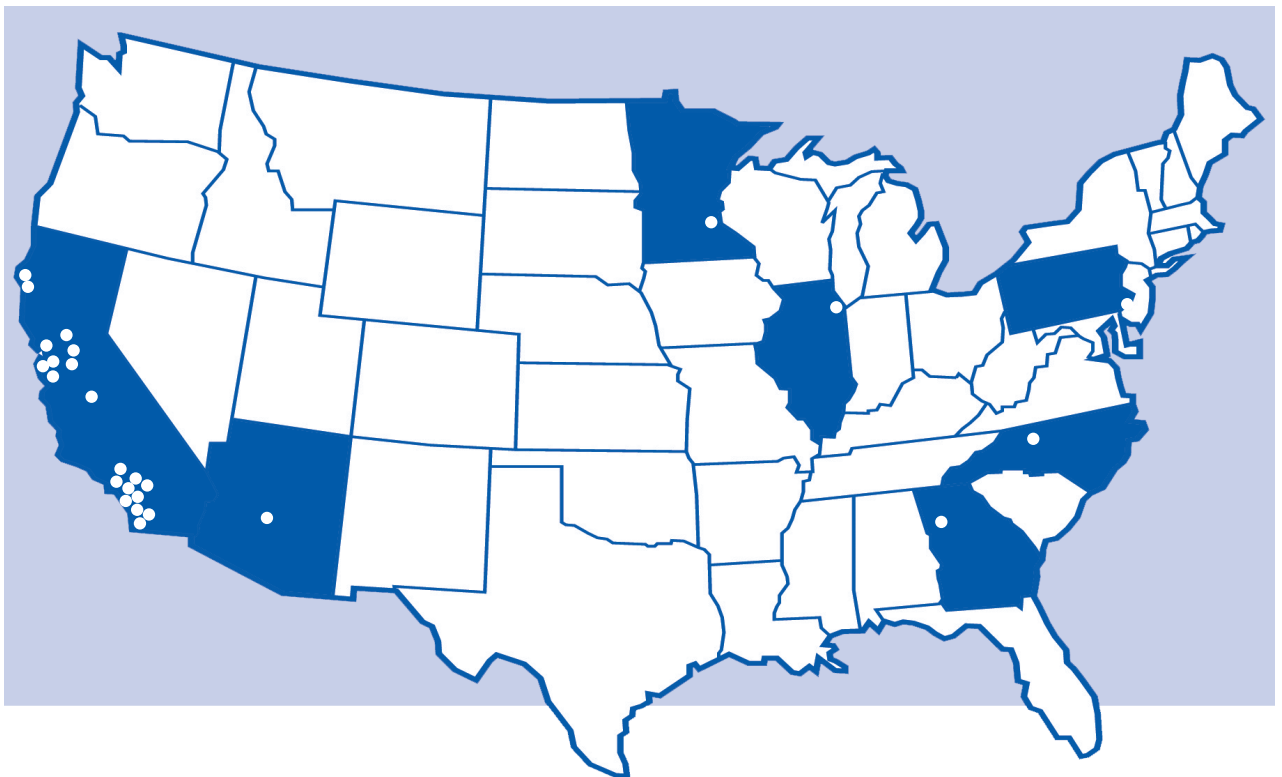
Minneapolis, MN

North Carolina

Winston-Salem

Pennsylvania

Philadelphia, PA



APPENDIX VI

Case Studies Overview Chart

(as of 06/30/08)

	Implementation				Objectives				Business Model				
	PL	PC	FN	NF	ED	DI	GS	PS	PF	AT	SP	GF	N/A
Anaheim				X	X			X	X				
Atlanta		X			X	X	X	X	X				
Chicago				X	X	X	X	X	X				
Escondido			X		X						X		
Eureka	X				X	X	X	X					X
Fresno			X					X				X	
Fullerton			X		X			X				X	
Galt			X		X			X	X	X			
Garden Grove			X				X	X				X	
Los Angeles	X				X	X	X						X
Minneapolis			X		X	X	X	X	X	X			
Modesto	X							X					X
Napa				X	X	X	X	X	X				
Oakland	X				X	X	X	X					X
Ontario		X			X	X			X				
Pasadena				X	X	X	X	X	X	X			
Philadelphia			X		X	X	X		X				
Pomona	X				X	X	X	X					X
Rio Dell			X			X			X				
Riverside			X		X	X	X	X	X	X			
Sacramento		X			X	X			X	X			
San Francisco				X	X	X			X				
SCTDV*			X		X	X	X	X			X		
Silicon Valley		X			X	X	X	X	X				
Tempe				X	X	X	X		X				
Winston-Salem			X		X	X			X	X			

* Southern California Tribal Digital Village

Planning

Post-Contract

Functioning

Not Functioning

Economic Development

Digital Inclusion

Government Services

Public Safety

Provider Financed

AT: Anchor-Tenant

Government Financed

Sponsorship

Case Studies Overview Chart

(continued)

	Technology				Digital Inclusion				Speed Range
	WF	WM	OT	N/A	IA	TR	EQ	N/A	
Anaheim	x	x			x		x		1 Mbps
Atlanta	x				x				1-3 Mbps
Chicago	x				x	x	x		3 Mbps
Escondido	x							x	700 Kpbs
Eureka				x	x				n/a
Fresno			x					x	n/a
Fullerton	x							x	5 Mbps
Galt	x							x	2-4 Mbps
Garden Grove		x						x	3-4 Mbps
Los Angeles				x				x	n/a
Minneapolis	x				x	x			1-6 Mbps
Modesto				x				x	768 Kpbs-1.5 Mbps
Napa	x				x				n/a
Oakland				x	x				n/a
Ontario	x							x	3-8 Mbps
Pasadena	x				x				n/a
Philadelphia	x		x		x	x	x		1 Mbps
Pomona	x	x			x	x	x		1-26 Mbps
Rio Dell	x				x				???
Riverside	x				x	x	x		1-54 Mbps
Sacramento	x				x		x		1-3 Mbps
San Francisco	x				x	x	x		300Kbps-1Mbps
SCTDV*	x				x		x		45 Mbps
Silicon Valley	x	x	x		x				1-54 Mbps
Tempe	x				x				2 Mbps
Winston-Salem	x	x			x	x	x		512 Kbps-3 Mbps

WiFi

WiMax

Other

Internet Access

Training for users

Equipment for users

* Southern California Tribal Digital Village

Select Bibliography

The Project Team conducted a comprehensive examination of recent publications on government-led broadband. Below you will find highlights from the more than 100 publications reviewed for this project. The full bibliography is part of the Literature Review research document.

To access the Literature Review and the other research documents, please visit:

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